

**Curriculum of  
BACHELOR OF COMPUTER APPLICATIONS**

**Programme Code: 3USCA**

**Offered by**

**Centre for Differently Abled Persons**

**Bharathidasan University**

Tiruchirappalli - 620 023

Tamil Nadu, India



**BACHELOR OF COMPUTER APPLICATIONS**

Regulations and Syllabi for the BCA Programme  
For the candidates admitted from the academic year 2026-2027  
onwards

## Bharathidasan University, Centre for Differently Abled Persons

Bachelor of Computer Applications (Curriculum from 2026-2027)

### 1. PREAMBLE

The Bachelor of Computer Applications (BCA) programme provides a strong foundation in Computer Applications and contemporary computing technologies. It integrates theoretical knowledge with practical learning to develop computational thinking, analytical abilities and technical competence. The programme covers programming, software development and emerging technologies while promoting communication, ethics, innovation, collaboration and continuous learning. It prepares graduates for higher education, employment, entrepreneurship and lifelong professional development in Computer Applications.

### 2. ABOUT THE PROGRAMME

The Bachelor of Computer Applications (BCA) is a three-year undergraduate programme integrating theoretical knowledge with practical and experiential learning. The curriculum covers programming, data structures, databases, networking, software engineering and web development, along with emerging technologies such as IoT, Artificial Intelligence and Machine Learning. Laboratory activities, skill development, projects and industrial training enhance practical competence and employability. Digital skills and assistive technologies promote accessible learning and professional readiness.

### 3. REGULATION OF THE PROGRAMME (BCA)

- a) **Duration** : Three Years (Six semesters).
- b) **Medium of Instruction** : The medium of instruction will be Bilingual (Tamil & English).
- c) **Number of Intake** : The maximum number of student's enrolment for the programme will be 20 and shall be increased based on need and approval from the University.
- d) **Eligibility** : This programme is specifically for **Students with Speech and Hearing Impairment** with minimum 40% of the specified disability (UDID Certificate is mandatory). The candidates shall be required to have passed (10 + 2 patterns) with Computer Science or Mathematics or Business Mathematics in Higher Secondary Examination as specified by the Government of Tamil Nadu Higher Education (G1) Department G.O. (D) No.147, Dated 05.05.2023 and as per University norms.

#### e) Courses in Programme

##### i. Language Course (LC):

1. Tamil
2. English

##### ii. Course structure

|                                 |    |
|---------------------------------|----|
| Language Courses                | 8  |
| Core Course + Foundation Course | 11 |
| Core Practical + Project        | 8  |
| Allied Course                   | 4  |
| Allied Practical                | 4  |

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|                            |           |
|----------------------------|-----------|
| Skill Enhancement Course   | 5         |
| Non Major Elective         | 2         |
| Others                     | 5         |
| <b>Total No of Courses</b> | <b>47</b> |

**f) Attendance requirements for Examination**

| <b>Attendance %</b> | <b>Eligibility / Requirement</b>                                                                                                                                 |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 75% and above       | Students are eligible to appear for the semester examination.                                                                                                    |
| 65%–74%             | Students may apply for condonation of shortage of attendance in the prescribed form along with the prescribed fee.                                               |
| 50%–64%             | Students may apply for condonation of shortage of attendance in the prescribed form along with the prescribed fee and a valid Medical Certificate.               |
| Below 50%           | Students are not eligible to appear for the semester examination and shall be required to re-do the concerned semester(s) after the completion of the programme. |

**g) Evaluation**

Evaluation of each course shall comprise Continuous Internal Assessment (**CIA**) and the End Semester Examination (**ESE**) in accordance with the University norms and regulations.

**i. Passing Minimum**

|                  | <b>Continuous Internal Assessment (CIA)</b> | <b>Minimum Passing Marks</b> | <b>University Examination (UE)</b> | <b>Minimum Passing Marks</b> |
|------------------|---------------------------------------------|------------------------------|------------------------------------|------------------------------|
| <b>Theory</b>    | 40% out of 30 marks                         | 12                           | 40% out of 70 marks                | 28                           |
| <b>Practical</b> | 40% out of 40 marks                         | 16                           | 40% out of 60 marks                | 24                           |

**ii. Passing Condition:**

A candidate shall be declared to have passed a course only if the candidate secures the prescribed minimum marks in both Continuous Internal Assessment (CIA) and University Examination (UE).

**iii. Reappearance Condition:**

A candidate who fails in the **CIA** shall be permitted two chances to reappear through Tests and Assignments in subsequent semesters. A candidate who fails in the **University Examination** shall be permitted to reappear for the failed course in the subsequent University Examination, as per the University rules and regulations in force.

### **Eligibility for the Award of Bachelor of Computer Applications**

A candidate shall be eligible for the award of the Degree of Bachelor of Computer Applications upon successful completion of all prescribed courses and credits of the BCA Programme and fulfillment of all academic and regulatory requirements prescribed by the University.

### **4. REVISION OF REGULATIONS AND CURRICULUM**

The University reserves the right to revise, amend, or modify the **Regulations and Curriculum** from time to time, as deemed necessary.

**Note: The above regulations are subject to amendments from time to time.**

### **5. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

Graduates of the programme will be able to:

**PEO1:** Apply fundamental knowledge of computer applications, programming, mathematics and computational techniques to analyse and solve problems in academic, professional and real-world contexts.

**PEO2:** Design, develop and implement software applications using modern programming languages, databases, web technologies, networking, AI-enabled tools and contemporary computing technologies.

**PEO3:** Pursue higher education, employment, entrepreneurship and lifelong learning while demonstrating professional ethics, effective communication, teamwork, innovation and social responsibility.

### **6. PROGRAMME OUTCOMES**

On successful completion of the BCA Programme, graduates will be able to:

**PO1 – Disciplinary Knowledge:** Apply knowledge of computer applications, mathematics, algorithms, programming and computing fundamentals to model, analyse and develop computer-based solutions.

**PO2 – Problem Analysis and Problem Solving:** Analyse, formulate and solve computing problems using logical, algorithmic and computational approaches, considering relevant societal, ethical and environmental requirements.

**PO3 – Modern Tools, Professional Skills and Lifelong Learning:** Use contemporary computing tools and technologies to develop software solutions and demonstrate effective communication, teamwork, professional ethics, innovation and continuous learning.

## **7. PROGRAMME SPECIFIC OUTCOMES:**

On successful completion of the BCA Programme, graduates will be able to:

**PSO1:** Apply programming concepts, data structures, algorithms and computational techniques to develop effective solutions for real-world problems.

**PSO2:** Design and develop software applications using programming languages, web technologies, database management systems, networking and system software.

**PSO3:** Apply software engineering principles, open-source technologies and modern development tools to analyse, design, implement and test software projects.

**PSO4:** Utilise emerging technologies such as Artificial Intelligence, Machine Learning, Internet of Things, cloud-based and digital technologies to address contemporary computing requirements.

**PSO5:** Demonstrate professional communication, teamwork, problem-solving, innovation, ethical practice and entrepreneurial skills for employment, higher education and lifelong learning.

## **8. PEO–PO–PSO ALIGNMENT MATRIX**

| PEOs / POs & PSOs | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------------|-----|-----|-----|------|------|------|------|------|
| PEO1              | ✓   | ✓   |     | ✓    | ✓    | ✓    |      |      |
| PEO2              | ✓   | ✓   | ✓   | ✓    | ✓    | ✓    | ✓    |      |
| PEO3              |     | ✓   | ✓   |      |      | ✓    | ✓    | ✓    |

**Legend:** ✓ – Direct alignment

This alignment reflects a progressive development of learning from foundational computing knowledge and its application (PO1) to systematic problem analysis and problem-solving (PO2), and further to the effective application of modern computing tools, professional competencies and lifelong learning (PO3). The PSOs further define the specialized competencies expected of graduates in programming, software development, database and web technologies, emerging computing technologies, and professional practice.

## **9. BLOOM’S TAXONOMY LINKAGE WITH PROGRAMME OUTCOMES**

The alignment of Programme Outcomes (POs) with Bloom’s Taxonomy reflects the progressive development of cognitive abilities, from understanding fundamental computing

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concepts to applying knowledge, analysing problems, evaluating solutions and creating technology-based applications.

| PO                                                               | Dominant Bloom's Level | Cognitive Process                                                                                                      | Indicative Action Verbs                                      |
|------------------------------------------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| PO1 –<br>Disciplinary Knowledge                                  | <b>K3 – Apply</b>      | Application of computing, programming and mathematical knowledge to academic and practical contexts                    | Apply, demonstrate, implement, use, solve                    |
| PO2 –<br>Problem Analysis and Problem Solving                    | <b>K4 – Analyse</b>    | Analysis, interpretation and systematic solution of computational and real-world problems                              | Analyse, differentiate, examine, interpret, solve, formulate |
| PO3 –<br>Modern Tools, Professional Skills and Lifelong Learning | <b>K6 – Create</b>     | Design and development of technology-based solutions using contemporary tools, collaboration and innovative approaches | Design, develop, construct, create, integrate, implement     |

### Bloom's Taxonomy Levels

| Level     | Cognitive Process |
|-----------|-------------------|
| <b>K1</b> | Remember          |
| <b>K2</b> | Understand        |
| <b>K3</b> | Apply             |
| <b>K4</b> | Analyse           |
| <b>K5</b> | Evaluate          |
| <b>K6</b> | Create            |

## 10. GRADUATE ATTRIBUTES

Graduates of the BCA programme are expected to demonstrate technical competence in programming, computing and software development; apply logical, analytical and computational approaches to problem-solving; effectively utilise modern computing tools, digital platforms and emerging technologies; communicate and collaborate effectively in academic and professional environments; and demonstrate innovation, professional ethics, social responsibility and a commitment to lifelong learning in response to evolving technological and professional requirements.

## **11. EXPECTED JOB ROLES / CAREER OPPORTUNITIES**

BCA graduates may pursue careers in software development, web development, database management, technical support and IT-enabled services. Potential roles include Software Developer, Web Developer, Software Tester, Database Assistant, IT Support Executive and Junior System Administrator. Graduates may also explore opportunities in AI/ML support, freelancing, entrepreneurship and higher education.

## **12. PEDAGOGICAL METHODS**

The BCA programme adopts a learner-centred, practical and technology-enabled approach to facilitate the effective acquisition and application of computing knowledge and skills.

1. **Interactive Lectures** – Deliver fundamental concepts through structured lectures, discussions and question-answer sessions.
2. **Demonstration and Guided Practice** – Demonstrate programming, software tools and computing applications followed by supervised hands-on practice.
3. **Laboratory-Based Learning** – Develop practical competency through programming, database, web development, networking, IoT and AI/ML laboratory activities.
4. **Problem-Based Learning** – Engage students in analysing computational problems and developing logical and technology-based solutions.
5. **Project-Based Learning** – Provide opportunities to design and implement individual or group projects addressing practical requirements.
6. **Experiential and Activity-Based Learning** – Use practical exercises, case studies, simulations and real-world activities to strengthen application-oriented learning.
7. **Collaborative Learning** – Promote teamwork, peer learning, group discussions and collaborative technology projects.
8. **Technology-Enabled Learning** – Utilise digital learning platforms, multimedia resources, open-source software, AI-enabled tools and online resources to support learning.
9. **Inclusive and Accessible Learning** – Incorporate appropriate assistive technologies, accessible digital resources and suitable communication practices to facilitate effective participation.
10. **Industry-Oriented Learning** – Integrate industrial training, expert interactions, demonstrations and workplace-oriented activities to enhance employability and professional readiness.
11. **Continuous Assessment and Feedback** – Employ assignments, laboratory exercises, presentations, quizzes, projects and formative assessments to monitor learning progress and provide timely feedback.
12. **Self-Directed and Lifelong Learning** – Encourage independent learning, exploration of emerging technologies, professional certifications and continuous skill development.

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## BCA - Programme Structure under CBCS

(For the Candidates admitted from the Academic year 2026-2027 onwards)

| SEM | Course Code               | Part | Course                        | Sub order | Title                                                       | In hrs / week | Credits | Marks |     | Total |
|-----|---------------------------|------|-------------------------------|-----------|-------------------------------------------------------------|---------------|---------|-------|-----|-------|
|     |                           |      |                               |           |                                                             |               |         | CIA   | ESE |       |
| 1   | 26UCA1TLC01               | 1    | Tamil - I                     | TLC       | தமிழ் இலக்கிய வரலாறு -1                                     | 3             | 3       | 30    | 70  | 100   |
|     | 26UCA1ELC01               | 2    | English - I                   | ELC       | Functional English and ISL - 1                              | 4             | 3       | 30    | 70  | 100   |
|     | 26UCA1CC01                | 3    | Core Course - I               | CC        | Programming in C                                            | 5             | 4       | 30    | 70  | 100   |
|     | 26UCA1CP01                |      | Core Practical - I            | CP        | Programming in C Lab                                        | 5             | 4       | 40    | 60  | 100   |
|     | 26UCA1AC01A/ 26UCA1AC01B  |      | Allied Course - I             | AC        | Discrete Mathematics / Optimization Techniques              | 5             | 4       | 30    | 70  | 100   |
|     | 26UCA1AP01A / 26UCA1AP01B |      | Allied Practical - I          | AP        | Discrete Mathematics Lab / Optimization Techniques Lab      | 4             | 4       | 40    | 60  | 100   |
|     | 26UCA1FC                  |      | Foundation Course             | FC        | Digital Logic Fundamentals                                  | 2             | 2       | 30    | 70  | 100   |
|     | 26UCA1VE                  | 4    | Value Education               | VE        | Value Education                                             | 2             | 2       | 30    | 70  | 100   |
|     | TOTAL                     |      |                               |           |                                                             | 30            | 26      |       |     | 800   |
| 2   | 26UCA2TLC02               | 1    | Tamil - II                    | TLC       | தமிழ் இலக்கிய வரலாறு - 2                                    | 3             | 3       | 30    | 70  | 100   |
|     | 26UCA2ELC02               | 2    | English - II                  | ELC       | Functional English and ISL - 2                              | 4             | 3       | 30    | 70  | 100   |
|     | 26UCA2CC02                | 3    | Core Course - II              | CC        | Python Programming                                          | 5             | 4       | 30    | 70  | 100   |
|     | 26UCA2CP02                |      | Core Practical - II           | CP        | Python Programming Lab                                      | 5             | 4       | 40    | 60  | 100   |
|     | 26UCA2AC02A/ 26UCA2AC02B  |      | Allied Course - II            | AC        | Statistical Methods and its Application / Numerical Methods | 5             | 4       | 30    | 70  | 100   |
|     | 26UCA2AP02A / 26UCA2AP02B |      | Allied Practical - II         | AP        | Business Statistics Lab / Numerical Methods Lab             | 5             | 4       | 40    | 60  | 100   |
|     | 26UCA2SEC01               | 4    | Skill Enhancement Course - I  | SEC       | Digital Skills and Assistive Technology Lab                 | 2             | 2       | 40    | 60  | 100   |
|     | 26UCA2ES                  |      | Environmental Studies         | ES        | Environmental Studies                                       | 1             | 1       | 30    | 70  | 100   |
|     | TOTAL                     |      |                               |           |                                                             | 30            | 25      |       |     | 800   |
| 3   | 26UCA3TLC03               | 1    | Tamil – III                   | TLC       | தமிழக வரலாறும் பண்பாடும்                                    | 3             | 3       | 30    | 70  | 100   |
|     | 26UCA3ELC03               | 2    | English - III                 | ELC       | English for Digital and Social Life                         | 4             | 3       | 30    | 70  | 100   |
|     | 26UCA3CC03                | 3    | Core Course - III             | CC        | Data Structures and Algorithms                              | 5             | 4       | 30    | 70  | 100   |
|     | 26UCA3CP03                |      | Core practical - III          | CP        | Data Structures and Algorithms Lab                          | 5             | 4       | 40    | 60  | 100   |
|     | 26UCA3AC03A / 26UCA3AC03B |      | Allied Course - III           | AC        | Financial Accounting / Cost and Management Accounting       | 5             | 4       | 30    | 70  | 100   |
|     | 26UCA3AP03A / 26UCA3AP03B |      | Allied Practical - III        | AP        | Accounting Package Lab / Cost and Management Accounting Lab | 5             | 4       | 40    | 60  | 100   |
|     | 26UCA3SEC02               | 4    | Skill Enhancement Course - II | SEC       | Computer Graphics lab                                       | 2             | 2       | 40    | 60  | 100   |
|     | 26UCA3NME01               |      | Non Major Elective - I        | NME       | Health and Wellness                                         | 1             | 1       | 30    | 70  | 100   |
|     | TOTAL                     |      |                               |           |                                                             | 30            | 25      |       |     | 800   |
| 4   | 26UCA4TLC04               | 1    | Tamil – IV                    | TLC       | தமிழும் அறிவியலும்                                          | 3             | 3       | 30    | 70  | 100   |
|     | 26UCA4ELC04               | 2    | English - IV                  | ELC       | English for Workplace and Civic Life                        | 4             | 3       | 30    | 70  | 100   |
|     | 26UCA4CC04                | 3    | Core Course -IV               | CC        | Programming in JAVA                                         | 5             | 4       | 30    | 70  | 100   |
|     | 26UCA4CP04                |      | Core Practical- IV            | CP        | Programming in JAVA Lab                                     | 5             | 4       | 40    | 60  | 100   |

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|             |                             |   |                                |     |                                                                |    |     |    |    |      |
|-------------|-----------------------------|---|--------------------------------|-----|----------------------------------------------------------------|----|-----|----|----|------|
|             | 26UCA4AC04A/<br>26UCA4AC04B |   | Allied Course - IV             | AC  | Advanced Financial Accounting / Organizational Behaviour       | 5  | 4   | 30 | 70 | 100  |
|             | 26UCA4AP04A/<br>26UCA4AP04B |   | Allied Practical - IV          | AP  | Advanced Accounting Package Lab / Organizational Behaviour Lab | 5  | 4   | 40 | 60 | 100  |
|             | 26UCA4SEC03                 | 4 | Skill Enhancement Course - III | SEC | Web Development Lab                                            | 3  | 2   | 40 | 60 | 100  |
|             | TOTAL                       |   |                                |     |                                                                | 30 | 24  |    |    | 700  |
| 5           | 26UCA5CC05                  | 3 | Core Course - V                | CC  | Operating Systems                                              | 5  | 4   | 30 | 70 | 100  |
|             | 26UCA5CC06                  |   | Core Course -VI                | CC  | RDBMS                                                          | 5  | 4   | 30 | 70 | 100  |
|             | 26UCA5CC07                  |   | Core Course -VII               | CC  | Internet of Things (IoT)                                       | 5  | 4   | 30 | 70 | 100  |
|             | 26UCA5CP05                  |   | Core Practical- V              | CP  | RDBMS Lab                                                      | 5  | 4   | 40 | 60 | 100  |
|             | 26UCA5CP06                  |   | Core Practical- VI             | CP  | Internet of Things Lab                                         | 5  | 4   | 40 | 60 | 100  |
|             | 26UCA5NME02                 | 4 | Non Major Elective - II        | NME | Introduction to Disaster Management                            | 2  | 2   | 30 | 70 | 100  |
|             | 26UCA5SEC04                 |   | Skill Enhancement Course - IV  | SEC | Animation Lab                                                  | 3  | 2   | 40 | 60 | 100  |
|             | 26UCA5I/<br>26UCA5IT        |   |                                |     | Internship / Industrial Training                               | -  | 2   | 20 | 80 | 100  |
|             | TOTAL                       |   |                                |     |                                                                | 30 | 26  |    |    | 800  |
| 6           | 26UCA6CC08                  | 3 | Core Course – VIII             | CC  | Computer Networks                                              | 5  | 4   | 30 | 70 | 100  |
|             | 26UCA6CC09                  |   | Core Course – IX               | CC  | Software Engineering                                           | 5  | 4   | 30 | 70 | 100  |
|             | 26UCA6CC10                  |   | Core Course - X                | CC  | AI and ML - Concepts and Applications                          | 5  | 4   | 30 | 70 | 100  |
|             | 26UCA6CP07                  |   | Core Practical- VII            | CP  | AI Tools and Machine Learning Lab                              | 5  | 4   | 40 | 60 | 100  |
|             | 26UCA6CP01                  |   | Core Project Work - I          | CPW | Project                                                        | 5  | 4   | 40 | 60 | 100  |
|             | 26UCA6SEC05                 | 4 | Skill Enhancement Course - V   | SEC | Software Testing Lab                                           | 3  | 2   | 40 | 60 | 100  |
|             | 26UCA6GS                    |   | Gender studies                 | GS  | Gender studies                                                 | 1  | 1   | 30 | 70 | 100  |
|             |                             |   |                                |     | Extension and Extra-Curricular Activities                      | 1  | 1   | -  | -  | -    |
|             | TOTAL                       |   |                                |     |                                                                | 30 | 24  |    |    | 700  |
| GRAND TOTAL |                             |   |                                |     |                                                                |    | 150 |    |    | 4600 |

### Consolidated Semester wise and Component wise Credit distribution

| Parts                            | Sem I     | Sem II    | Sem III   | Sem IV    | Sem V     | Sem VI    | Total Credits (Part Wise) |
|----------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|---------------------------|
| Part I                           | 3         | 3         | 3         | 3         | -         | -         | 12                        |
| Part II                          | 3         | 3         | 3         | 3         | -         | -         | 12                        |
| Part III                         | 18        | 16        | 16        | 16        | 20        | 20        | 106                       |
| Part IV                          | 2         | 3         | 3         | 2         | 6         | 4         | 20                        |
| <b>Total Credits ( Sem-Wise)</b> | <b>26</b> | <b>25</b> | <b>25</b> | <b>24</b> | <b>26</b> | <b>24</b> | <b>150</b>                |

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## Summary of Curriculum Structure of BCA Programme

| S.No  | Part | Types of the Courses                         | No. of Courses | Credits for each Course | Total Credits | Marks |
|-------|------|----------------------------------------------|----------------|-------------------------|---------------|-------|
| 1     | I    | Tamil Language Course                        | 4              | 3                       | 12            | 400   |
| 2     | II   | English Language Course                      | 4              | 3                       | 12            | 400   |
| 3     | III  | Core Course                                  | 10             | 4                       | 40            | 1000  |
| 4     |      | Core Practical                               | 7              | 4                       | 28            | 700   |
| 5     |      | Allied Course                                | 4              | 4                       | 16            | 400   |
| 6     |      | Allied Practical                             | 4              | 4                       | 16            | 400   |
| 9     |      | Foundation Course                            | 1              | 2                       | 2             | 100   |
| 10    |      | Project Work                                 | 1              | 4                       | 4             | 100   |
| 11    | IV   | Skill Enhancement Course                     | 5              | 2                       | 10            | 500   |
| 12    |      | Value Education                              | 1              | 2                       | 2             | 100   |
| 13    |      | Environmental Studies                        | 1              | 1                       | 1             | 100   |
| 14    |      | Health and Wellness (NME-I)                  | 1              | 1                       | 1             | 100   |
| 15    |      | Internship / Industrial Training             | 1              | 2                       | 2             | 100   |
| 16    |      | Introduction to Disaster Management (NME-II) | 1              | 2                       | 2             | 100   |
| 18    |      | Gender studies                               | 1              | 1                       | 1             | 100   |
| 19    |      | Extension and Extra-Curricular Activities    | 1              | 1                       | 1             | 0     |
| TOTAL |      |                                              | 47             | -                       | 150           | 4600  |

|                      | Part-1   | Part-2   | Part-3    |               |          |          | Part-4   |          |                        |               |
|----------------------|----------|----------|-----------|---------------|----------|----------|----------|----------|------------------------|---------------|
| Semester             | Tamil    | English  | CC-T / FC | CC-P /Project | AC-T     | AC-P     | SEC      | NME      | VE/ EVS /INT /GS/ Extn | TOTAL COURSES |
| Sem-1                | 1        | 1        | 2         | 1             | 1        | 1        | 0        | 0        | 1                      | 8             |
| Sem-2                | 1        | 1        | 1         | 1             | 1        | 1        | 1        | 0        | 1                      | 8             |
| Sem-3                | 1        | 1        | 1         | 1             | 1        | 1        | 1        | 1        | 0                      | 8             |
| Sem-4                | 1        | 1        | 1         | 1             | 1        | 1        | 1        | 0        | 0                      | 7             |
| Sem-5                | 0        | 0        | 3         | 2             | 0        | 0        | 1        | 1        | 1                      | 8             |
| Sem-6                | 0        | 0        | 3         | 2             | 0        | 0        | 1        | 0        | 2                      | 8             |
| <b>TOTAL COURSES</b> | <b>4</b> | <b>4</b> | <b>11</b> | <b>8</b>      | <b>4</b> | <b>4</b> | <b>5</b> | <b>2</b> | <b>5</b>               | <b>47</b>     |

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**LIST OF ALLIED COURSES**

| SE<br>M | Course Code | Part | Title                                   | In<br>hrs /<br>week | Cr<br>ed<br>its | Marks   |         | Total |
|---------|-------------|------|-----------------------------------------|---------------------|-----------------|---------|---------|-------|
|         |             |      |                                         |                     |                 | CI<br>A | ES<br>E |       |
| 1       | 26UCA1AC01A | 3    | Discrete Mathematics                    | 4                   | 4               | 30      | 70      | 100   |
|         | 26UCA1AC01B |      | Optimization Techniques                 | 4                   | 4               | 30      | 70      | 100   |
|         | 26UCA1AP01A |      | Discrete Mathematics Lab                | 2                   | 4               | 40      | 60      | 100   |
|         | 26UCA1AP01B |      | Optimization Techniques Lab             | 2                   | 4               | 40      | 60      | 100   |
| 2       | 26UCA2AC02A | 3    | Statistical Methods and its Application | 5                   | 4               | 30      | 70      | 100   |
|         | 26UCA2AC02B |      | Numerical Methods                       | 5                   | 4               | 30      | 70      | 100   |
|         | 26UCA2AP02A |      | Business Statistics Lab                 | 5                   | 4               | 40      | 60      | 100   |
|         | 26UCA2AP02B |      | Numerical Methods Lab                   | 5                   | 4               | 40      | 60      | 100   |
| 3       | 26UCA3AC03A | 3    | Financial Accounting                    | 4                   | 4               | 30      | 70      | 100   |
|         | 26UCA3AC03B |      | Cost and Management Accounting          | 4                   | 4               | 30      | 70      | 100   |
|         | 26UCA3AP03A |      | Accounting Package Lab                  | 4                   | 4               | 40      | 60      | 100   |
|         | 26UCA3AP03B |      | Cost and Management Accounting Lab      | 4                   | 4               | 40      | 60      | 100   |
| 4       | 26UCA4AC04A | 3    | Advanced Financial Accounting           | 4                   | 4               | 30      | 70      | 100   |
|         | 26UCA4AC04B |      | Organizational Behaviour                | 4                   | 4               | 30      | 70      | 100   |
|         | 26UCA4AP04A |      | Advanced Financial Accounting Lab       | 4                   | 4               | 40      | 60      | 100   |
|         | 26UCA4AP04B |      | Organizational Behaviour Lab            | 4                   | 4               | 40      | 60      | 100   |

# BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI

## Centre for Differently Abled Persons

### Bachelor of Computer Applications

முதல் பருவம் - தாள் - 1

தமிழ் இலக்கிய வரலாறு - 1

Course Code: 26UCA1TLC01

Credits : 3

Max. Marks : 100

Internal Marks : 30

External Marks : 70

#### பாட நோக்கம்:

- தமிழ் மொழி இலக்கியங்களை அறிமுகம் செய்தல்
- தமிழ் இலக்கியப் போக்குகளையும், இலக்கணங்களையும் மாணவர்கள் அறியுமாறு செய்தல்
- தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்

#### அலகு 1

நற்றினை - முதல் பாடல் - நின்று சொல்லர் குறுந்தொகை - மூன்றாம் பாடல் - நிலத்தினும் பெரிதே<sup>1</sup> ஐங்குறுநூறு - நெல் பல பொலிக - பொன் பெரிது சிறக்க - முதல் பாடல் வேட்கைப் பத்து கலித்தொகை 51 சுடர்தொடி இக்கேளாய் - குறிஞ்சிக்கலி புறநானூறு 189 தெண்கடல் வளாகம் பொதுமையின்றி நாடா கொன்றோ - 187.

#### அலகு 2

திருக்குறள் - அறன் வலியுறுத்தல் அதிகாரம் நான்மணிக்கடிகை - நிலத்துக்கு அணியென்ப பழமொழி நானூறு - தம் நடை நோக்கார், இனியவை நாற்பது - 37- இளமையை மூப்பு.

#### அலகு 3

சிலப்பதிகாரம் - வழக்குரைகாதை<sup>8</sup> மணிமேகலை - பாத்திரம் பெற்ற காதை பெரியபுராணம் - பூசால் நாயனார் புராணம் கம்பராமாயணம் - குகப் படலம், சீறாப்புராணம் - மானுக்குப் பிணை நின்ற படலம் இயேசு காவியம் - ஊதாரிப்பிள்ளை.

#### அலகு 4

இலக்கணம்: எழுத்து பிரித்தெழுதல் சேர்த்து எழுதுதல் சந்திப்பிழை குறில் நெடில் வேறுபாடு எதிர்ச்சொல்லை எடுத்து எழுதுதல் ஒரெழுத்து ஒரு மொழி உரிய பொருளை கண்டறிதல், ஒரு பொருள் தரும் பல சொற்கள், பொருந்தாச்சொல்லை கண்டறிதல், அகர வரிசைப்படி சொற்களை சீர் செய்தல், ஒரு பொருள் பன்மொழி இரு பொருள் குறிக்கும் சொற்கள், பேச்சு வழக்கு எழுத்து வழக்கு, சொல்லும் பொருளும் அறிதல், ஒரு சொல்லிற்கு இணையான வேறு சொல் அறிதல்<sup>12</sup>.

#### அலகு 5

தமிழின் தொன்மை சிறப்பு திராவிட மொழிகள் தொடர்பான செய்திகள் - உ வே சாமிநாத ஐயர், தா . பொ. மீனாட்சி சுந்தரம், சி இலக்குவனார், தமிழ் பணி தொடர்பான செய்திகள்<sup>7</sup>.

## அலகு 6

மொழித்திறன் போட்டி தேர்வு

1. பொருள் பொதிந்த சொற்றொடர் அமைத்தல்
2. ஓர் எழுத்து ஒரு மொழி
3. வேற்றுமை உருபுகள்
4. திணை பால் எண் இடம்
5. சொல்லாக்கம் மொழிபெயர்ப்பு.

### Pedagogical method used:

<sup>1</sup>Interactive Lectures

<sup>7</sup>Collaborative Learning

<sup>8</sup>Technology-Enabled Learning

<sup>12</sup>Self-Directed and Lifelong Learning

### பார்வை நூல்கள்:

1. மு. வரதராசன், தமிழ் இலக்கிய வரலாறு, சாகித்திய அகாடமி, புதுடெல்லி 2022.
2. மது. சா. விமலா விமலானந்தன், தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை, 2004 .
3. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை, 2017.
4. தமிழ் இலக்கிய வரலாறு - முனைவர். சிற்பி பாலசுப்பிரமணியம், முனைவர் சேதுபதி, 2021.
5. புதிய தமிழ் இலக்கிய வரலாறு - முனைவர் சிற்பி பாலசுப்பிரமணியம், நீல. பத்மநாதன், 2022.
6. தமிழ் இலக்கிய வரலாறு- டாக்டர். அ. கா. பெருமாள், 2020.
7. தமிழ் இலக்கிய வரலாறு - முனைவர் பா. ச. ஏசுதாசன் 2021.
8. தமிழ் இலக்கிய வரலாறு - ஸ்ரீ குமார் 2022.
9. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - பாக்கிய மேரி, 2021.
- 10.தமிழ் பயிற்று முறை, பேராசிரியர் ந. சுப்புரெட்டியார் - மணிவாசகர் பதிப்பகம், சிதம்பரம், 2020.

### மாணவர் பெறும் திறன்

இப்பாடத்தைக் கற்பதால் பின்வரும் பயன்களை மாணவர் அடைவர்

|     |       |                                                                            |
|-----|-------|----------------------------------------------------------------------------|
| CO1 | K1    | சங்க இலக்கியத்தில் காணப்பெறும் வாழ்வியல் சிந்தனைகளை அறிந்து கொள்வர்        |
| CO2 | K2 K3 | அற இலக்கியம் மற்றும் தமிழ் காப்பியங்களின்வழி வாழ்வியல் சிந்தனையைப் பெறுவர் |
| CO3 | K1 K3 | மொழியறிவோடு சிந்தனைத்திறனைப் பெறுவர்                                       |
| CO4 | K2 K4 | மொழிபெயர்ச்சிக்குத் தேவையான இலக்கணங்களைக் கற்பர்                           |
| CO5 | K5    | மொழித்திறன் போட்டி தேர்வுக்கான திறனை பெறுவர்                               |

### Mapping with Program Outcomes and Program Specific Outcomes:

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     | ✓    |      | ✓    |      |      |
| CO3           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |
| CO4           |     |     | ✓   |      | ✓    | ✓    | ✓    |      |
| CO5           |     | ✓   | ✓   |      |      | ✓    |      | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-I English - I**

**Functional English and ISL – I**

**Course Code : 26UCA1ELC01**

**Credits : 3**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop basic English literacy skills to support communication, academic learning, and daily living.
- To promote bilingual communication through the integrated use of English and Indian Sign Language (ISL).
- To build functional vocabulary related to daily life, education, technology, and social interactions.
- To enhance reading skills to understand simple texts, notices, instructions, and information encountered in everyday situations.
- To develop basic writing skills for completing forms, writing personal information, and creating simple messages and sentences.

**UNIT I**

Introduction to Functional English and ISL: Need and importance of English literacy for students with speech and hearing disability - Introduction to Indian Sign Language: history and role of ISLRTC - The ISL manual alphabet (finger spelling) and its correspondence with English letters - Numbers 1–100 in English and ISL; practice of fingerspelling names<sup>7</sup>.

**UNIT II**

Basic Vocabulary Building: Vocabulary of family members, body parts and colours in English-ISL- Days of the week, months and seasons - Common household and classroom objects - Matching English words with ISL signs through picture-word-sign association<sup>1</sup>.

**UNIT III**

Simple Sentence Formation: Greetings and leave-taking expressions - Self-introduction: name, age, place, family<sup>7,8</sup> - Asking and answering simple WH-questions (What, Who, Where) - Simple present tense statements about oneself.

**UNIT IV**

Reading Practical Texts: Reading name boards, shop names and public signs - Common safety and public notices: Exit, Danger, Toilet, No Entry - Picture-word association exercises - Reading simple classroom charts and timetable<sup>8</sup>.

**UNIT V**

Writing Basic Personal Information: Writing one's own name, address and phone number -Filling simple personal-information forms - Writing short messages to family members - Copying and reproducing simple sentences correctly<sup>9</sup>.

## UNIT VI

Communication Etiquette: Turn-taking conventions in sign-supported conversation - Greeting elders, peers and teachers appropriately<sup>1</sup> - Following simple classroom instructions in English-ISL - Basic classroom courtesy expressions (please, thank you, sorry, excuse me)<sup>12</sup>.

### Pedagogical method used:

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>12</sup>Self-Directed and Lifelong Learning

### Materials for Study & Reference:

#### Text Books:

1. Indian Sign Language Research and Training Centre (ISLRTC). “*Indian Sign Language Learning Resources*”, Ministry of Social Justice and Empowerment, Government of India, 2022.
2. Murphy, Raymond. “*Essential Grammar in Use*”, 4th Edition, Cambridge University Press, 2020.

#### Reference Books:

1. Rizvi, M. Ashraf, “*Effective Technical Communication*”, 2nd ed., McGraw Hill Education (India), 2017.
2. Ali Yavar Jung National Institute of Speech and Hearing Disabilities (Divyangjan) (AYJNISHD). “*Functional English for Daily Living*”, AYJNISHD (Divyangjan), Department of Empowerment of Persons with Disabilities, Ministry of Social Justice and Empowerment, Government of India, 2022.
3. Kumar, Sanjay, “*Communication Skills in English*”, Oxford University Press India, 2021.
4. Raman, Meenakshi, and Sangeeta Sharma, “*Technical Communication: Principles and Practice*”, 4th Edition, Oxford University Press, 2022.

#### E-Resources:

1. [https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26\\_ge30](https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26_ge30)
2. [https://learnenglish.britishcouncil.org/?utm\\_source](https://learnenglish.britishcouncil.org/?utm_source)
3. [https://indiansignlanguage.org/search-dictionary/?utm\\_source](https://indiansignlanguage.org/search-dictionary/?utm_source)

### Course Outcomes:

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

|     |       |                                                                                                                           |
|-----|-------|---------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2 | Recognize and produce the ISL manual alphabet, numbers and their correspondence with the English alphabet                 |
| CO2 | K2K3  | Identify and use common sight words and everyday vocabulary in both English and ISL.                                      |
| CO3 | K3 K4 | Construct simple English sentences for greetings and self-introduction with ISL support                                   |
| CO4 | K2K3  | Apply English and ISL skills confidently in academic, social, and workplace settings.                                     |
| CO5 | K4K5  | Demonstrate greater independence and participation in communication within inclusive learning and community environments. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   |     |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           |     | ✓   |     |      | ✓    | ✓    |      |      |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-I Core Course - I**  
**PROGRAMMING IN C**

**Course Code : 26UCA1CC01**

**Credits : 4**

**Max. Marks :100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To understand the fundamental concepts of C programming, including data types, variables, constants, operators, expressions, and statements.
- To apply input/output functions, library functions, decision-making, branching, and looping constructs to develop simple C programs.
- To analyze arrays, strings, functions, structures, unions, and storage classes for solving programming problems efficiently.
- To develop C programs using pointers, file handling, text and binary files, and basic graphics programming.

**UNIT I**

Introduction to Programming- Compiler – Header Files- Types of Headers<sup>3</sup>- Fundamental Character set - Identifier and keywords - Data Types - Constants - Variables - Declarations - Expressions - Statements – Operators.

**UNIT II**

Data input output functions - Library functions<sup>4</sup> - Simple C programs - Decision making, branching and looping. Break, continue and goto statements<sup>4</sup>.

**UNIT III**

Arrays: Declaring and Initializing, One-Dimensional Arrays, Two-Dimensional Arrays, Multi-Dimensional Arrays - Passing arrays to functions. Functions: Function Definition, prototyping, types of functions, passing arguments to functions, Nested Functions, Recursive functions<sup>3</sup> - Storage Classes<sup>5</sup>.

**UNIT IV**

Strings: Declaring and Initializing strings, Operations on strings, Arrays of strings, passing strings to functions. Structures - Declaring and Initializing, Nested structure, Array of Structure, Passing Structures to functions, Union<sup>6</sup>.

**UNIT V**

Pointers: Declaration - Passing pointers to Functions - Operation in Pointers - Pointer and Arrays - Arrays of Pointers - Structures and Pointers. Files - File modes, File functions, and File operations, Text and Binary files, Graphics in C<sup>5</sup>.

**UNIT VI**

The importance of C Programming in getting employment opportunities: discussions<sup>4</sup>.

**Pedagogical method used:**<sup>3</sup>Laboratory-Based Learning<sup>4</sup>Problem-Based Learning<sup>5</sup>Project-Based Learning<sup>6</sup>Experiential and Activity-Based Learning**Materials for Study & Reference:****Text Books:**

1. Kanetkar, Yashavant P, “*Let Us C*”, 18th ed., BPB Publications, 2023.
2. E. Balaguruswamy, “*Programming in ANSI C*”, TMH Publishing Company Ltd, 2007.

**Reference Books:**

1. Singh, Manmohan, et al., “*C Programming*”, Arcler Education, 2024.
2. Ashok N. Kamthane & Amit Ashok Kamthane, “*Programming in C*”, Latest Edition, Pearson Education, 2025.
3. Reema Thareja, “*Programming in C*”, 3rd Edition, Oxford University Press, 2023.

**E-Recourses:**

1. <http://www.freebookcentre.net/Language/Free-C-Programming-Books-Download-1.htm>
2. <https://electronicsforu.com/resources/15-free-c-programming-ebooks>

**Course Outcomes:**

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

|            |              |                                                                                                                   |
|------------|--------------|-------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Identify basic C programming concepts, keywords, data types, and operators.                                       |
| <b>CO2</b> | <b>K3</b>    | Describe the reason why different constructs are available for iteration, such as "for" loops, "do...while" loops |
| <b>CO3</b> | <b>K3 K4</b> | Develop simple programs using functions and arrays.                                                               |
| <b>CO4</b> | <b>K3</b>    | Apply pointers and file handling techniques in C programming.                                                     |
| <b>CO5</b> | <b>K3 K4</b> | Create and test C programs to solve simple real-life problems using appropriate programming concepts.             |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| <b>CO1</b>    | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| <b>CO2</b>    | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| <b>CO3</b>    | ✓   | ✓   |     |      | ✓    | ✓    | ✓    |      |
| <b>CO4</b>    |     |     | ✓   |      |      | ✓    | ✓    |      |
| <b>CO5</b>    |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-I Core Practical - I**  
**PROGRAMMING IN C LAB**

**Course Code : 26UCA1CP01**  
**Credits : 4**

**Max. Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Course Objectives:**

- To develop practical skills in designing, coding, compiling, and executing C programs.
- To enable students to apply fundamental programming concepts, including variables, data types, operators, and control structures.
- To develop problem-solving skills through the implementation of algorithms and logical solutions using C programming.
- To provide hands-on experience in using functions, arrays, pointers, structures, and file handling in C programs.

**EXERCISES:** 2,3,4,5,6

1. Write a program to check whether a given number is Even or Odd using conditional statements.
2. Write a program to swap two variable value without a third variable.
3. Write a program to using switch statement to display Monday to Sunday.
4. Write a program to display the first 'N' natural numbers and find their sum using loops.
5. Write a program to perform Addition of two matrices.
6. Write a program to generate the Fibonacci series using Recursion.
7. Write a program to perform String Operations using String Handling Functions.
8. Write a program to Create and Display Student Details using Structure.
9. Write a program to find the sum and average of elements in an integer array using Pointers.
10. Write a program to copy the contents of one file into another.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

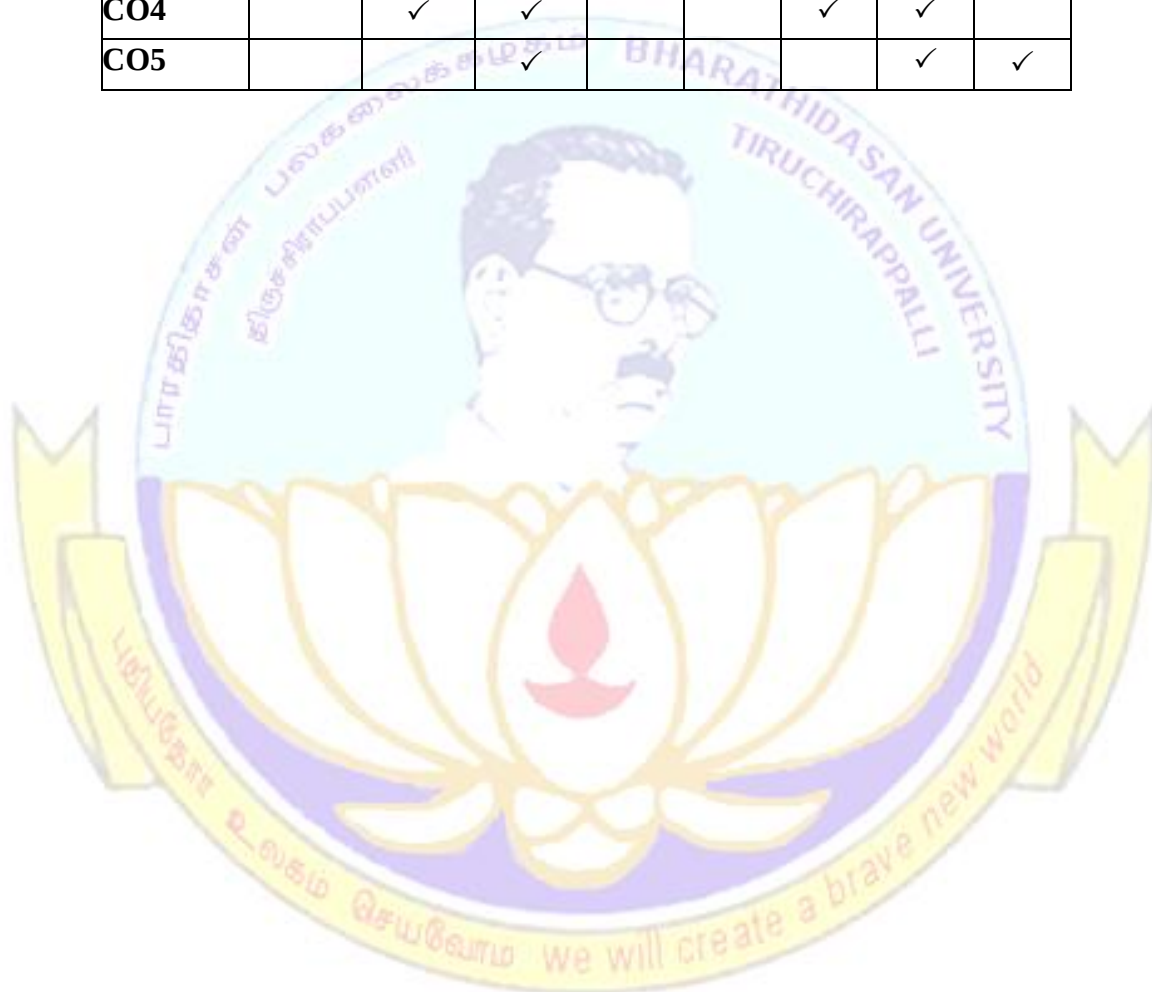
**Course Outcomes:**

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

|            |              |                                                                                                     |
|------------|--------------|-----------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Write and execute simple C programs using basic input/output statements and conditional statements. |
| <b>CO2</b> | <b>K2K3</b>  | Apply decision-making, looping, and switch-case statements to solve programming problems.           |
| <b>CO3</b> | <b>K3 K4</b> | Develop C programs using arrays, functions, recursion, and string handling techniques.              |
| <b>CO4</b> | <b>K3 K4</b> | Create programs using structures, pointers, and file handling concepts for data processing.         |
| <b>CO5</b> | <b>K3 K4</b> | Apply file handling concepts to store, retrieve, and process data using C programs.                 |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           | ✓   | ✓   |     |      |      | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     |     | ✓   |      |      |      | ✓    | ✓    |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-I Allied Course - I**

**DISCRETE MATHEMATICS**

**Course Code : 26UCA1AC01A**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop an understanding of fundamental concepts of sets, relations, and their properties for mathematical and computational applications.
- To provide knowledge of matrices and determinants and their application in solving mathematical problems and simultaneous linear equations.
- To develop an understanding of vectors, vector spaces, linear dependence, basis, dimension and eigenvectors.
- To introduce the principles of mathematical logic, including propositions, predicate logic, logical equivalence, quantifiers, and rules of inference.

**UNIT I**

Sets and subsets -Venn diagrams - Set operations - Cartesian product - Relations and their properties<sup>1</sup> - Equivalence relations - Partial order relations - Relation matrix and graph of a relation.

**UNIT II**

Matrices – Types of Matrices – Matrix Operations – Addition, Subtraction, and Multiplication – Transpose of a Matrix – Symmetric and Skew-Symmetric Matrices<sup>7,9</sup>.

**UNIT III**

Determinants – Properties of Determinants – Minors and Cofactors – Adjoint of a Matrix – Inverse of a Matrix – Solution of Simultaneous Linear Equations using Matrix Inverse Method<sup>7</sup>.

**UNIT IV**

Vectors – Vector Spaces – Subspaces – Linear Dependence and Independence – Basis and Dimension – Eigen Values and Eigen Vectors<sup>11</sup>.

**UNIT V**

Mathematical Logic: Propositions and logical connectives - Truth tables - Tautology, Contradiction, Contingency - Logical equivalence - Laws of logic - Predicate logic – Quantifiers - Rules of inference<sup>1</sup>.

**UNIT VI**

The relationship of set theory and matrices in day-to-day applications in human life<sup>11</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>11</sup>Continuous Assessment and Feedback

**Materials for Study & Reference:****Text Books:**

- Singh, J. P., “*Discrete Mathematics for Undergraduates*”, 2nd ed., ANE Books, 2023.
- Chandrasekaran, N., and M. Umavparvathi, “*Discrete Mathematics*”, 3rd ed., PHI Learning Pvt. Ltd., 2022.

**Reference Books:**

- Kumar, Vinay, “*Discrete Mathematics*”, BPB Publications, 2018.
- Sarkar, Swapan Kumar, “*A Textbook of Discrete Mathematics*”, S. Chand Publishing, 2025.

**E-Resources:**

- [https://nptel.ac.in/courses/106103205?utm\\_source](https://nptel.ac.in/courses/106103205?utm_source)
- [https://onlinecourses.nptel.ac.in/e-learning/preview/noc19\\_cs49](https://onlinecourses.nptel.ac.in/e-learning/preview/noc19_cs49)

**Course Outcomes:**

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

|     |       |                                                                                                                                                                      |
|-----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1    | Apply the concepts of sets, relations, Cartesian products, and partial orders to solve mathematical and computational problems.                                      |
| CO2 | K1 K2 | Perform matrix operations and use determinants, minors, cofactors, adjoint, and inverse matrices in solving mathematical problems and simultaneous linear equations. |
| CO3 | K2 K3 | Analyze vector spaces and their properties, including linear dependence and independence, basis, dimension and eigenvectors.                                         |
| CO4 | K2 K4 | Apply the principles of mathematical logic, including propositions, truth tables, logical equivalence, predicate logic, quantifiers, and rules of inference.         |
| CO5 | K5    | Relate the concepts of set theory and matrices to practical applications and real-life situations, enabling logical and systematic problem-solving.                  |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    | ✓    |      |      |
| CO3           |     | ✓   |     |      |      | ✓    | ✓    |      |
| CO4           |     |     | ✓   |      |      |      | ✓    | ✓    |
| CO5           |     |     | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-I: Allied Practical - I**

**DISCRETE MATHEMATICS LAB**

**Course Code : 26UCA1AP01A**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To develop practical skills in implementing fundamental concepts of Discrete Mathematics using the C programming language.
- To enable students to apply programming techniques for solving problems related to sets, relations, matrices, and determinants.
- To provide hands-on experience in implementing matrix operations and basic logical operations through C programs.
- To develop logical thinking, problem-solving ability, and computational skills through practical applications of Discrete Mathematics concepts.

**EXERCISES <sup>2,3,4,5,6</sup>**

1. Write a program to perform set operations (Union, Intersection).
2. Write a program to find the difference of Two Sets.
3. Write a program to represent two sets and display their Cartesian Product.
4. Write a program to perform Matrix Addition and Subtraction for two matrices.
5. Write a program to find the Transpose of a matrix.
6. Write a program to calculate the Determinant of a  $2 \times 2$  and  $3 \times 3$  matrix.
7. Write a program to solve a system of two simultaneous linear equations using the Matrix Method.
8. Write a program to perform Vector Addition, Scalar Multiplication, and Dot Product of two vectors.
9. Write a program to generate Truth Tables for logical operators.
10. Write a program to Verify De Morgan's Laws Using Set Operations

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|            |              |                                                                                                                                          |
|------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Develop C programs to perform basic set operations, including union, intersection, difference, and Cartesian product.                    |
| <b>CO2</b> | <b>K2K3</b>  | Implement C programs to perform various matrix operations, including addition, subtraction, multiplication, and transpose.               |
| <b>CO3</b> | <b>K3 K4</b> | Develop programs to solve problems involving symmetric matrices and determinants.                                                        |
| <b>CO4</b> | <b>K3 K4</b> | Construct and evaluate basic logical expressions and truth tables using C programming.                                                   |
| <b>CO5</b> | <b>K5</b>    | Apply concepts of Discrete Mathematics and C programming to develop logical and computational solutions for basic mathematical problems. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO3</b>                |            | ✓          | ✓          |             |             | ✓           | ✓           |             |
| <b>CO4</b>                |            |            | ✓          |             |             |             | ✓           | ✓           |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-I Foundation Course**  
**DIGITAL LOGIC FUNDAMENTALS**

**Course Code : 26UCA1FC**

**Credits : 2**

**Max. Marks :100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To provide a comprehensive understanding of number systems, binary codes, and their applications in digital systems.
- To familiarize students with the principles and significance of error detection and error correction techniques in digital communication.
- To develop the ability to simplify Boolean expressions using Karnaugh Maps (K-Maps) for efficient logic design.
- To equip students with the knowledge and skills required to analyze, design, and implement digital logic circuits.

**UNIT I**

Digital Systems and Binary Numbers: Digital systems, binary numbers, number base conversions<sup>1</sup>, octal and hexadecimal numbers, complements, signed binary numbers, binary codes, error detection and error correction codes.

**UNIT II**

Boolean Algebra and Logic Gates: Basic definitions, axiomatic definition of Boolean algebra<sup>6,8</sup>, basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, digital logic gates.

**UNIT III**

Gate Level Minimization: The k-map method, four-variable map, five-variable map, product of sums simplification, don't-care conditions, NAND and NOR implementation<sup>9</sup>, determination and selection of Prime Implicants, Essential and Non-essential prime Implicants.

**UNIT IV**

Combinational Circuits: Design procedure, Binary Adder, Binary Subtractor, Binary Multiplier<sup>11</sup>, Magnitude Comparator, Decoders, Encoders, Multiplexers, and Demultiplexers.

**UNIT V**

Registers, Counters and Memory: Registers, shift registers, ripple counters, ring counter, flip-flops<sup>8</sup>, Random access memory, memory decoding, error detection and correction, read only memory, programmable logic array - Applications of Digital Logic.

**UNIT VI**

The importance of digital logic circuits and its real time applications: Seminar and Discussions<sup>6</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>6</sup>Experiential and Activity-Based Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>11</sup>Continuous Assessment and Feedback

**Materials for Study & Reference:****Text Books:**

1. Thomas L. Floyd., “*Digital Fundamentals*”, 11th Edition, Pearson Education, 2025.
2. M. Morris Mano & Michael D. Ciletti., “*Digital Design*”, 6th Edition, Pearson Education, 2024

**Reference Books:**

1. Charles H. Roth Jr., Larry L. Kinney and Raghunandan G. H., “*Fundamentals of Logic Design*”, 1st Indian Edition, Cengage Learning, 2020.
2. R. P. Jain., “*Modern Digital Electronics*”, 5th Edition, McGraw Hill Education, 2022.

**E- Resources:**

1. [https://swayam.gov.in/search\\_courses?searchText=DIGITAL%20LOGIC%20FUNDAMENTALS](https://swayam.gov.in/search_courses?searchText=DIGITAL%20LOGIC%20FUNDAMENTALS)
2. <https://www.geeksforgeeks.org/digital-logic/digital-electronics-logic-design-tutorials>

**Course Outcomes:**

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

|     |       |                                                                                                                       |
|-----|-------|-----------------------------------------------------------------------------------------------------------------------|
| CO1 | K4    | Demonstrate an understanding of number systems, binary codes, and code conversion techniques used in digital systems. |
| CO2 | K2    | Apply error detection and error correction methods to ensure data reliability in digital communication systems.       |
| CO3 | K2 K3 | Simplify Boolean expressions using Boolean algebra and Karnaugh Maps for optimized logic design.                      |
| CO4 | K4    | Analyze the operation and functionality of combinational and sequential logic circuits.                               |
| CO5 | K4 K5 | Design and implement digital logic circuits to solve computing problems.                                              |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           |     | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     |     | ✓   |      | ✓    |      | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     |     | ✓   |      |      | ✓    |      | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester - I**

**VALUE EDUCATION**

**Course Code: 26UCA1VE**

**Credits: 2**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks: 70**

**Course Objectives:**

- To develop an understanding of fundamental human values and their importance in personal, social, and professional life.
- To promote ethical behaviour, integrity, responsibility, and respect for individuals and society.
- To develop awareness of social harmony, national integration, cultural values, and responsible citizenship.
- To encourage students to apply moral and ethical values in decision-making and contribute positively to society.

**UNIT I**

Human Life on Earth (Kural 629) Purpose of Life (Kural 46) Meaning and Philosophy of Life (Kural 131, 226) Family (Kural 45), Peace in Family(Kural 1025) Society (Kural 446), The Law of Life (Kural 952), Brotherhood (Kural 807) Five responsibilities / duties of Man (a) to himself (b) to his family (c) to his environment (d) to his society, (e) to the Universe in his lives (Kural 43, 981)<sup>1</sup>.

**UNIT II**

Definitions, Nature of Human Rights. Universal Declaration of Human Rights, International covenant on Civil and Political Rights - International covenant of Economic, Social and Cultural Rights. Amnesty International Red Cross<sup>7</sup>.

**UNIT III**

Child labour - Womens Right - Bonded labour - Problems of refugees - Capital punishment. National and State Human Rights Commissions<sup>8,9</sup>.

**UNIT IV**

Definition, Meaning, Scope of Yoga - Aims and objectives of Yoga - Yoga Education with modern context - Different traditions and schools of Yoga - Yoga practices: Asanas, Pranayama and Meditation<sup>7</sup>.

**UNIT V**

Constitutional provisions and formation - Powers and Functions - Methods of recruitment -Rules and notification, syllabi for different exams- written and oral – placement<sup>1</sup>.

**UNIT VI**

Role of youth in nation building – Promoting peace, harmony and brotherhood – Ethical conduct in personal, family and professional life – Application of human values in everyday life<sup>9</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>9</sup>Inclusive and Accessible Learning

**Materials for Study & Reference:****Text Books:**

1. Agarwal, H. O., “*Human Rights*”, 18th ed. Central Law Publications, 2025.
2. N. Arumugam., “*Value Education*”, (As per TANSCHS Syllabus). 6th Edition, Saras Publication, 2024.

**Reference Books:**

1. Dr. Ritu Soryan., “*Universal Human Values and Professional Ethics*”, 2nd Edition, S.K. Kataria & Sons, 2025.
2. R. R. Gaur, R. Asthana & G. P. Bagaria., “*A Foundation Course in Human Values and Professional Ethics*”, 3rd Revised Edition, UHV Publications, 2023.
3. Swami Kuvalayananda and Dr.S.L.Vinekar, “*Yogic Therapy*”, Government of India, Ministry of Health, New Delhi.

**E-Recourses:**

1. [https://www.un.org/en/about-us/universal-declaration-of-human-rights?utm\\_source](https://www.un.org/en/about-us/universal-declaration-of-human-rights?utm_source)
2. <https://www.ugc.ac.in/oldpdf/xplanpdf/humanrights.pdf>

**Course Outcomes:**

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

|     |    |                                                                                                                     |
|-----|----|---------------------------------------------------------------------------------------------------------------------|
| CO1 | K3 | Demonstrate an understanding of fundamental human values and ethical principles.                                    |
| CO2 | K2 | Apply values such as honesty, integrity, responsibility, respect, and empathy in personal and professional life.    |
| CO3 | K5 | Develop positive interpersonal relationships and demonstrate respect for diversity and social harmony.              |
| CO4 | K6 | Demonstrate responsible citizenship and awareness of social, cultural, and national values.                         |
| CO5 | K4 | Apply ethical and value-based approaches to decision-making and contribute positively to society and the community. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     | ✓   | ✓   | ✓    | ✓    |      |      |      |
| CO4           |     | ✓   | ✓   |      | ✓    | ✓    |      |      |
| CO5           |     |     | ✓   |      |      | ✓    | ✓    | ✓    |

# BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI

## Centre for Differently Abled Persons

### Bachelor of Computer Applications

இரண்டாம் பருவம் - தாள் - 2

தமிழ் இலக்கிய வரலாறு - 2

Course Code : 26UCA2TLC02

Credits : 3

Max. Marks : 100

Internal Marks : 30

External Marks : 70

பாட நோக்கம்:

- தமிழ் மொழி இலக்கியங்களை அறிமுகம் செய்தல்.
- தமிழ் இலக்கியப் போக்குகளையும், இலக்கணங்களையும் மாணவர்கள் அறியுமாறு செய்தல்
- தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்

#### அலகு 1 தமிழ் இலக்கிய வரலாறு அறிமுகம்

- சிற்றிலக்கியம்: குறவஞ்சி, கலம்பகம், உலா, பரணி, பல்லு, பிள்ளைத்தமிழ் தூது அந்தாதி
- தனிப்பாடல் அறிமுகம்<sup>1</sup>
- இக்கால இலக்கியம்: கவிதை, சிறுகதை, நாடகம், உரைநடை, திராவிட, இயக்கம் வளர்த்த தமிழ்.

#### அலகு 2 சிற்றிலக்கியமும், தனிப்பாடலும்

- கலிங்கத்துப்பரணி - விருந்தினரும் வறியவரு நெருங்கியுண்ணரும் முதல் கேட்பாரைக் காண்மின் காண்மின் - வரை
- திருக்குற்றாலக் குறவஞ்சி - வானரங்கள் கனிகொடுத்து<sup>7</sup>
- முக்கூடற் பள்ளு - ஆற்று வெள்ளம் நாளை வரத்
- அபிராமி அந்தாதி - கலையாத கல்வியும் குறையாத வயதும்
- திருவரங்கக் கலம்பகம் - மறம் பிள்ளைப் பெருமாள் ஐயங்கார் பேசவந்த தூத செல்லரித்த ஓலை செல்லுமோ
- தமிழ்விடு தூது முதல் 10 கன்னிகள்

#### அலகு 3 இக்கால இலக்கியம்

- பாரதியார் பாரத சமுதாயம் வாழ்கவே
- பாரதிதாசன் - சிறுத்தையே வெளியில் வா<sup>8</sup>
- நாமக்கல் கவிஞர் - கத்தியின்றி
- தமிழ் ஒளி - மீன்கள் (அந்திநிலா பார்க்க வா)
- ஈரோடு தமிழன்பன் - எட்டாவது சீர்

சிறுகதைகள்

- புதுமைப்பித்தன் - கடிதம்<sup>12</sup>
- ஜெயகாந்தன் - வாய் சொற்கள் (மாலை மயக்கம் தொகுப்பு)
- ஆர். குடாமணி - அந்நியர்கள்

#### அலகு 4 இக்கால இலக்கியம்

- தந்தை பெரியார் - திருக்குறள் (மாநாட்டு) உரை<sup>8</sup>
- பேரறிஞர் அண்ணா - இரண்டாம் உலகத் தமிழ் மாநாட்டு உரை
- கலைஞர் மு. கருணாநிதி - தொல்காப்பிய பூங்கா - எழுத்து முதல் நூற்பா கட்டுரை

## நாடகம் திரைத்தமிழ்

- வேலைக்காரி - திரைப்படம்
- ராஜா ராணி - சாக்ரடீஸ் ஓரங்க நாடகம்
- இதழியல் தமிழ் : முரசொலி கடிதம்
- செம்மொழி வரலாற்றில் சில செப்பேடுகள்

## அலகு 5 மொழித்திறன் போட்டி தேர்வு திறன்

- தொடர் வகைகள்<sup>12</sup>
- மரபுத்தொடர் பழமொழிகள்
- பிற மொழிச் சொற்களை களைதல்
- வழச்சொற்களை நீக்குதல்<sup>8</sup>
- இலக்கண குறிப்பு அறிதல்.

## Pedagogical method used:

<sup>1</sup>Interactive Lectures

<sup>7</sup>Collaborative Learning

<sup>8</sup>Technology-Enabled Learning

<sup>12</sup>Self-Directed and Lifelong Learning

## பார்வை நூல்கள்

1. மு. வரதராசன், தமிழ் இலக்கிய வரலாறு, சாகித்திய அகாடமி, புதுடெல்லி, 2022.
2. மது. சா. விமலா விமலானந்தன், தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை, 2004.
3. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை, 2017.
4. தமிழ் இலக்கிய வரலாறு - முனைவர். சிற்பி பாலசுப்பிரமணியம், முனைவர் சேதுபதி, 2021.
5. புதிய தமிழ் இலக்கிய வரலாறு - முனைவர் சிற்பி பாலசுப்பிரமணியம், நீல. பத்மநாதன், 2022.
6. தமிழ் இலக்கிய வரலாறு- டாக்டர். அ. கா. பெருமாள், 2020.
7. தமிழ் இலக்கிய வரலாறு - முனைவர் பா. ச. ஏசுதாசன், 2021
8. தமிழ் இலக்கிய வரலாறு - ஸ்ரீ குமார், 2022
9. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - பாக்கிய மேரி, 2021
10. தமிழ் பயிற்று முறை, பேராசிரியர் ந. சுப்புரெட்டியார் - மணிவாசகர் பதிப்பகம், சிதம்பரம், 2020.

## Course Outcomes:

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

|     |          |                                                                                                           |
|-----|----------|-----------------------------------------------------------------------------------------------------------|
| CO1 | K1       | புதுக்கவிதை வரலாற்றினை அறிந்து கொள்வர்.                                                                   |
| CO2 | K2<br>K3 | திராவிட இயக்க இலக்கியங்களைக் கற்பதன் மூலம் மொழி உணர்வு, இன உணர்வு, சமத்துவம் சார்ந்த சிந்தனைகளைப் பெறுவர் |
| CO3 | K1<br>K3 | தமிழ்மொழியைப் பிழையின்றி எழுதவும், புதிய கலைச் சொற்களை உருவாக்கவும் அறிந்து கொள்வர்                       |
| CO4 | K3<br>K4 | போட்டித் தேர்வுகளில் வெற்றி பெறுவதற்குத் தமிழ்ப் பாடத்தினைப் பயன் கொள்ளும் வகையில் பயிற்சி பெறுவர்.       |

### Mapping with Program Outcomes and Program Specific Outcomes:

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           |     |     | ✓   |      | ✓    | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      | ✓    | ✓    | ✓    |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-II: English Course-II**  
**FUNCTIONAL ENGLISH AND ISL – 2**

**Course Code : 26UCA2ELC02**

**Credits : 3**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop functional communication skills in English and Indian Sign Language (ISL) for everyday situations and independent living.
- To enhance students' vocabulary and communication skills related to shopping, money, time, daily routines, travel, transport, health, and hygiene.
- To develop the ability to understand and use simple written information, including bills, receipts, timetables, tickets, medicine labels, and public signs.
- To enable students to communicate effectively through simple conversations, polite requests, questions, and functional writing in day-to-day situations.

**UNIT I**

Shopping and Money -Vocabulary of market and shop items, fruits, vegetables and groceries<sup>1</sup> - Indian currency, prices and simple calculations in context - Reading bills, receipts and price tags - Polite expressions used while shopping and bargaining.

**UNIT II**

Time and Daily Routine<sup>1,9</sup> - Telling time (hours, minutes) in English and ISL - Describing one's daily routine using simple present tense - Reading calendars, timetables and simple schedules - Vocabulary of seasons, festivals and important dates.

**UNIT III**

Travel and Transport - Vocabulary related to bus, train, auto-rickshaw and metro - Asking and understanding simple directions - Reading route boards, platform signs and ticket information - Simple conversation for ticket booking and fare enquiry<sup>7</sup>.

**UNIT IV**

Health and Hygiene - Vocabulary of body parts, common illnesses and symptoms - Simple conversation for visiting a doctor or hospital<sup>8</sup> - Reading medicine labels, dosage instructions and hospital signage - Vocabulary of hygiene and personal care practices.

**UNIT V**

Writing for Daily Use - Writing a shopping list and simple household notes - Writing short notes/messages to family and friends<sup>12</sup> - Filling simple registers, attendance sheets and daily forms - Writing short diary entries about the day's events.

**UNIT VI**

Polite Requests and Questions - Making polite requests (Can I..., Could you..., Please...) - Asking permission and giving simple responses - WH-question practice in real-life conversational contexts<sup>12</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>12</sup>Self-Directed and Lifelong Learning

**Materials for Study & Reference:****Text Books:**

1. Raman, Meenakshi, and Sangeeta Sharma., “*Technical Communication: Principles and Practice*”, 4th Edition, Oxford University Press, 2022.
2. Sanjay Kumar and Pushp Lata., “*English for Effective Communication*”, Oxford University Press India, 2020.

**Reference Books:**

1. Rizvi, M. Ashraf., “*Effective Technical Communication*”, 2nd ed., McGraw Hill Education (India), 2017.
2. Ali Yavar Jung National Institute of Speech and Hearing Disabilities (Divyangjan) (AYJNISHD)., “*Functional English for Daily Living*”, AYJNISHD (Divyangjan), Department of Empowerment of Persons with Disabilities, Ministry of Social Justice and Empowerment, Government of India, 2022.

**E-Resources:**

1. [https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26\\_ge30](https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26_ge30)
2. [https://learnenglish.britishcouncil.org/?utm\\_source\](https://learnenglish.britishcouncil.org/?utm_source\)
3. [https://indiansignlanguage.org/search-dictionary/?utm\\_source](https://indiansignlanguage.org/search-dictionary/?utm_source)

**Course Outcomes:**

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

|     |       |                                                                                                                                                     |
|-----|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2 | Communicate effectively in English and ISL in everyday situations related to shopping, money, time, and daily routines.                             |
| CO2 | K3    | Use appropriate vocabulary and simple expressions for travel, transport, health, hygiene, and other daily-life situations.                          |
| CO3 | K4    | Read and interpret functional information such as price tags, bills, receipts, calendars, timetables, tickets, medicine labels, and public signage. |
| CO4 | K2 K3 | Use polite requests, questions, and simple conversational expressions to communicate effectively in real-life contexts.                             |
| CO5 | K4 K5 | Demonstrate basic functional writing skills by preparing shopping lists, notes, messages, forms, attendance records, and simple diary entries.      |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     |     | ✓   |      |      |      | ✓    | ✓    |
| CO5           |     |     | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-II Core Course- II**  
**PYTHON PROGRAMMING**

**Course Code : 26UCA2CC02**  
**Credits : 4**

**Max. Marks : 100**  
**Internal Marks : 30**  
**External Marks : 70**

**Course Objectives:**

- To introduce students to the fundamental concepts of programming and the basic features, syntax, and structure of the Python programming language.
- To develop programming skills using Python data types, operators, expressions, control statements, arrays, strings, and mathematical functions.
- To enable students to design and develop Python programs using functions, file handling, and appropriate programming techniques.
- To provide an understanding of object-oriented programming.

**UNIT I**

Overview of Programming & Introduction to Python: Structure of a Python Program<sup>3</sup>, Elements of Python. Python Interpreter, Using Python as calculator, Python shell, Indentation, Atoms, Built-in Datatypes, Type conversions.

**UNIT II**

Identifiers and keywords, Literals, Comments, Operators, Python membership & identity operators<sup>4</sup>, Operator precedence, Python Arrays: Defining and Processing Arrays-Array methods

**UNIT III**

Creating Python Programs: Input and Output Statements<sup>5</sup>, String special operations, String formatting operator, Single quotes, Double quotes, Triple quotes, Control Statements, Mathematical functions and constants

**UNIT IV**

Functions - Function Definition - Function Call - Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments, Recursion<sup>6</sup>. Files and Directories - Creating files Operations on files, File object attributes, file positions, Listing Files in a Directory

**UNIT V**

Python tuples and sets, Python Dictionary - Classes, Object-oriented Programming and Exception: Abstract Data Types and Classes, Inheritance, Encapsulation and Information hiding, handling exceptions<sup>10</sup>

**UNIT VI**

The importance of python programming in getting employment opportunities: discussions<sup>10</sup>

**Pedagogical method used:**<sup>3</sup>Laboratory-Based Learning<sup>4</sup>Problem-Based Learning<sup>5</sup>Project-Based Learning<sup>6</sup>Experiential and Activity-Based Learning<sup>10</sup>Industry-Oriented Learning**Materials for Study & Reference:****Text Books:**

1. Allen B. Downey, "Think Python", O'Reilly Media, 3<sup>rd</sup> Edition 2024.
2. Nischay Kumar, "Python Programming Fundamentals - A Beginner's Handbook", Educreation Publishing, 2018.

**Reference Books:**

1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, 2022
2. John M. Zelle., "Python Programming: An Introduction to Computer Science", 3<sup>rd</sup> Edition, Franklin, Beedle & Associates, 2024.

**E-Resources:**

1. [https://www.py4e.com/book.php?utm\\_source](https://www.py4e.com/book.php?utm_source)
2. [https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26\\_mg227](https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg227)
3. <https://www.geeksforgeeks.org/python/python-programming-language-tutorial/>

**Course Outcomes:****On completion of the course the students will be able to:**

|            |              |                                                                                                                                                                                |
|------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Understand and apply the fundamental concepts, syntax, data types, operators, and expressions used in Python programming.                                                      |
| <b>CO2</b> | <b>K4</b>    | Develop Python programs using input/output operations, strings, arrays, control statements, and mathematical functions.                                                        |
| <b>CO3</b> | <b>K3 K4</b> | Create and manipulate lists, tuples and dictionaries                                                                                                                           |
| <b>CO4</b> | <b>K3 K4</b> | Design and implement modular programs using functions, different types of arguments, recursion, and file handling techniques.                                                  |
| <b>CO5</b> | <b>K5</b>    | Apply object-oriented programming concepts such as classes, objects, inheritance, encapsulation, and information hiding, along with appropriate exception-handling mechanisms. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| <b>CO1</b>    | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| <b>CO2</b>    | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| <b>CO3</b>    |     | ✓   | ✓   |      | ✓    | ✓    | ✓    |      |
| <b>CO4</b>    |     |     | ✓   |      |      | ✓    | ✓    | ✓    |
| <b>CO5</b>    |     | ✓   | ✓   |      |      | ✓    | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-II Core Practical - II**  
**PYTHON PROGRAMMING LAB**

**Course Code : 26UCA2CP02**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To develop practical skills in Python programming and application development.
- To apply control structures, functions, and modular programming techniques.
- To develop reusable programs using Python modules and standard programming practices.
- To implement file handling and exception handling in Python applications.

**EXERCISES<sup>2,3,4,5,6</sup>:**

1. Write a program to calculate the area of a Rectangle and Triangle using input functions.
2. Write a program to find the biggest number among three numbers.
3. Write a program to find whether a given year is a Leap Year or Non-Leap Year.
4. Write a program to swap two numbers using a temporary variable.
5. Write a program to display the Fibonacci series up to **\*\*N\*\*** numbers.
6. Write a program to print different Star (`\*`) Patterns using nested loops.
7. Write a program to count the number of Vowels, Consonants, and Spaces in a given string.
8. Write a program to find the Minimum and Maximum elements in a List.
9. Write a program to Create a Dictionary of Student Details and Display the Information.
10. Write a program to demonstrate Exception Handling using try and except.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

On completion of the course the students will be able to

|            |              |                                                                                                                                                          |
|------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K5</b>    | Develop Python programs using input/output statements, variables, operators, and basic arithmetic operations.                                            |
| <b>CO2</b> | <b>K2 K3</b> | Apply conditional and looping statements to solve problems involving comparisons, leap years, number swapping, Fibonacci series, and pattern generation. |
| <b>CO3</b> | <b>K4</b>    | Manipulate strings and lists to perform operations such as counting characters, vowels, consonants, spaces, and finding minimum and maximum values.      |
| <b>CO4</b> | <b>K3 K4</b> | Create and manage Python dictionaries to store, organize, and retrieve structured information such as student details.                                   |
| <b>CO5</b> | <b>K4 K5</b> | Apply exception-handling techniques using try and except statements to develop reliable and error-handled Python programs.                               |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          |            |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            | ✓           | ✓           | ✓           |             |             |
| <b>CO3</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO4</b>                |            |            | ✓          |             |             | ✓           | ✓           |             |
| <b>CO5</b>                |            |            | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-II Allied Course - II**  
**STATISTICAL METHODS AND ITS APPLICATION**

|                                  |                       |              |
|----------------------------------|-----------------------|--------------|
| <b>Course Code : 26UCA2AC02A</b> | <b>Max. Marks</b>     | <b>: 100</b> |
| <b>Credits : 4</b>               | <b>Internal Marks</b> | <b>: 30</b>  |
|                                  | <b>External Marks</b> | <b>: 70</b>  |

**Course Objectives**

- To understand the fundamental concepts and applications of statistics.
- To develop skills in organizing, presenting, and interpreting data.
- To apply measures of central tendency and dispersion to simple data sets.
- To understand the basic concepts of correlation, regression, and trend analysis.
- To develop practical skills in interpreting statistical information for everyday and workplace applications.

**UNIT I**

Introduction to Statistics and Averages<sup>1</sup> - Data, Variable, Random Variable, Population, Sample, Random Sample; Descriptive Statistics; Inferential Statistics<sup>12</sup>.

**UNIT II**

Meaning and Importance of Dispersion<sup>9</sup> – Range – Quartile Deviation – Mean Deviation – Standard Deviation – Coefficient of Range – Coefficient of Quartile Deviation – Coefficient of Variation – Comparison of variability using simple examples<sup>7</sup>.

**UNIT III**

Meaning of Correlation – Importance and uses of correlation – Types of correlation – Positive and negative correlation<sup>11</sup> – Scatter Diagram

**UNIT IV**

Meaning of Regression<sup>12</sup> – Difference between Correlation and Regression – Uses of Regression – Regression Lines – Regression Coefficients – Simple Regression Equations

**UNIT V**

Classification of Data<sup>7</sup>; Frequency Distribution; Mean, Median and Mode; Time Series Analysis; Trend Analysis

**UNIT VI**

Statistics in Daily Life and Business: Use of tables<sup>11</sup>, charts and graphs for decision-making- Interpretation of simple statistical information from newspapers, reports and digital media<sup>12</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>11</sup>Continuous Assessment and Feedback
- <sup>12</sup>Self-Directed and Lifelong Learning

**Materials for Study & Reference:****Text Books:**

- Gupta, S. C., “*Fundamentals of Statistics*”, Himalaya Publishing House, 2022.
- Pillai, R. S. N., and Bagavathi. *Statistics: Theory and Practice*. S. Chand Publishing, 2021.

**Reference Books:**

- Gupta, S. P., “*Statistical Methods*”, 46th ed., Sultan Chand & Sons, 2021.
- Elhance, D. N., Veena Elhance, and B. M. Aggarwal., “*Fundamentals of Statistics*”, Kitab Mahal, 2022.

**E- Resources:**

- <https://www.geeksforgeeks.org/maths/statistics/>
- [https://onlinecourses.nptel.ac.in/e-learning/preview/noc26\\_ce87](https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ce87)

**Course Outcomes:**

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

|            |             |                                                                                         |
|------------|-------------|-----------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K3</b>   | Explain fundamental statistical concepts and terminology.                               |
| <b>CO2</b> | <b>K1K2</b> | Organize and present data using tables, charts, and graphs.                             |
| <b>CO3</b> | <b>K4</b>   | Calculate and interpret measures of central tendency and dispersion.                    |
| <b>CO4</b> | <b>K2K4</b> | Identify relationships and trends in data using correlation and regression.             |
| <b>CO5</b> | <b>K2K3</b> | Apply basic statistical methods to interpret data in everyday and workplace situations. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| <b>CO1</b>    | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| <b>CO2</b>    |     | ✓   |     | ✓    | ✓    | ✓    |      |      |
| <b>CO3</b>    |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| <b>CO4</b>    |     |     | ✓   |      |      | ✓    |      | ✓    |
| <b>CO5</b>    |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-II Allied Practical - II**  
**BUSINESS STATISTICS LAB**

**Course Code : 26UCA2AP02A**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To understand basic statistical concepts using Python.
- To perform statistical calculations using Python programs.
- To analyze data using measures of central tendency and dispersion.
- To apply correlation, regression, time series, and index number techniques using Python.
- To develop simple Python programs for solving real-life statistical problems.

**EXERCISES <sup>2,3,4,5,6</sup>:**

1. Write a program to calculate Arithmetic Mean, Median, and Mode for a given dataset.
2. Write a program to calculate Geometric Mean, Harmonic Mean
3. Write a program to calculate Weighted Mean and Combined Mean for two datasets.
4. Write a program to calculate Range, Quartile Deviation.
5. Write a program to calculate Mean Deviation, and Standard Deviation.
6. Write a program to calculate Coefficient of Variation (CV) and compare the variability of two datasets.
7. Write a program to find Karl Pearson's Correlation Coefficient between two variables.
8. Write a program to calculate Spearman's Rank Correlation Coefficient for ranked data.
9. Write a program to perform Simple Linear Regression and predict the value of the dependent variable.
10. Write a program to plot a Time Series graph and calculate the Moving Average for the given data.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|            |              |                                                                                               |
|------------|--------------|-----------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K5</b>    | Develop and execute Python programs for computing basic statistical measures.                 |
| <b>CO2</b> | <b>K4</b>    | Analyze data using measures of central tendency and dispersion.                               |
| <b>CO3</b> | <b>K5</b>    | Implement and interpret correlation and regression techniques using Python.                   |
| <b>CO4</b> | <b>K3 K4</b> | Analyze time series data and identify basic trends using appropriate Python techniques.       |
| <b>CO5</b> | <b>K4 K5</b> | Apply statistical programming methods to solve practical data analysis and business problems. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                |            | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO3</b>                |            |            | ✓          |             | ✓           | ✓           |             |             |
| <b>CO4</b>                |            |            | ✓          |             |             | ✓           | ✓           |             |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-II Skill Enhancement Course -I**  
**DIGITAL SKILLS AND ASSISTIVE TECHNOLOGY LAB**

**Course Code : 26UCA2SEC01**

**Credits : 2**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To develop basic digital literacy and computer operation skills.
- To use office productivity software to create documents, spreadsheets, and presentations
- To access the internet, email, and cloud services for learning and communication.
- To use assistive technologies and accessibility features to support independent learning and workplace tasks.
- To apply digital and assistive technology tools in academic, personal, and professional environments.

**EXERCISES<sup>2,3,4,5,6,12</sup>:**

1. Create, rename, copy, move, and delete files and folders.
2. Prepare a resume with proper formatting using a word processor.
3. Create a class timetable using tables in a word processor.
4. Use Print Preview and print a document with appropriate print settings.
5. Create, enter, edit, and format data in an Excel worksheet.
6. Create a student marksheet and use basic functions such as SUM, COUNT, MAX, MIN, and AVERAGE.
7. Sort and filter spreadsheet data, and create a bar or pie chart from the filtered data.
8. Prepare a simple employee salary sheet and calculate gross salary and net salary using formulas.
9. Prepare a presentation with text, images, animations, and transitions.
10. Search for educational resources on the internet and bookmark useful websites.

**Pedagogical method used:**

- <sup>2</sup>Demonstration and Guided Practice
- <sup>3</sup>Laboratory-Based Learning
- <sup>4</sup>Problem-Based Learning
- <sup>5</sup>Project-Based Learning
- <sup>6</sup>Experiential and Activity-Based Learning
- <sup>12</sup>Self-Directed and Lifelong Learning

### Course Outcomes

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

|     |    |                                                                                                                                                            |
|-----|----|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K3 | Demonstrate proficiency in basic computer operations, file management, and digital resource organization.                                                  |
| CO2 | K3 | Create, format, edit, and print professional documents using word-processing applications.                                                                 |
| CO3 | K6 | Develop and manage spreadsheets using formulas, functions, sorting, filtering, and graphical representations.                                              |
| CO4 | K4 | Design and deliver effective presentations incorporating text, images, animations, and transitions.                                                        |
| CO5 | K4 | Utilize internet services, digital resources, assistive technologies, and accessibility features to support independent learning and workplace activities. |

### Mapping with Program Outcomes and Program Specific Outcomes:

| CO/<br>PO&PS<br>O | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------------|-----|-----|-----|------|------|------|------|------|
| CO1               | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2               | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3               |     | ✓   |     |      |      | ✓    | ✓    |      |
| CO4               |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO5               |     |     | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester - II**

**ENVIRONMENTAL STUDIES**

**Course Code: 26UCA2ES**

**Credits: 1**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop an understanding of the multidisciplinary nature, scope, and importance of environmental studies.
- To familiarize students with natural resources, their utilization, conservation, and sustainable management.
- To develop an understanding of ecosystems, biodiversity and their conservation.
- To create awareness of environmental pollution, its causes, impacts, and prevention measures.
- To promote environmental awareness, responsible practices, and sustainable development.

**UNIT I**

Multidisciplinary Nature: Definition, scope and importance of Environmental Studies; relationship between humans and the environment. Environmental Components<sup>9</sup> - Public Awareness: Need for environmental awareness, resource conservation, pollution control and sustainable development<sup>12</sup>.

**UNIT II**

Renewable and non-renewable resources – Forest, water, mineral, food, energy and land resources – Resource exploitation and environmental problems – Conservation of natural resources – Sustainable use of resources<sup>8</sup>.

**UNIT III**

Concept, structure and functions of ecosystems – Producers, consumers and decomposers – Energy flow – Ecological succession – Food chains, food webs and ecological pyramids – Forest, grassland, desert and aquatic ecosystems<sup>7</sup>.

**UNIT IV**

Concept and types of biodiversity – Biogeographical classification of India – Values and levels of biodiversity – India as a mega-diversity nation – Biodiversity hotspots – Threats to biodiversity – Endangered and endemic species – In-situ and Ex-situ conservation<sup>1</sup>.

**UNIT V**

Air, water, soil, marine, noise and thermal pollution – Nuclear hazards – Solid waste management – Pollution prevention and case studies – Disaster management – Environmental Protection, Air, Water, Wildlife Protection and Forest Conservation Acts<sup>8</sup>.

**UNIT VI**

The current status of environmental cleanliness and sanitation in and around our house and in the society<sup>12</sup>

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>12</sup>Self-Directed and Lifelong Learning

**Materials for Study & Reference:****Text Books:**

1. Bharucha, Erach., “*Textbook of Environmental Studies for Undergraduate Courses*”, 4th ed., Universities Press, 2024.
2. Kaushik, Anubha, and C. P. Kaushik., “*Perspectives in Environmental Studies*”, 8th ed., New Age International Publishers, 2025.
3. Cunningham, William P., and Mary Ann Cunningham., “*Environmental Science: A Global Concern*”, 16th ed., McGraw-Hill, 2023.

**Reference Books:**

1. De, Arnab Kumar, and Anil Kumar De, “*Environmental Chemistry*”, 11th ed., New Age International, 2023.
2. Agarwal, K.C., “*Environmental Biology*”, Nidi Public Ltd Bikaner, 2001.

**E-Resources:**

1. <https://www.kopykitab.com/Environmental-Studies-ebook-By-Dr-J-P-Sharma>
2. <https://www.pdfdrive.net/environmental-science-books.html>

**Course Outcomes:**

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

|     |    |                                                                                                                                                                                                  |
|-----|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K3 | Explain the importance of the environment, natural resources, and their role in sustaining daily life and human well-being.                                                                      |
| CO2 | K3 | Describe the basic structure and functioning of ecosystems and recognize the importance of biodiversity and its conservation                                                                     |
| CO3 | K2 | Identify major types of environmental pollution, their causes and effects, and appropriate measures for prevention and control                                                                   |
| CO4 | K4 | Recognize the importance of conserving water, energy, forests, land, and other natural resources through sustainable practices                                                                   |
| CO5 | K6 | Demonstrate responsible environmental behaviour through proper resource utilization, waste management, sustainable living, and participation in creating a clean, safe, and healthy environment. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--------|-----|-----|-----|------|------|------|------|------|
| CO1    | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2    | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3    |     | ✓   | ✓   | ✓    | ✓    |      |      |      |
| CO4    |     |     | ✓   |      | ✓    | ✓    | ✓    |      |
| CO5    |     |     | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

மூன்றாம் பருவம் - தாள் - 3

தமிழக வரலாறும் பண்பாடும்

**Course Code: 26UCA3TLC03**

**Credits : 3**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**பாட நோக்கம்:**

- தமிழக வரலாற்றை அறிந்து கொள்ளுதல்
- தமிழரின் வாழ்வியல் தொன்மையை அறிதல்
- தமிழரின் பண்பாட்டினை அறிந்து கொள்ளல்
- தமிழர் மேல் நிகழ்ந்த பிற பண்பாட்டுத் தாக்கங்களை அறிதல்
- தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்

**அலகு 1 பழங்கால வரலாறும் சங்ககால வரலாறும்**

- தொல் தமிழர்
- பழைய கற்காலம்
- புதிய கற்காலம்
- உலோகக் கற்காலம்
- அகழ்வாராய்ச்சியில் தமிழும் தமிழரும் (கீழடி வரை)
- திணை வாழ்வியல் (கனவு வாழ்க்கை, கற்பு வாழ்க்கை, உணவு, அணிகலன்கள், வாணிகம், விளையாட்டுக்கள்)<sup>1</sup>
- கல்வியும் கலைகளும்
- தமிழ் வளர்த்த சங்கம்
- சங்ககால ஆட்சி முறை
- அயல்நாட்டு தொடர்புகள்

**அலகு 2 ஆட்சியர் வரலாறு**

- மூவேந்தர் வரலாறு
- பல்லவர் வரலாறு
- நாயக்கர் ஆட்சி
- முகம்மதியர் ஆட்சி<sup>7</sup>
- மராட்டியர் ஆட்சி

**அலகு 3 ஐரோப்பியர் கால வரலாறு**

- போர்த்துகீசியர்
- டச்சுக்காரர்கள்
- டேனிஸ்காரர்கள்
- பிரெஞ்சுகாரர்கள்
- ஆங்கிலேயர்கள்<sup>8</sup>
- பாளையக்காரர்கள்
- இந்தியவிடுதலை போராட்டத்தில் தமிழ்நாடு

**அலகு 4 விடுதலைக்குப் பின் தமிழ்நாட்டு வரலாறு**

- மொழிப் போராட்டம்
- சமூக மறுமலர்ச்சி<sup>12</sup>
- தொழில்நுட்ப வளர்ச்சி

**அலகு 5 மொழி பயிற்சி**

- நிறுத்தக் குறிகள்
- கலைச்சொற்கள்
- மொழி பெயர்ப்பு<sup>12</sup>

## அலகு 6 தமிழகப் பண்பாட்டு மரபுகள் மற்றும் நவீன அடையாளங்கள்

- தமிழகக் கலை மரபுகள்
- தமிழர் திருவிழாக்களும் வழிபாட்டு முறைகளும்
- மறுமலர்ச்சியும் சமூக மாற்றமும்
- உலகளாவிய தமிழ்ப்பரவல் (புலம்பெயர் தமிழர்)
- டிஜிட்டல் தளங்களில் தமிழக வரலாறு

### Pedagogical method used:

<sup>1</sup>Interactive Lectures

<sup>7</sup>Collaborative Learning

<sup>8</sup>Technology-Enabled Learning

<sup>12</sup>Self-Directed and Lifelong Learning

### பாடநூல்கள்:

1. தமிழக வரலாறும் பண்பாடும்- கே. கே. பிள்ளை, உலக தமிழ் ஆராய்ச்சி நிறுவனம், சென்னை, 2004.
2. தமிழர் நாகரிகமும் பண்பாடும்- அ. தட்சிணாமூர்த்தி, யாழ் வெளியீடு, சென்னை, 2011.
3. தமிழக வரலாறும் பண்பாடும் - வே. தி. செல்லம், மணிவாசகர் பதிப்பகம் சென்னை 2008.
4. ஆதிச்சநல்லூர் முதல் கீழடிவரை - நுவேதாலாயிஸ், கிழக்குப் பதிப்பகம், சென்னை, 2020.
5. பண்பாட்டு மானிடவியல் - பக்தவச்சலபாரதி, அடையாளம் பதிப்பகம், திருச்சி-2019.
6. தமிழர் மேல் நிகழ்ந்த பண்பாட்டுப் படையெடுப்புகள், சு.ப.அறவாணன், தமிழ்த்தோட்டம், சென்னை, 1990.

### பார்வை நூல்கள்:

1. தமிழக சமுதாய பண்பாட்டு கலை வரலாறு - கு. சேதுராமன்,என்.சி.பி.எச்,சென்னை, 2017.
2. தமிழர் கலையும் பண்பாடும் - அ. கா. பெருமாள், என்.சி.பி.எச்,சென்னை- 2018.
3. ஒரு பண்பாட்டின் பயணம்: சிந்து முதல் வைகை வரை - ஆர்.பாலகிருஷ்ணன், ரோஜா முத்தையா ஆராய்ச்சி நூலகம், சென்னை- 2023.
4. தமிழும் பிறப்பண்பாடும்- தெ.பொ. மீனாட்சி சுந்தரனார், நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை-2012.
5. தமிழக வரலாறும் பண்பாடும் - நீலகண்ட சாஸ்திரி, ஸ்ரீசெண்பகா பதிப்பகம், சென்னை, 1972.
6. தமிழர் வரலாறும் தமிழர் பண்பாடும் - மா. இராசமாணிக்கனார், 1969.
7. தமிழர் நாகரிக வரலாறு- க.ந.திருநாவுக்கரசு, தொல்காப்பியர் நூலகம், சென்னை, 1980.

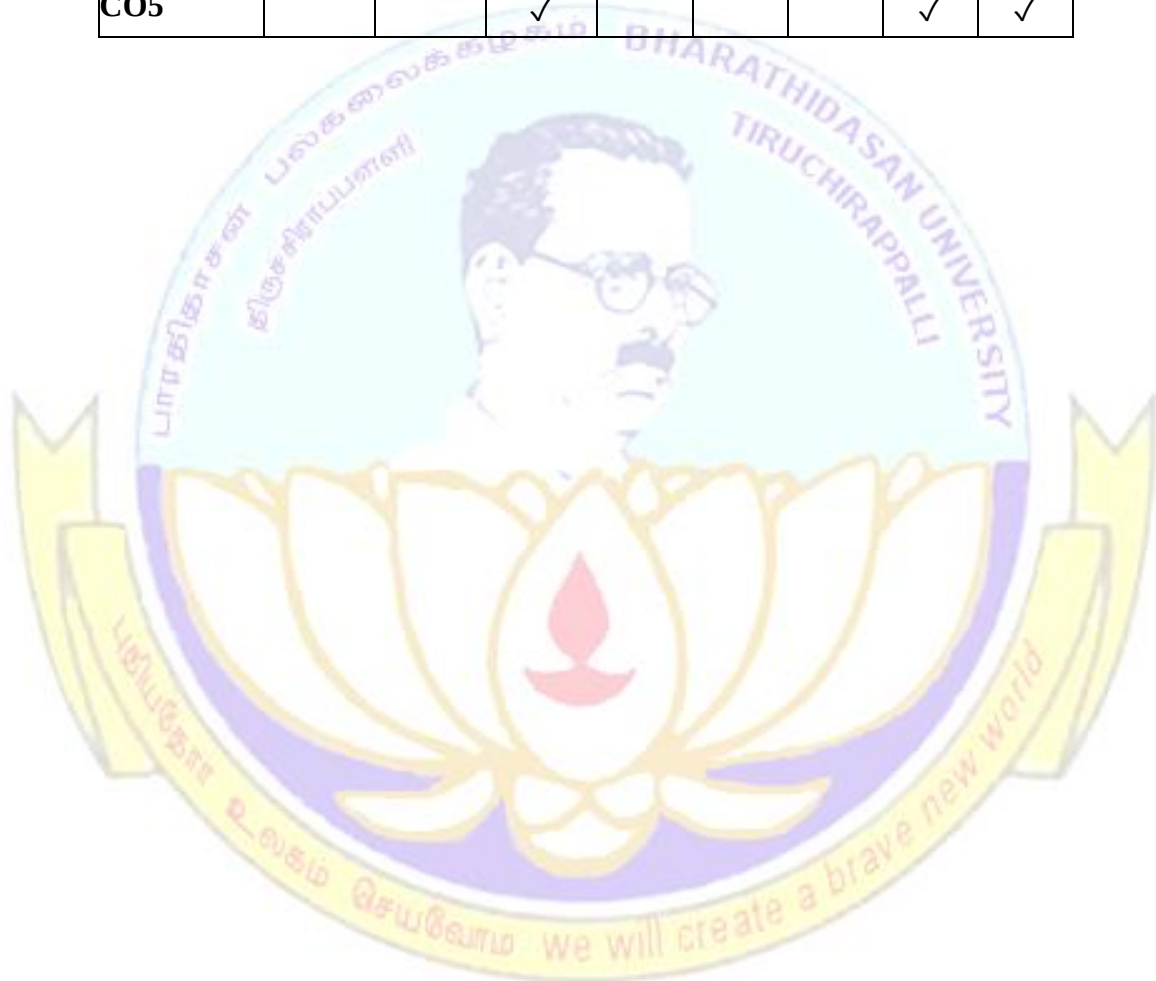
### மாணவர் பெறும் திறன்:

இப்பாடத்தைக் கற்பதால் பின்வரும் பயன்களை மாணவர் அடைவர்

|     |       |                                                      |
|-----|-------|------------------------------------------------------|
| CO1 | K1    | தமிழக வரலாற்றை அறிந்து கொள்வர்                       |
| CO2 | K2 K3 | தமிழரின் வாழ்வியல் தொன்மையை அறிவர்                   |
| CO3 | K1 K3 | தமிழரின் பண்பாட்டுக் கூறுகளை அறிந்துகொள்வர்          |
| CO4 | K3 K4 | பிற பண்பாட்டுத் தாக்கம் மற்றும் அணுகு முறைகளை அறிவர் |
| CO5 | K3 K4 | மொழி பெயர்ச்சிக்குத் தேவையான இலக்கணங்களைக் கற்பர்    |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     | ✓   |     |      | ✓    | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |
| CO5           |     |     | ✓   |      |      |      | ✓    | ✓    |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-III English -III**

**ENGLISH FOR DIGITAL AND SOCIAL LIFE**

**Course Code : 26UCA3ELC03**

**Credits : 3**

**Max. Marks :100**

**Internal Marks : 30**

**External Marks :70**

**Course Objectives:**

- To develop students' proficiency in computer, information technology, and programming-related vocabulary required for academic and professional communication.
- To enhance students' ability to communicate effectively through email, digital platforms, and accessible communication technologies in academic and workplace contexts.
- To develop academic, technical, workplace, and employability communication skills, including teamwork, presentations, interviews, self-advocacy, and professional interactions.
- To promote responsible, inclusive, and safe digital communication through awareness of digital etiquette, privacy, cybersecurity, accessibility, and professional online behavior.

**UNIT I**

Computer and Information Technology terminology relevant to IT and Professional environments - Basic programming, software development, internet, networking, and cloud-computing terminology - Interpretation of technical instructions, system notifications, prompts, and error messages - Effective use of technical terms, abbreviations, and acronyms in academic and professional contexts<sup>1</sup>.

**UNIT II**

Principles of effective digital communication and professional email communication. Email components: subject line, salutation, body, closing, and signature. Writing clear, concise, and appropriate messages for academic and workplace contexts. Video-relay, captioned-call, and text-based communication practices for Deaf and Hard-of-Hearing users<sup>7</sup>.

**UNIT III**

Comprehension of college notices, circulars, announcements, timetables, and examination notifications. Interpretation and application of classroom, laboratory, assignment, and academic instructions. Comprehension of basic technical texts, programming problems, algorithms, and computer-related information. Developing skills for seeking clarification and communicating academic requirements effectively<sup>8</sup>.

## UNIT IV

Workplace vocabulary and expressions used in offices, IT environments, and professional settings – Writing and responding to workplace messages, instructions, requests, and announcements – Communication skills for teamwork, meetings, presentations, interviews, and professional interactions – Developing professional etiquette, self-advocacy, problem-solving, and inclusive workplace communication skills<sup>12</sup>.

## UNIT V

Digital etiquette and appropriate communication practices in academic, professional, and social online environments – Respectful language, privacy, confidentiality, and responsible sharing of digital information – Appropriate use of email, social media, online platforms, video conferencing, and collaborative tools – Cyber safety, digital identity, accessibility, and responsible online behavior for inclusive participation<sup>9</sup>.

## UNIT VI

Writing Digital Texts - Composing short, purposeful emails - Writing social media posts and captions appropriately - Digital communication ethics and online safety - Proofreading and correcting simple digital texts<sup>12</sup>.

### Pedagogical method used:

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>12</sup>Self-Directed and Lifelong Learning

### Materials for Study & Reference:

#### Text Books:

1. Indian Sign Language Research and Training Centre (ISLRTC), “*Indian Sign Language Dictionary*”, Vols. 1–4, ISLRTC, Department of Empowerment of Persons with Disabilities, Ministry of Social Justice and Empowerment, Government of India, 2024.
2. Murphy, Raymond, “*Essential Grammar in Use*”, 5th ed., Cambridge University Press, 2024.

#### Reference Books:

1. Rizvi, M. Ashraf, “*Effective Technical Communication*”, 3rd ed., McGraw Hill Education (India), 2024.
2. Raman, Meenakshi, and Sangeeta Sharma, “*Technical Communication: Principles and Practice*”, 4th ed., Oxford University Press, 2023.
3. British Council, “*English for the Workplace and Digital Communication*”, British Council, 2023.
4. Ali Yavar Jung National Institute of Speech and Hearing Disabilities (Divyangjan), “*Functional English for Persons with Hearing Impairment*”, AYJNISHD (Divyangjan), Department of Empowerment of Persons with Disabilities, Ministry of Social Justice and Empowerment, Government of India, 2023.

#### E-Resources:

1. Indian Sign Language Research and Training Centre. *Indian Sign Language Learning Resources*. ISLRTC, <https://www.islrtc.nic.in>.
2. British Council. *Learn English*. British Council, <https://learnenglish.britishcouncil.org>.

**Course Outcomes:**

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

|            |              |                                                                                                                                                                                 |
|------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1</b>    | Demonstrate appropriate use of computer and IT terminology in academic, technical, and professional contexts.                                                                   |
| <b>CO2</b> | <b>K2 K3</b> | Compose and interpret effective digital communications, including professional emails, workplace messages, and accessible online communication.                                 |
| <b>CO3</b> | <b>K3 K4</b> | Read, interpret, and respond to academic and technical information, including notices, instructions, programming problems, and computer-related texts.                          |
| <b>CO4</b> | <b>K2 K3</b> | Apply effective workplace communication skills in teamwork, meetings, presentations, interviews, problem-solving, and self-advocacy.                                            |
| <b>CO5</b> | <b>K4 K5</b> | Practice responsible and inclusive digital communication by applying principles of netiquette, privacy, confidentiality, cybersecurity, accessibility, and digital citizenship. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO3</b>                |            | ✓          |            |             |             | ✓           | ✓           |             |
| <b>CO4</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |
| <b>CO5</b>                |            |            | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-III Core Course- III**  
**DATA STRUCTURES AND ALGORITHMS**

**Course Code : 26UCA3CC03**

**Credits : 4**

**Max. Marks :100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop a strong foundation in data structures, algorithms, and algorithmic problem-solving, including time and space complexity and asymptotic notations.
- To develop proficiency in implementing and manipulating linear and non-linear data structures using Python.
- To enable students to apply searching and sorting techniques and evaluate their efficiency for solving computational problems.
- To develop practical skills in linked lists, stacks, queues, trees, and graphs, including their implementation, traversal, and real-world applications.

**UNIT I**

Introduction to Data Structures, Algorithms: Definition and Characteristics, Time and Space Complexity, Asymptotic Notations (Big O, Big  $\Omega$ , Big  $\Theta$ ), Python Basics: Features, Variables, Data Types, Operators, Input and Output Statements, Control Statements<sup>2</sup>, Functions, Recursion.

**UNIT II**

Data Structures - Definition, Linear Data Structures, Non-Linear Data Structures Python Specific Data Structures: List, Tuples, Set, Dictionaries, Comprehensions and its Types, Strings, slicing<sup>3,6</sup>.

**UNIT III**

Arrays - Overview, Types of Arrays, Operations on Arrays, Arrays vs List. Searching - Linear Search and Binary Search. Sorting - Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort<sup>4,5</sup>.

**UNIT IV**

Linked Lists - Implementation of Singly Linked Lists, Doubly Linked Lists, Circular Linked Lists. Stacks - Overview of Stack, Implementation of Stack (List & Linked list), Applications of Stack Queues: Overview of Queue, Implementation of Queue (List & Linked list), Applications of Queues, Priority Queues<sup>6</sup>.

## UNIT V

Graphs -Introduction, Directed vs Undirected Graphs, Weighted vs Unweighted Graphs, Representations, Breadth First Search, Depth First Search. Trees - Overview of Trees, Tree Terminology, Binary Trees: Introduction, Implementation, Applications. Tree Traversals, Binary Search Trees - AVL Trees: Rotations<sup>6</sup>.

## UNIT VI

The importance of Data Structures and Algorithms: Seminar & Discussion

### Pedagogical method used:

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

### Materials for Study & Reference:

#### Text Books:

1. Reema Thareja, "Data Structures and Algorithms", 1st Edition, Oxford University Press, 2025.
2. Narasimha Karumanchi, "Data Structure and Algorithmic Thinking with Python", Career Monk Publications, 2015.

#### Reference Books:

1. G. A. Vijayalakshmi Pai, "A Textbook of Data Structures and Algorithms: Mastering Linear Data Structures", 1st Edition, Wiley-ISTE, 2023.
2. Elvis Foster, "Fundamentals of Data Structures and Algorithms", 1st Edition, CRC Press (Routledge), 2026.
3. Tenenbaum, Aaron M., Yedidyah Langsam, and Moshe J. Augenstein. "Data Structures Using C". 2nd ed., Pearson Education, 2008

#### E-Resources:

1. [https://onlinecourses.nptel.ac.in/e-learning/preview/noc26\\_cs109](https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs109)
2. <https://www.geeksforgeeks.org/dsa/dsa-tutorial-learn-data-structures-and-algorithms/>

#### Course Outcomes:

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

|     |          |                                                                                                                                                           |
|-----|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2    | Explain Python syntax and semantics and apply control structures, functions, and basic programming concepts to develop Python programs.                   |
| CO2 | K1 K4 K5 | Create, execute, and manipulate Python programs using built-in data structures such as lists, tuples, sets, and other collections.                        |
| CO3 | K2 K3    | Apply dictionaries, strings, and regular expressions to store, process, and manipulate data effectively.                                                  |
| CO4 | K3 K4    | Explain and apply the fundamental concepts of Object-Oriented Programming in Python, including classes, objects, methods, inheritance, and encapsulation. |
| CO5 | K6       | Design and develop complete Python applications using object-oriented programming principles, classes, and objects to solve practical problems.           |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     |     | ✓   |      |      |      | ✓    | ✓    |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-III Core Practical - III**  
**DATA STRUCTURES AND ALGORITHMS LAB**

**Course Code : 26UCA3CP03**

**Credits : 4**

**Max. Marks :100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives**

- To understand the fundamental concepts and operations of basic data structures.
- To apply searching and sorting techniques using Python programs.
- To implement stacks, queues, linked lists, graphs, and trees using Python.
- To develop problem-solving skills using appropriate data structures and algorithms.

**EXERCISES <sup>2,3,4,5,6</sup>:**

1. Write a program to perform basic List operations (Add, Delete, Update, Display).
2. Write a program to perform Dictionary operations (Add, Update, Delete, Display).
3. Write a program to implement Stack operations.
4. Write a program to implement Queue operations.
5. Write a program to implement Linear Search.
6. Write a program to create a Singly Linked List.
7. Write a program to implement Binary Search.
8. Write a program to sort a List using Bubble Sort.
9. Write a program to perform Breadth First Search (BFS) on a Graph.
10. Write a Program to Implement a Binary Search Tree and Perform Tree Traversals.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

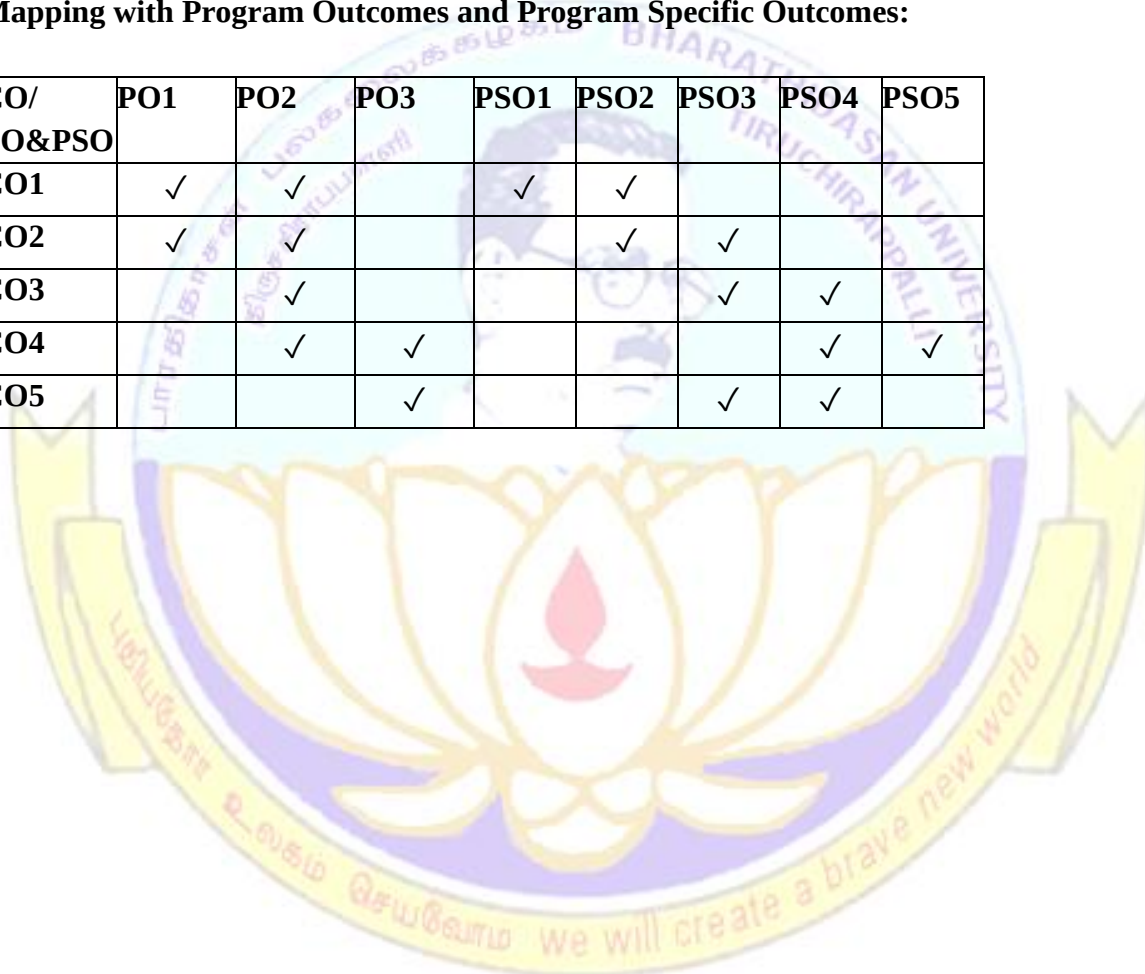
**Course Outcomes:**

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

|            |              |                                                                                                                                           |
|------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1</b>    | Implement and manipulate fundamental Python data structures such as Lists, Dictionaries, Stacks, Queues, and Linked Lists.                |
| <b>CO2</b> | <b>K2</b>    | Develop and execute searching algorithms, including Linear Search and Binary Search, for efficient data retrieval.                        |
| <b>CO3</b> | <b>K2 K3</b> | Apply sorting techniques such as Bubble Sort to organize and process data effectively.                                                    |
| <b>CO4</b> | <b>K4 K5</b> | Implement graph traversal techniques, particularly Breadth First Search (BFS), to solve basic graph-based problems.                       |
| <b>CO5</b> | <b>K6</b>    | Construct and implement Binary Search Trees and perform standard tree traversal techniques for efficient data organization and retrieval. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO3</b>                |            | ✓          |            |             |             | ✓           | ✓           |             |
| <b>CO4</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |
| <b>CO5</b>                |            |            | ✓          |             |             | ✓           | ✓           |             |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-III Allied Course - III**

**FINANCIAL ACCOUNTING**

**Course Code: 26UCA3AC03A**

**Credits: 4**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop a comprehensive understanding of accounting concepts, voucher creation, and the preparation of final accounts with appropriate adjustments.
- To develop skills in generating Management Information System (MIS) reports and preparing GST-related reports.
- To develop practical skills in recording business transactions using appropriate accounting vouchers and creating and applying cost centres.
- To familiarize students with the creation and management of inventory masters and the effective use of inventory-related features.

**UNIT I**

Need and Importance – Book –Keeping – Accounting – Accountancy- Accounting and Book-Keeping – Users of Accounting Information – Branches of Accounting – Basic accounting terms- Rules for Debiting and crediting – Books of original entry – Journal – Ledger – Trail balance<sup>1</sup>

**UNIT II**

Getting Started with Tally Prime – Mouse/Keyboard Conventions – Company creation – Shut a Company – Select a Company – Alter Company Details – Company Features and Configuration – Ledger – Group<sup>1,7</sup>

**UNIT III**

Parts of final accounts – Trading account – profit and loss account – balance sheet – preparation of final accounts – without adjustments<sup>9</sup>.

**UNIT IV**

Voucher Entry in Tally Prime – Accounting Vouchers – Types of Vouchers – Contra, Payment, Receipt, Journal, Sales, Purchase, Credit note, debit note, reversing journals, Memo Voucher Transactions – Display<sup>10</sup>

**UNIT V**

Inventory Masters In Tally Prime – Creating inventory masters – creating Inventory Masters – Creation of Stock Group – Creation of Units of Measure – Creation of Stock Item – Creation of Go down – Defining of Stock Opening Balance in Tally Prime - Stock Category – Reports<sup>11</sup>

**UNIT VI**

Application of accountancy in our day-to-life: discussions<sup>10</sup>

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>10</sup>Industry-Oriented Learning
- <sup>11</sup>Continuous Assessment and Feedback

**Materials for Study & Reference:****Text Books**

1. Lal, Jawahar and Seema Srivastava, "*Financial Accounting*", 4th ed., Himalaya Publishing House, New Delhi, 2019.
2. Monga, J. R., "*Financial Accounting: Concepts and Applications*", 3rd ed., Mayoor Paper Backs, New Delhi, 2018.
3. Shukla, M. C., T. S. Grewal, and S. C. Gupta, "*Advanced Accounts. Vol.-I*", S. Chand & Co., New Delhi, 2020.

**References**

1. Maheshwari, S. N., "*Financial Accounting*", 5th ed., Vikas Publication, New Delhi, 2020.
2. Grewal, T. S., "*Introduction to Accounting*", 4th ed., S. Chand and Co., New Delhi, 2018.

**E-Resources:**

1. [https://onlinecourses.nptel.ac.in/e-learning/preview/noc26\\_mg92](https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_mg92)
2. [https://www.tutorialspoint.com/accounting\\_basics/index.htm?utm\\_source](https://www.tutorialspoint.com/accounting_basics/index.htm?utm_source)

**Course Outcomes:**

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

|     |    |                                                                                                                                                                                   |
|-----|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 | Explain the fundamentals of bookkeeping and accounting and apply the principles of journalizing, ledger posting, and preparation of trial balance.                                |
| CO2 | K3 | Create and manage companies, accounting groups, and ledgers in Tally Prime using appropriate configuration and accounting features.                                               |
| CO3 | K4 | Prepare and interpret final accounts, including Trading Account, Profit and Loss Account, and Balance Sheet, using computerized accounting practices.                             |
| CO4 | K2 | Record and manage various business transactions in Tally Prime using appropriate accounting vouchers and voucher-entry procedures.                                                |
| CO5 | K5 | Create and maintain inventory masters in Tally Prime, including stock groups, stock categories, stock items, units of measure, go downs, opening balances, and inventory reports. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     | ✓   | ✓   | ✓    | ✓    |      |      |      |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-III Allied Practical - III**

**ACCOUNTING PACKAGE LAB**

**Course Code : 26UCA3AP03A**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To understand the basic features and accounting functions of Tally.
- To apply Tally for creating companies, groups, ledgers, and stock items.
- To prepare Trading Account, Profit and Loss Account, and Balance Sheet using Tally.
- To develop skills in configuring and managing accounting data using Tally.

**EXERCISES: 2,3,4,5,6**

1. Company creation, alteration and deletion of companies and user defined Accounting groups
2. Creation, alteration and deletion of ledgers and final accounts and Balance sheet Preparations.
3. F11: Company Features, F12: Configuration
4. Single Ledger Creation, Multi Ledger Creation
5. Altering and Displaying Ledgers
6. Group Creation, Single Group Creation, Multiple Group Creation
7. Displaying Groups and Ledgers
8. Creation of Stock Item, Go down
9. Trading and Profit and Loss Account, Balance sheet
10. Types of Assets and Liabilities included in a Balance Sheet

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|            |              |                                                                                      |
|------------|--------------|--------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1</b>    | Create, alter, and delete companies, groups, and ledgers using Tally.                |
| <b>CO2</b> | <b>K2</b>    | Configure company features and settings using F11 and F12 options.                   |
| <b>CO3</b> | <b>K2 K3</b> | Create and manage single and multiple ledgers, groups, stock items, and godowns.     |
| <b>CO4</b> | <b>K4 K5</b> | Prepare Trading Account, Profit and Loss Account, and Balance Sheet using Tally.     |
| <b>CO5</b> | <b>K3</b>    | Identify and analyze different types of assets and liabilities in the Balance Sheet. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO3</b>                |            | ✓          | ✓          |             |             | ✓           | ✓           |             |
| <b>CO4</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |
| <b>CO5</b>                |            |            | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-III Skill Enhancement Course - II**

**COMPUTER GRAPHICS LAB**

**Course Code : 26UCA3SEC02**

**Credits : 2**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To develop practical skills in using shapes, text, colors, brushes, gradients, patterns, and artistic effects for creating graphic designs.
- To develop proficiency in using image-editing tools, filters, effects, and object-formatting techniques to enhance artwork and images.
- To provide practical experience in designing logos, greeting cards, invitations, banners, certificates and advertisements.
- To develop skills in combining and organizing multiple images, text, and layers to create professional-quality graphic compositions.

**EXERCISES: 2,3,4,5,6**

1. Create a greeting card using shapes, text, brushes, colors, and decorative effects.
2. Create a logo using shapes, text, colors, and object formatting tools.
3. Create a composite image by combining selected portions of multiple images.
4. Design an invitation card using multiple layers of images and text.
5. Design a banner or poster for a college or institutional event.
6. Create a logo using Weld, Trim, Intersect, and other object-editing techniques.
7. Design a visiting card and letterhead using text, shapes, images, and formatting tools.
8. Create a certificate using text, borders, shapes, colors, and artistic effects.
9. Create a product advertisement using images, text, shapes, and special effects.
10. Design a three-fold pamphlet or brochure using text, images, shapes, and page layout tools.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|     |       |                                                                                                                      |
|-----|-------|----------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2 | Apply basic graphic design tools including shapes, text, colors, brushes, and effects.                               |
| CO2 | K2 K4 | Design professional graphic materials using typography, formatting, colors, and layout techniques.                   |
| CO3 | K3 K5 | Manipulate and combine images using selection, layers, filters, and special effects.                                 |
| CO4 | K3 K4 | Apply object-editing techniques such as Weld, Trim, Intersect, and alignment to create structured designs.           |
| CO5 | K5    | Create professional print-ready designs using appropriate images, text, shapes, effects, and page-layout techniques. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           |     | ✓   |     |      |      | ✓    | ✓    |      |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-III Non-Major Elective - I**

**HEALTH AND WELLNESS**

**Course Code: 26UCA3NME01**

**Credits : 1**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop an understanding of the concepts of health and wellness and their importance in daily life.
- To understand the interrelationship between physical, mental, and social well-being.
- To understand the principles and practices of various physical exercises.
- To encourage the adoption of healthy lifestyle practices for promoting overall well-being.

**UNIT I**

Introduction to Health and Wellness: Definition of Health, Wellness vs. Health, Health and Wellness Myths and Misconceptions, Determinants of Health, Social, economic, environmental, and behavioral factors influencing health<sup>1</sup>.

**UNIT II**

Nutrition and Healthy Eating: Basic Nutritional Concepts, The Role of Nutrition in Preventing Diseases, Dietary Guidelines and Food Labels, Creating a Healthy Meal Plan, Meal planning strategies for different lifestyles<sup>7,8</sup>. Special diets (vegetarian, vegan, gluten-free, etc).

**UNIT III**

Physical Activity and Fitness: Importance of Physical Activity - Benefits for the body and mind. Physical activity recommendations for adults. Types of Exercise, designing a Fitness Program, Setting SMART goals for fitness. Principles of exercise: Frequency, Intensity, Time, and Type (FITT). Overcoming Barriers to Physical Activity<sup>9</sup>.

**UNIT IV**

Mental Health and Stress Management: Understanding Mental Health, Stress and Its Impact on Health, Stress Management Techniques, Relaxation techniques<sup>11</sup>: deep breathing, progressive muscle relaxation. Cognitive-behavioral strategies, mindfulness, and meditation. Building Emotional Resilience.

**UNIT V**

Preventive Health and Disease Management: Preventive Health Measures, Vaccination, screenings, and early detection. Regular check-ups and maintaining a healthy lifestyle. Common Preventable Diseases, Disease Management and Chronic Illnesses, Health Advocacy and Public Health Initiatives, Role of community programs in disease prevention<sup>12</sup>.

## UNIT VI

The current status of Health and Wellness in and around our house and in the society

### Pedagogical method used:

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>11</sup>Continuous Assessment and Feedback
- <sup>12</sup>Self-Directed and Lifelong Learning

### Materials for Study and References:

#### Text Books:

1. Gordon Edlin and Eric Golanty, "Health & Wellness", 14th Edition, Jones & Bartlett Learning, 2023.
2. Schrijver, Iris, "On the Path to Health, Wellbeing, and Fulfilment: To Your Health", United Kingdom, Cambridge Scholars Publisher, 2021.

#### References Books:

1. Sachin Batra (Ed.), "Health and Wellness for All: Navigating Pathways to a Better Life", 1st Edition, Springer Nature, 2025.
2. Basavaraddi, I.V., "Yogasana: A Comprehensive description about Yogasana", MDNIY, New Delhi, 2011.
3. Swami Dharendra Bhrahmachari: "YogasanaVijnana", Dharendra Yoga Publications, New Delhi.
4. Thathuvagnani Vethathiri Maharishi, "Simplified Physical Exercises", Vethathiri Publications.
5. Jessica Alsup, "The Basics of Health, Wellness, and Fitness", 1st Edition, ROTEL (Open Textbook), 2024.

#### E-Resources:

1. [https://onlinecourses.nptel.ac.in/e-learning/preview/noc26\\_hs150](https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_hs150)
2. [https://www.who.int/?utm\\_source](https://www.who.int/?utm_source)

#### Course Outcomes:

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

|     |      |                                                                                                       |
|-----|------|-------------------------------------------------------------------------------------------------------|
| CO1 | K1   | Understand the basic concepts of health, wellness, and factors affecting overall health.              |
| CO2 | K1   | Understand the importance of nutrition and healthy eating habits for a balanced lifestyle.            |
| CO3 | K3K4 | Develop knowledge of physical activity, exercise, and fitness practices for maintaining good health.  |
| CO4 | K2   | Understand different techniques for stress management and maintaining mental well-being.              |
| CO5 | K5   | Develop awareness of preventive health practices and healthy lifestyle habits for disease prevention. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      | ✓    | ✓    |      |      |
| CO5           |     |     | ✓   |      |      |      | ✓    | ✓    |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

நான்காம் பருவம் - தாள் - 4

தமிழும் அறிவியலும்

**Course Code : 26UCA4TLC04**

**Credits : 3**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**பாட நோக்கம்:**

- தாய்மொழி வழியாக அறிவியல் பற்றிய சிந்தனைகளை வளர்த்தல்
- அறிவியல் கலைச் சொல்லாக்கம் பற்றிப் பயிற்றுவித்தல்
- மாணவர்களுக்கு அறிவியல் பார்வையை ஏற்படுத்துதல்
- தமிழில் அறிவியல் படைப்பிலக்கியங்களை உருவாக்கத் தூண்டுதல்
- தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்

**அலகு 1 - தமிழரின் அறிவியல் சிந்தனைகள்<sup>1</sup>**

- அறிவியலும் மனித வாழ்வும்
- ஐந்திணைப் பகுப்பும் சூழலியலும்
- தொழில்நுட்ப மேலாண்மை
- நீர் நில மேலாண்மை

**அலகு 2 - பழந்தமிழ் இலக்கியங்களில் அறிவியல் சிந்தனைகள்<sup>7,8</sup>**

- நிலவியல்
- உலோகவியல்
- வானவியல்
- உயிரியல்
- உளவியல்

**அலகு 3 - இடைக்கால இலக்கியங்களில் அறிவியல் சிந்தனைகள்<sup>1</sup>**

- காப்பியங்களில் அறிவியல்
- சிற்றிலக்கியங்களில் அறிவியல்
- உரைநூல்களில் அறிவியல்

**அலகு 4 - இணையத் தமிழ்**

- இணையத் தமிழ் பயன்பாடு - அறிமுகம்
- இணையத்தமிழ் கல்விக்கழகம்
- இணைய நூலகம்
- செயற்கை நுண்ணறிவியல்<sup>8</sup>
- தமிழ்நாட்டு அறிவியல் ஆளுமைகள்

**அலகு 5 - கடிதம் எழுதுதலும் கட்டுரை எழுதுதலும்**

- உறவு முறைக் கடிதப் பயிற்சி
- அலுவலகக் கடித பயிற்சி
- விண்ணப்ப படிவம் எழுதும் பயிற்சி
- தன் விவரப் படிவம் எழுதும் பயிற்சி<sup>12</sup>
- கருத்து விளக்கக் கட்டுரைகள் எழுதும் பயிற்சி
- பத்திரிகைகளுக்குக் கட்டுரை எழுதும் பயிற்சி

## அலகு 6 – அறிவியல் கலைச்சொல்லாக்கம், மொழிபெயர்ப்பு மற்றும் நவீன ஊடகங்கள்

- அறிவியல் கலைச்சொல் உருவாக்கக் கோட்பாடுகள்
- ஆங்கிலம் – தமிழ் அறிவியல் மொழிபெயர்ப்புச் சவால்கள்
- நவீன ஊடகங்களில் அறிவியல் தமிழ்.
- வலைப்பதிவுகளில் அறிவியல் பதிவுகள்
- அறிவியல் தமிழ் ஆய்வுகள் மற்றும் எதிர்கால வளர்ச்சி

### Pedagogical method used:

<sup>1</sup>Interactive Lectures

<sup>7</sup>Collaborative Learning

<sup>8</sup>Technology-Enabled Learning

<sup>12</sup>Self-Directed and Lifelong Learning

### பாட நூல்கள்:

1. அறிவியல் தமிழ் இன்றைய நிலை, - ராதா செல்லப்பன், உலக தமிழ் ஆராய்ச்சி நிறுவனம், சென்னை- 1992.
2. மணவை முஸ்தபா, தமிழில் அறிவியல் படைப்பிலக்கியம், மணவை பதிப்பகம், சென்னை- 1995.
3. கலைச் சொல்லாக்கம் - மங்கை, ரங்கராசபுரம், சென்னை-1999.

### பார்வை நூல்கள்:

1. தமிழர் வேளாண் மரபுகள். இல. செ. கந்தசாமி, 1983.
2. சங்க இலக்கியத்தில் வேளாண் சமுதாயம் - பெ மாதையன், நியூ செஞ்சுரி புக் ஹவுஸ்- 2004.
3. தமிழில் அறிவியல் இதழ்கள் - சாமுவேல் ரா. பார்வேந்தன், ஃபி'கிறீன் பதிப்பகம் கோவை- 2007.
4. அறிவியல் தமிழ் - பதிப்பாசிரியர் இரா. செல்லப்பன், பாரதிதாசன் பல்கலைக்கழகம், திருச்சிராப்பள்ளி, 2008.
5. இணையத் தமிழ் வரலாறு- மு பொன்னவைக்கோ, பாரதிதாசன் பல்கலைக்கழகம், 2010.
6. இணையதமிழ் -சந்திரிகா சுப்பிரமணியன், சந்திரோதயம் பதிப்பகம்-2010.
7. இணையமும் இனியதமிழும் - துரை. மணியரசன், இசைபதிப்பகம்- 2005.
8. கணினி தமிழ் - இல. சுந்தரம்,விகடன் பிரசுரம்- 2008.
9. தமிழ் இலக்கியத்தில் அறிவியல் சிந்தனைகள் - வானதி பதிப்பகம்- 2013.

### மாணவர் பெறும் திறன்

இப்பாடத்தைக் கற்பதால் பின்வரும் பயன்களை மாணவர் அடைவர்

|     |       |                                                                            |
|-----|-------|----------------------------------------------------------------------------|
| CO1 | K1    | தாய்மொழி வழியாக அறிவியல் பற்றிச் சிந்திக்கும் திறன் பெற்றிருப்பர்          |
| CO2 | K2 K3 | அறிவியல் கலைச் சொல்லாக்கம் பற்றிய விதிகள், நுணுக்கங்களைத் தெரிந்திருப்பர்  |
| CO3 | K1 K3 | அறிவியல் தமிழ் வளர்ச்சியில் மொழி பெயர்ப்பின் பங்கு குறித்து அறிந்திருப்பர் |
| CO4 | K4    | மொழியறிவோடு சிந்தனைத் திறனைப் பெறுவர்                                      |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO3           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-IV English - IV**  
**ENGLISH FOR WORKPLACE AND CIVIC LIFE**

**Course Code : 26UCA4ELC04**

**Credits : 3**

**Max. Marks :100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop students' skills in resume preparation, job application writing, and professional documentation for employment opportunities.
- To enhance interview and workplace communication skills, including self-introduction, professional etiquette, collaboration, and effective follow-up.
- To develop functional knowledge of civic, financial, and government services, including forms, official notices, and public-service procedures.
- To promote awareness of disability rights, reasonable accommodation, self-advocacy, and grievance redressal in academic, workplace, and civic environments.

**UNIT I**

Resume and Application Writing - Structure and content of a simple resume/bio-data - Filling job application forms accurately - Writing a formal letter/email of application - Proofreading and formatting application documents<sup>1,9</sup>.

**UNIT II**

Interview Communication - Common interview vocabulary and expected questions - Self-introduction for interview settings - Mock interview practice with ISL support and interpreter coordination - Appropriate interview etiquette and follow-up communication<sup>7</sup>.

**UNIT III**

Professional terminology in IT and corporate environments – Interpreting job descriptions, policies, technical briefs, and workplace correspondence – Formal writing of emails, reports, proposals, and official communications – Professional etiquette, collaboration, self-advocacy, negotiation, decision-making, and problem-solving<sup>8</sup>.

**UNIT IV**

Civic and Financial Literacy<sup>7</sup> - Reading and filling bank account opening forms and ATM instructions - Understanding Aadhaar, ration card and other identity-document forms - Reading government scheme notices relevant to persons with disabilities - Vocabulary of civic services (post office, municipal office, RTO)<sup>12</sup>

## UNIT V

Rights and Self-Advocacy - Basic vocabulary related to disability rights - Simple overview of the Rights of Persons with Disabilities (RPWD) Act-6, 2016 in accessible English - Requesting reasonable accommodation in academic and workplace settings - Expressing grievances and seeking assistance appropriately<sup>8</sup>

## UNIT VI

Confident Communication Practice -Simulated real-life situations: Group role-play and peer-assessed communication tasks - presentation demonstrating bilingual (English-ISL) communication<sup>12</sup>.

### Pedagogical method used:

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>12</sup>Self-Directed and Lifelong Learning

### Materials for Study & Reference:

#### Text Books

1. Raman, Meenakshi, and Sangeeta Sharma, "*Technical Communication: Principles and Practice*", 4th ed., Oxford University Press, 2023.
2. National Skill Development Corporation, "*Employability Skills Student Handbook*", 2nd ed., NSDC, 2023.

#### Reference Books

1. Rizvi, M. Ashraf, "*Effective Technical Communication*", 3rd ed., McGraw Hill Education (India), 2024.
2. Ministry of Social Justice and Empowerment, Government of India, "*The Rights of Persons with Disabilities Act, 2016 (Updated Edition)*", Universal Law Publishing, 2023.
3. Indian Sign Language Research and Training Centre (ISLRTC), "*Indian Sign Language Dictionary*", Vols. 1–4, ISLRTC, Department of Empowerment of Persons with Disabilities, Ministry of Social Justice and Empowerment, Government of India, 2024.

### E – Resources:

1. [https://learnenglish.britishcouncil.org/?utm\\_source](https://learnenglish.britishcouncil.org/?utm_source)
2. [https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26\\_hs28](https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26_hs28)
3. National Career Service. *National Career Service Portal*. Ministry of Labour and Employment, <https://www.ncs.gov.in>.

**Course Outcomes:**

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

|            |              |                                                                                                                                                                         |
|------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1</b>    | Prepare and present professional resumes, application letters, emails, and employment-related documents accurately.                                                     |
| <b>CO2</b> | <b>K2 K3</b> | Demonstrate effective interview and workplace communication skills through self-introduction, mock interviews, professional interactions, and collaborative activities. |
| <b>CO3</b> | <b>K4</b>    | Interpret and complete common civic and financial documents, forms, instructions, and government service information.                                                   |
| <b>CO4</b> | <b>K3 K4</b> | Demonstrate awareness of disability rights and entitlements, including key provisions of the RPwD Act, 2016, using accessible communication.                            |
| <b>CO5</b> | <b>K4 K5</b> | Practice self-advocacy by requesting reasonable accommodation, communicating concerns, expressing grievances, and seeking appropriate assistance.                       |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO3</b>                |            |            | ✓          |             |             | ✓           | ✓           |             |
| <b>CO4</b>                |            | ✓          |            |             |             | ✓           | ✓           |             |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-IV Core Course - IV**

**PROGRAMMING IN JAVA**

**Course Code : 26UCA4CC04**

**Credits : 4**

**Max. Marks :100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop a strong foundation in Java programming concepts and object-oriented programming principles, including classes, objects, inheritance, interfaces, and packages.
- To enable students to design and implement structured Java programs using operators, control structures, arrays, strings, and reusable program components.
- To develop competency in exception handling and multithreaded programming for building reliable and efficient Java applications.
- To introduce students to event-driven programming and graphical user interface development using Java AWT, applets, and event-handling mechanisms.

**UNIT I**

Introduction to Java and its relationship with the Internet – Features of Java, bytecode, Java Development Kit (JDK), and development environment – Java character set, tokens, operators, statements, and control structures – Basic Java programming and problem-solving – Arrays, vectors, strings, and string buffers<sup>3</sup>.

**UNIT II**

Classes and objects – Constructors, static blocks, static data members, and static methods – String, StringBuffer, and wrapper classes – Packages and their organization – Interfaces and their implementation – Developing modular and reusable Java programs<sup>4</sup>.

**UNIT III**

Concept and implementation of inheritance in Java – Extending classes and reusability – Abstract and final classes – Interfaces and inheritance – Method overriding and hierarchical relationships – Applying object-oriented principles to Java application development<sup>5</sup>.

**UNIT IV**

Exception handling using try, catch, throw, throws, and finally – Programmer-defined exceptions and error management – Fundamentals of multithreaded programming – Thread class and Runnable interface – Thread synchronization using synchronized methods and statements – Inter-thread communication and deadlock management<sup>6</sup>.

**UNIT V**

Fundamentals and life cycle of Java applets – Developing and executing applets and integrating them with HTML – Introduction to Abstract Window Toolkit (AWT) components and controls – Event-driven programming, event sources, and event listeners – Handling mouse and keyboard events – Adapter classes and basic graphical user interface development<sup>10</sup>.

## UNIT VI

The importance of JAVA programming for software development: discussions<sup>10</sup>.

### Pedagogical method used:

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

<sup>10</sup>Industry-Oriented Learning

### Materials for Study & Reference:

#### Text Books:

1. E. Balagurusamy, "*Programming with JAVA*", 7th Edition, McGraw Hill, 2024.
2. Schildt, Herbert, and Danny Coward. "*Java: The Complete Reference*". 13th ed., McGraw Hill, 2024.

#### References:

1. Cay S. Horstmann, "*Core Java, Volume I: Fundamentals*", 13th Edition, Pearson Education, 2025.

#### E-Resources:

1. <https://www.pdfdrive.net/java-books.html>
2. [https://onlinecourses.nptel.ac.in/e-learning/preview/noc26\\_cs153](https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs153)

#### Course Outcomes:

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

|     |       |                                                                                                                                                                   |
|-----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2 | Explain and apply fundamental Java programming concepts including syntax, data types, operators, control structures, arrays, strings, and Java development tools. |
| CO2 | K1 K3 | Develop object-oriented Java applications using classes, objects, constructors, inheritance, interfaces, packages, and abstraction.                               |
| CO3 | K2 K3 | Implement robust Java programs using exception-handling mechanisms and programmer-defined exceptions.                                                             |
| CO4 | K4 K5 | Develop multithreaded Java programs using threads, synchronization, inter-thread communication, and appropriate deadlock-management techniques.                   |
| CO5 | K6    | Design basic event-driven graphical applications using Java AWT, applets, event listeners, and mouse and keyboard event handling.                                 |

### Mapping with Program Outcomes and Program Specific Outcomes:

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           |     | ✓   | ✓   |      | ✓    | ✓    |      |      |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
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**Bachelor of Computer Applications**  
**Semester-IV Core Practical- IV**  
**PROGRAMMING IN JAVA LAB**

**Course Code : 26UCA4CP04**  
**Credits : 4**

**Max. Marks :100**  
**Internal Marks : 40**  
**External Marks : 60**

**Course Objectives:**

- To develop practical proficiency in Java programming fundamentals, including control structures, recursion, strings, and StringBuffer operations.
- To enable students to apply object-oriented programming concepts, particularly inheritance, in developing Java applications.
- To develop programming skills in multithreading and exception handling for creating robust and efficient Java programs.
- To provide practical exposure to Java Applets and basic graphics programming using graphical components and drawing methods.

**EXERCISES<sup>2,3,4,5,6:</sup>**

1. Write a program for biggest of Three numbers using else...if
2. Write a java program for factorial using recursive function.
3. Write a Java program to check whether a string is a palindrome.
4. Write a program to perform string operations using String Buffer class.
5. Write a java program to prepare a student detail using inheritance.
6. Write a java program to create multiple threads using Thread class
7. Write a Java program to implement the concept of Exception Handling.
8. Write a Java Applet to display the current system time using the Date class.
9. Write a java program to display text on Applet window.
10. Write a Java Applet to draw a smiley face using circles, arcs, and lines.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|     |       |                                                                                                                  |
|-----|-------|------------------------------------------------------------------------------------------------------------------|
| CO1 | K1    | Develop Java programs using conditional statements, recursion, string manipulation, and StringBuffer operations. |
| CO2 | K1 K2 | Apply object-oriented programming concepts, including inheritance, to solve programming problems.                |
| CO3 | K3    | Implement multithreading and exception-handling techniques in Java applications.                                 |
| CO4 | K3 K4 | Develop basic Java Applets for displaying text, system information, and graphical content.                       |
| CO5 | K4 K5 | Create simple graphical applications using Java drawing methods such as circles, arcs, and lines.                |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     |     | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-IV Allied Course - IV**  
**ADVANCED FINANCIAL ACCOUNTING**

**Course Code : 26UCA4AC04A**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop an understanding of budgeting, cash management, cost centres, payroll, and budgetary control using accounting principles and practices.
- To enable students to understand and apply partnership accounting procedures, including admission of partners, revaluation, goodwill, reserves, and capital adjustments.
- To develop practical skills in inventory management, taxation, and financial transactions using Tally ERP 9.
- To equip students with skills in accounting data management, reporting, backup, restoration, import/export, and financial year-end procedures.

**UNIT I**

Budgeting and Cash Budget: Definition, objectives, characteristics, and types – Cash Budget: Meaning, objectives, and advantages – Preparation of Cash Budget – Receipts and Payments Method – Estimation of cash inflows and outflows – Budgetary planning and cash management<sup>1</sup>.

**UNIT II**

Cost Centre and Cost Category: Concepts and applications – Creation and allocation of cost centers – Voucher entries using cost centres – Payroll preparation and employee-related accounting – Budget preparation and budgetary control – Scenario Management and analysis<sup>7</sup>.

**UNIT III**

Partnership Accounts: Introduction and accounting treatment – Adjustments relating to revaluation of assets and liabilities – Treatment of undistributed profit or loss and accumulated reserves – Treatment and valuation of goodwill – Preparation of Revaluation Account and Partners' Capital Accounts – Preparation of Balance Sheet after admission of a partner<sup>9</sup>.

**UNIT IV**

Inventory Management and Taxation: Stock Groups, Stock Categories, Godowns/Locations, Units of Measure, and Stock Items – Inventory Vouchers and inventory transactions – Voucher entry and inventory management using Tally ERP 9 – Introduction to TDS, VAT, CST, and GST – Point of Sale (PoS) transactions and billing<sup>10,11</sup>.

## UNIT V

Data Management and Financial Reporting: Data Backup and Restore – Creating and restoring company data backups – Importing and exporting data between companies using XML and other supported formats – E-mailing and printing financial reports – Data security and management – Financial year-end procedures and maintenance of accounting records<sup>12</sup>.

## UNIT VI

Application of Financial Accounting Package – Tally Prime Advanced in our day-to-life: discussions<sup>12</sup>.

### Pedagogical Method Used:

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>10</sup>Industry-Oriented Learning
- <sup>11</sup>Continuous Assessment and Feedback
- <sup>12</sup>Self-Directed and Lifelong Learning

### Materials for Study & Reference:

#### Text Books:

1. Lal, Jawahar and Seema Srivastava, “*Financial Accounting*”, Himalaya Publishing House.2019
2. Monga, J.R., “*Financial Accounting: Concepts and Applications*”, Mayoor Paper Backs, New Delhi.2018
3. Shukla, M.C., T.S. Grewal and S.C. Gupta. “*Advanced Accounts. Vol.-I*”. S. Chand & Co., New Delhi.2020.

#### References:

1. S. N. Maheshwari, “*Financial Accounting*”, Vikas Publication, New Delhi. 2020
2. T.S, Grewal, “*Introduction to Accounting*”, S. Chand and Co., New Delhi 2020

#### E-Resource:

1. [https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26\\_mg178](https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg178)
2. [https://www.gst.gov.in/?utm\\_source](https://www.gst.gov.in/?utm_source)
3. [https://tallyeducation.com/tepl/?utm\\_source](https://tallyeducation.com/tepl/?utm_source)

**Course Outcomes:**

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

|            |              |                                                                                                                                                                                   |
|------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Prepare and analyse cash budgets and apply cost centre, payroll, and budgetary control techniques.                                                                                |
| <b>CO2</b> | <b>K1 K3</b> | Apply accounting procedures for admission of a partner, including revaluation, goodwill, reserves, capital accounts, and balance sheet preparation.                               |
| <b>CO3</b> | <b>K2 K3</b> | Manage inventory transactions using stock groups, categories, godowns, units, stock items, and inventory vouchers in Tally ERP 9.                                                 |
| <b>CO4</b> | <b>K4 K5</b> | Process basic taxation and Point of Sale transactions, including TDS, VAT, CST, GST, and PoS-related entries.                                                                     |
| <b>CO5</b> | <b>K5</b>    | Perform accounting data management and reporting activities, including backup, restoration, import/export, e-mailing, printing, and financial year-end procedures in Tally ERP 9. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO3</b>                |            | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO4</b>                |            |            | ✓          |             |             | ✓           | ✓           |             |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-IV Allied Practical - IV**

**ADVANCED ACCOUNTING PACKAGE LAB**

**Course Code : 26UCA4AP04A**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To develop practical proficiency in Tally-based accounting, including creation of accounting groups, ledgers, vouchers, and final accounts.
- To enable students to apply cost centre, cost category, budgeting, variance analysis, and payroll accounting techniques.
- To develop skills in inventory and order management, including stock items, inventory vouchers, and related accounting transactions.
- To provide practical exposure to taxation, accounting reports, and financial record management using Tally.

**EXERCISES <sup>2,3,4,5,6</sup>:**

1. Creation, alteration and deletion of primary and secondary accounting groups.
2. Final A/Cs with adjustments (Creation and deletion of ledgers)
3. Voucher entry problems in single, double entry mode
4. Voucher entries using cost centre, Cost Category
5. Budget preparation and reporting variance
6. Payroll preparation
7. Accounting vouchers using stock items
8. Order processing and inventory vouchers
9. Generation of accounting books and reports.
10. TDS, VAT, CST, and Excise GST.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|            |           |                                                                                                                                   |
|------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1</b> | Create and manage accounting groups, ledgers, vouchers, and final accounts using Tally.                                           |
| <b>CO2</b> | <b>K3</b> | Record and analyse accounting transactions using cost centres, cost categories, budgets, and variance reports.                    |
| <b>CO3</b> | <b>K2</b> | Prepare payroll records and manage inventory transactions, including stock items, orders, and inventory vouchers.                 |
| <b>CO4</b> | <b>K4</b> | Generate accounting books and financial reports accurately using Tally.                                                           |
| <b>CO5</b> | <b>K5</b> | Process basic statutory tax transactions relating to TDS, GST, VAT, CST, and applicable indirect taxes using accounting software. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO3</b>                |            | ✓          | ✓          |             | ✓           | ✓           |             |             |
| <b>CO4</b>                |            |            | ✓          |             |             | ✓           | ✓           |             |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-IV Skill Enhancement Course - III**  
**WEB DEVELOPMENT LAB**

**Course Code : 26UCA4SEC03**

**Credits : 2**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To develop fundamental skills in HTML-based web page design, including text formatting, lists, tables, forms, multimedia, and embedded content.
- To enable students to design structured and user-friendly websites using hyperlinks, navigation, frames/iframes, and multimedia elements.
- To develop practical programming skills using JavaScript for interactive and dynamic web applications.
- To introduce students to database connectivity and basic web-based authentication through the development of a login interface.

**EXERCISES <sup>2,3,4,5,6</sup>:**

1. A Program to illustrate Simple Tags, Ordered List and Unordered List tags.
2. Design a simple webpage (To illustrate Embedded Multimedia).
3. Design a Exam Time Table using Table tag.
4. Develop a HTML application form for admission to under graduate programme.
5. Create an Online Newspaper (Single Page).
6. Create and Show the Bio-Data for 3 Students based on their names using iframes.
7. Create 4 pages website about the Family Members.
8. Create a calculator using HTML and JavaScript (add, subtract, multiply, divide).
9. Display current date and time on a webpage dynamically.
10. Design a Login page using Database.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|            |           |                                                                                                                                             |
|------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1</b> | Develop and format HTML Webpages using text elements, lists, tables, forms, multimedia, and embedded content.                               |
| <b>CO2</b> | <b>K2</b> | Design multi-page and interactive websites with appropriate navigation, hyperlinks, iframes, and structured content.                        |
| <b>CO3</b> | <b>K4</b> | Develop basic client-side applications using JavaScript, including calculators and dynamic date and time displays.                          |
| <b>CO4</b> | <b>K3</b> | Create functional web forms and user interfaces for applications such as admission forms, student profiles, and online information portals. |
| <b>CO5</b> | <b>K5</b> | Design basic database-connected web applications incorporating login functionality and user authentication concepts.                        |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO3</b>                |            |            | ✓          |             |             | ✓           | ✓           |             |
| <b>CO4</b>                |            | ✓          | ✓          |             |             | ✓           | ✓           |             |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-V Core Course - V**  
**OPERATING SYSTEMS**

**Course Code : 26UCA5CC05**

**Credits : 4**

**Max. Marks :100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To develop a comprehensive understanding of Operating System concepts, structures, services, system calls, and virtualization.
- To enable students to understand and apply process, thread, CPU scheduling, and inter-process communication concepts.
- To develop knowledge of process synchronization, semaphores, monitors, and deadlock prevention, avoidance, detection, and recovery.
- To provide a strong foundation in memory management, virtual memory, file management, disk scheduling, and cloud-based operating systems.

**UNIT I**

Introduction to Operating Systems – Definition, objectives, functions, and types of operating systems – Operating System structures and operations – System services and system calls – Types of system calls – Operating System design and implementation – Virtual machines and virtualization concepts<sup>1</sup>.

**UNIT II**

Process concepts and process states – Process creation, termination, and operations – Process scheduling and scheduling criteria – CPU scheduling algorithms – Thread concepts and thread scheduling – Multicore and multiprocessor scheduling – Inter-Process Communication (IPC)<sup>3,5</sup>.

**UNIT III**

Process synchronization and the critical-section problem – Synchronization mechanisms using semaphores and monitors – Introduction to deadlocks and necessary conditions – Deadlock prevention and avoidance – Deadlock detection and recovery – Practical approaches to synchronization and deadlock management<sup>3,4</sup>.

**UNIT IV**

Memory organization and management – Memory hierarchy and memory-management strategies – Contiguous and non-contiguous memory allocation – Single-user and partitioned memory allocation – Fixed and variable partition multiprogramming – Memory swapping and memory allocation techniques<sup>6</sup>.

**UNIT V**

Virtual memory concepts – Paging and segmentation – Demand paging and page-replacement strategies – File management and disk scheduling<sup>1</sup> – Virtual memory in cloud and virtualized environments – Cloud Operating Systems: resource pooling, elasticity, virtualization, and multi-tenancy<sup>6</sup>.

**UNIT VI**

Discuss the importance of Operating Systems: Seminar & Discussion<sup>8</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>3</sup>Laboratory-Based Learning
- <sup>4</sup>Problem-Based Learning
- <sup>5</sup>Project-Based Learning
- <sup>6</sup>Experiential and Activity-Based Learning
- <sup>8</sup>Technology-Enabled Learning

**Materials for Study & Reference:****Textbooks:**

1. Stallings, William., “*Operating Systems: Internals and Design Principles*”, 10th ed., Pearson, 2023.

**Reference Books:**

1. Tanenbaum, Andrew S., and Herbert Bos., “*Modern Operating Systems*”, 5th ed., Pearson, 2022.
2. Silberschatz, Abraham, and Peter B. Galvin., “*Operating System Concepts*”, 9th ed., John Wiley & Sons, 2018.

**E-Resource:**

1. [https://www.tutorialspoint.com/operating\\_system/index.htm](https://www.tutorialspoint.com/operating_system/index.htm)
2. <http://geeksforgeeks.org/operating-systems/operating-systems/>
3. <https://nptel.ac.in/courses/106106144>

**Course Outcomes:**

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

|     |       |                                                                                                                                                                  |
|-----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2 | Explain the fundamental concepts and functions of operating systems, including system structures, services, system calls, and virtualization.                    |
| CO2 | K2 K4 | Analyse process and thread management techniques, including scheduling algorithms, multiprocessor scheduling, and inter-process communication.                   |
| CO3 | K3 K4 | Apply synchronization and deadlock-management techniques to analyse and solve process coordination problems.                                                     |
| CO4 | K1 K4 | Analyse memory-management techniques, including memory allocation, swapping, paging, segmentation, demand paging, and page replacement.                          |
| CO5 | K2 K4 | Explain and evaluate file, disk, virtual-memory, and cloud operating system concepts, including virtualization, resource pooling, elasticity, and multi-tenancy. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     | ✓   |     |      | ✓    | ✓    |      |      |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    | ✓    |
| CO5           |     | ✓   | ✓   |      | ✓    | ✓    |      | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester - V Core Course - VI**  
**RDBMS**

**Course Code : 26UCA5CC06**  
**Credits : 4**

**Max. Marks :100**  
**Internal Marks : 30**  
**External Marks : 70**

**Course Objectives:**

- To develop a strong foundation in relational database concepts, data models, keys, relationships, and integrity constraints.
- To enable students to design and manage relational databases using SQL, normalization, constraints, views, and database programming techniques.
- To develop practical knowledge of transactions, concurrency control, database security, backup, and recovery mechanisms.
- To familiarize students with RDBMS applications, database connectivity, performance considerations, and contemporary database technologies.

**UNIT I**

Introduction to RDBMS – Characteristics and advantages of relational databases – Database concepts, tables, rows, columns, domains, and relationships – Schema, instances, and database architecture – Relational database terminology – Primary keys, foreign keys, candidate keys, and constraints<sup>1</sup>.

**UNIT II**

Relational data model and integrity constraints – Entity-Relationship (ER) concepts and ER diagrams – Mapping ER models to relational schemas – Relationships and cardinality – Functional dependencies – Database schema refinement – Normalization: 1NF, 2NF, 3NF, and BCNF<sup>3,4</sup>.

**UNIT III**

Introduction to SQL – Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL), and Transaction Control Language (TCL) – Creating and modifying tables – SQL queries using SELECT, WHERE, ORDER BY, GROUP BY, and HAVING – Joins, subqueries, aggregate functions, and views<sup>5</sup>.

**UNIT IV**

Advanced SQL concepts – Nested queries and complex joins – Views, indexes, sequences, and constraints – Stored procedures, functions, and triggers – Introduction to database connectivity – Transaction processing and ACID properties – Concurrency control and basic transaction management<sup>6</sup>.

**UNIT V**

Database security and user authorization – Access control and privileges – Backup and recovery techniques – Transaction failure and crash recovery – Introduction to database administration and performance considerations – RDBMS applications in banking, e-commerce, education, healthcare, and enterprise systems – Emerging trends in relational database technology<sup>5</sup>.

**UNIT VI**

Contemporary Developments related to the Course during the Semester concerned<sup>8</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>3</sup>Laboratory-Based Learning
- <sup>4</sup>Problem-Based Learning
- <sup>5</sup>Project-Based Learning
- <sup>6</sup>Experiential and Activity-Based Learning
- <sup>8</sup>Technology-Enabled Learning

**Materials for Study & Reference:****Text Books:**

1. Silberschatz, Abraham, Henry F. Korth, and S. Sudarshan., “*Database System Concepts*”, 7th ed., McGraw-Hill Education, 2020.
2. Hoffer, Jeffrey A., V. Ramesh, and Heikki Topi., “*Modern Database Management*”, 14th ed., Pearson, 2025.

**Reference Books:**

1. Sumathi, S., and S. Esakkirajan., “*Fundamentals of Relational Database Management Systems*”, Springer, 2007.
2. Bharathidasan, G., A. S. Arunachalam, and J. Ramya., “*RDBMS—Relational Database Management System*”, Sudarmani, 2025.

**E-Resources:**

1. <https://nptel.ac.in/courses/106106095>
2. <https://www.geeksforgeeks.org/dbms/dbms/>
3. <https://academy.oracle.com/en/solutions-curriculum-database.html/>

**Course Outcomes:**

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

|            |              |                                                                                                                                                              |
|------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Explain and apply relational database concepts, including schemas, relations, keys, relationships, and integrity constraints.                                |
| <b>CO2</b> | <b>K1 K3</b> | Design normalized relational databases using ER concepts, functional dependencies, and appropriate normalization techniques.                                 |
| <b>CO3</b> | <b>K2 K3</b> | Develop and execute SQL-based database applications using queries, joins, subqueries, views, constraints, procedures, functions, and triggers.               |
| <b>CO4</b> | <b>K2 K4</b> | Apply transaction management, concurrency control, security, backup, and recovery techniques to maintain database reliability and integrity.                 |
| <b>CO5</b> | <b>K4 K5</b> | Analyse and utilize RDBMS technologies for practical applications such as enterprise systems, e-commerce, banking, education, and other information systems. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| <b>CO1</b>    | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| <b>CO2</b>    | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| <b>CO3</b>    |     |     | ✓   |      |      | ✓    | ✓    |      |
| <b>CO4</b>    |     | ✓   | ✓   |      |      |      | ✓    | ✓    |
| <b>CO5</b>    |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester - V Core Course - VII**  
**INTERNET OF THINGS (IoT)**

**Course Code : 26UCA5CC07**  
**Credits : 4**

**Max. Marks :100**  
**Internal Marks : 30**  
**External Marks : 70**

**Course Objectives:**

- To develop a fundamental understanding of IoT concepts, architectures, components, devices, and communication technologies relevant to BCA applications.
- To enable students to apply programming and networking concepts for sensor, actuator, and IoT device integration using platforms such as Arduino, Raspberry Pi, and ESP32.
- To develop knowledge of IoT data collection, cloud integration, data processing, and security mechanisms for connected systems.
- To familiarize students with real-world IoT applications, emerging technologies, challenges, and ethical considerations in computing environments.

**UNIT I**

Introduction to Internet of Things – Definition, evolution, characteristics, objectives, and significance of IoT – IoT ecosystem and components – Sensors, actuators, devices, gateways, and cloud platforms – IoT architecture and communication layers – IoT applications and use cases<sup>1</sup>.

**UNIT II**

Fundamentals of computer networks and Internet technologies – IP addressing and network connectivity – Wireless communication technologies: Wi-Fi, Bluetooth, Zigbee, RFID, and NFC – Mobile networks and 4G/5G technologies – IoT communication models and protocols – Introduction to MQTT, CoAP, and HTTP for IoT applications<sup>3,4</sup>.

**UNIT III**

Introduction to IoT programming and embedded computing – Sensors: temperature, light, humidity, motion, and proximity – Actuators: motors, LEDs, buzzers, and relays – Introduction to Arduino, Raspberry Pi, and ESP32 – Sensor and actuator interfacing – Data acquisition and basic IoT application development<sup>5</sup>.

**UNIT IV**

IoT data generation, collection, transmission, and processing – Introduction to cloud computing and IoT–cloud integration – Cloud-based data storage and processing – IoT security challenges and vulnerabilities – Authentication, authorization, encryption, privacy, and secure communication – Basic principles of IoT data protection and cybersecurity<sup>6</sup>.

**UNIT V**

IoT applications in smart homes, smart cities, agriculture, healthcare, education, transportation, and industrial environments – Industrial IoT and smart energy systems – Environmental monitoring and wearable technologies – IoT-based automation and real-time monitoring – Emerging IoT technologies, challenges, ethical considerations, and future trends<sup>8</sup>.

**UNIT VI**

Contemporary Developments Related to the Course during the Semester Concerned.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>3</sup>Laboratory-Based Learning
- <sup>4</sup>Problem-Based Learning
- <sup>5</sup>Project-Based Learning
- <sup>6</sup>Experiential and Activity-Based Learning
- <sup>8</sup>Technology-Enabled Learning

**Materials for Study & Reference:****Text Books:**

1. Arshdeep Bahga, Vijay Madisetti, “*Internet of Things: A Hands-on Approach*”, Universities Press, 2020.
2. Raj Kamal, “*Internet of Things: Architecture and Design Principles*”, McGraw Hill Education, 2022.

**Reference Books:**

1. Samuel Greengard, “*The Internet of Things*”, MIT Press, 2021.
2. Pethuru Raj, Anupama C. Raman, Harihara Subramanian, “*The Internet of Things*”, CRC Press, 2020.
3. Ovidiu Vermesan, Peter Friess, “*Internet of Things*”, River Publishers, 2020.

**E-Resources:**

1. <https://www.ibm.com/topics/internet-of-things>
2. <https://www.oracle.com/internet-of-things/>

**Course Outcomes:**

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

|            |              |                                                                                                                                                           |
|------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Explain the architecture, components, and working principles of IoT systems and identify suitable IoT technologies for different applications.            |
| <b>CO2</b> | <b>K1 K3</b> | Apply networking and communication protocols such as Wi-Fi, Bluetooth, Zigbee, HTTP, MQTT, and CoAP in IoT environments.                                  |
| <b>CO3</b> | <b>K2 K3</b> | Develop basic IoT applications by programming and interfacing sensors, actuators, and platforms such as Arduino, Raspberry Pi, and ESP32.                 |
| <b>CO4</b> | <b>K2 K4</b> | Apply cloud computing, data processing, and security techniques for managing and protecting IoT data and connected devices.                               |
| <b>CO5</b> | <b>K3 K4</b> | Analyse and propose IoT solutions for applications such as smart homes, healthcare, agriculture, smart cities, transportation, and industrial automation. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| <b>CO1</b>    | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| <b>CO2</b>    | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| <b>CO3</b>    | ✓   |     |     | ✓    |      | ✓    |      |      |
| <b>CO4</b>    |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| <b>CO5</b>    |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-V Core Practical - V**  
**RDBMS LAB**

**Course Code : 26UCA5CP05**  
**Credits : 4**

**Max. Marks :100**  
**Internal Marks : 40**  
**External Marks : 60**

**Course Objectives:**

- To develop practical proficiency in relational database concepts and SQL commands for creating, manipulating, and retrieving data.
- To enable students to perform database queries using conditions, joins, aggregate functions, subqueries, set operators, and built-in functions.
- To develop skills in implementing views, transactions, constraints, stored procedures, functions, and triggers using an RDBMS.
- To provide hands-on experience in database design, data management, security, and transaction processing through practical exercises.

**EXERCISE <sup>2,3,4,5,6</sup>:**

1. Create a STUDENT table with suitable fields and perform INSERT, UPDATE, DELETE, and SELECT operations.
2. Retrieve student records using WHERE, ORDER BY, COUNT(), and AVG() functions.
3. Create EMPLOYEE and DEPARTMENT tables with a primary key and foreign key, and display related records using a simple JOIN.
4. Use GROUP BY, MAX(), MIN(), SUM(), and AVG() to analyse employee salary and departmental data.
5. Create a table using PRIMARY KEY, UNIQUE, and NOT NULL constraints and use a simple subquery to identify the highest-paid employee.
6. Demonstrate UNION and UNION ALL and use basic date and string functions such as CURRENT\_DATE, UPPER(), and LENGTH().
7. Create a simple VIEW from a table, retrieve records through the view, and perform basic modifications where permitted.
8. Demonstrate COMMIT, ROLLBACK, and SAVEPOINT operations using simple database transactions.
9. Develop and execute a simple stored procedure and a user-defined function for performing database operations.
10. Develop a simple trigger to automatically validate, update, or record changes to data in a database table.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

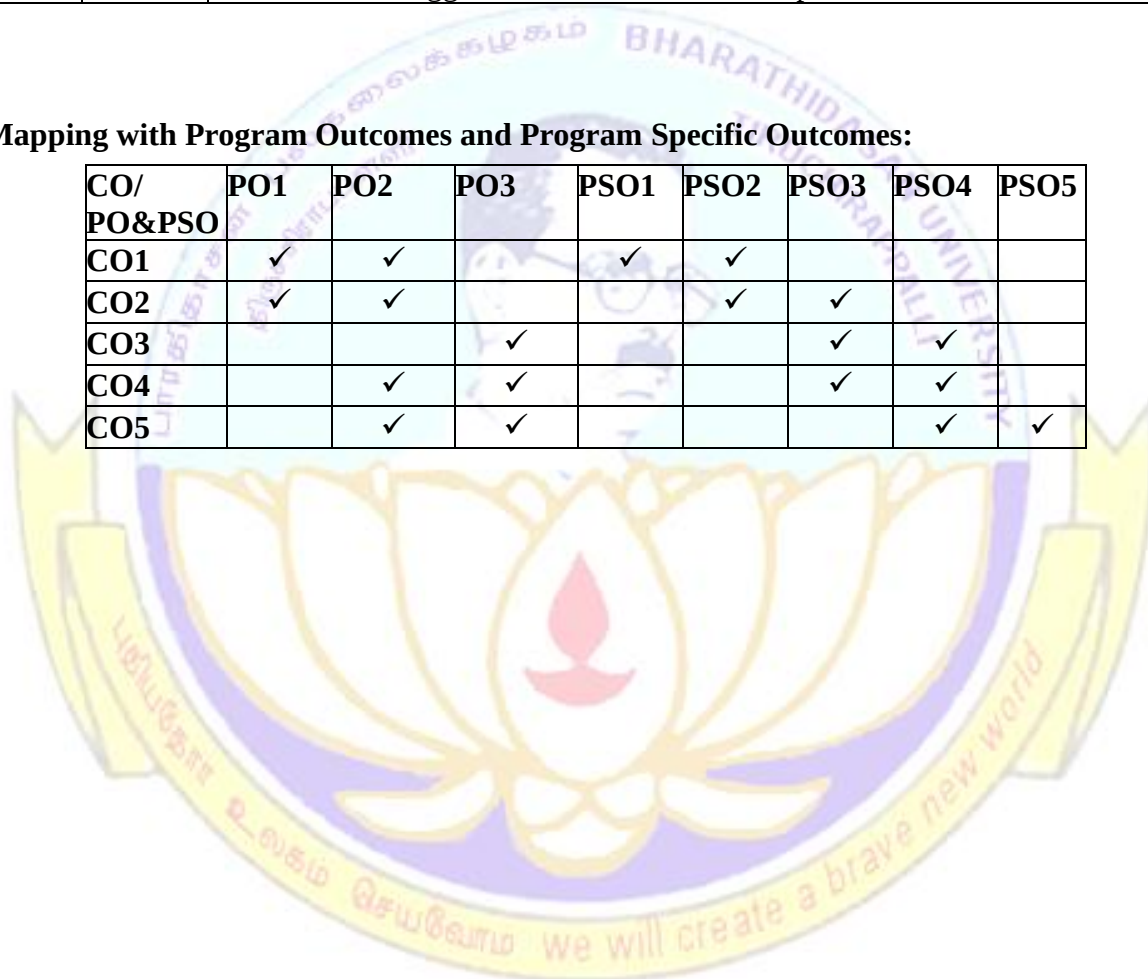
**Course Outcomes:**

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

|            |              |                                                                                                                                   |
|------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Create and manage relational database tables using appropriate fields, keys, constraints, and basic CRUD operations.              |
| <b>CO2</b> | <b>K3</b>    | Develop SQL queries using filtering, sorting, joins, aggregate functions, subqueries, set operators, and built-in functions.      |
| <b>CO3</b> | <b>K4</b>    | Create and manipulate database views for simplified and controlled access to database information.                                |
| <b>CO4</b> | <b>K4</b>    | Apply transaction and database security mechanisms using COMMIT, ROLLBACK, SAVEPOINT, GRANT, and REVOKE commands.                 |
| <b>CO5</b> | <b>K5</b>    | Develop basic database programming components such as stored procedures, functions, and triggers to automate database operations. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO3</b>                |            |            | ✓          |             |             | ✓           | ✓           |             |
| <b>CO4</b>                |            | ✓          | ✓          |             |             | ✓           | ✓           |             |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-V Core Practical - VI**  
**INTERNET OF THINGS LAB**

**Course Code : 26UCA5CP06**  
**Credits : 4**

**Max. Marks :100**  
**Internal Marks : 40**  
**External Marks : 60**

**Course Objectives:**

- To develop practical knowledge of IoT hardware components, Arduino programming, sensors, and actuators.
- To enable students to interface and program sensors and output devices such as LEDs, buzzers, motors, LDR, IR, ultrasonic, and soil-moisture sensors.
- To develop skills in building basic sensor-based IoT applications for automation, monitoring, and control.
- To provide hands-on experience in Bluetooth-based wireless communication and smartphone-controlled IoT applications.

**EXERCISE <sup>2,3,4,5,6,10</sup>:**

1. Identify the Arduino board, breadboard, sensors, actuators, and basic IoT components and study their functions.
2. Interface LED / Buzzer with Arduino and write a program to turn ON LED for 1 second after every 2 seconds.
3. Interface Digital Sensor (LDR) with Arduino and write a program to turn ON LED when at sensor detection.
4. Interfacing RGB LED (Traffic Signal) with Arduino.
5. Interface a Bluetooth Module with Arduino and write a program to turn an LED ON and OFF using a smartphone.
6. Interface a Soil Moisture Sensor with Arduino and write a program to measure and display the soil moisture level.
7. Indicate the water level and turn ON / OFF the motor using probes and DC Motor.
8. Interface Servo Motor and IR Sensor with Arduino and write a program to open and close the door.
9. Display the distance of the object using Ultrasonic sensor and Arduino.
10. Switch Light ON and OFF based on the input of user using Bluetooth.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

<sup>10</sup>Industry-Oriented Learning

**Course Outcomes:**

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

|            |              |                                                                                                                                                    |
|------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Identify and explain the functions of basic IoT components and Arduino-based development platforms.                                                |
| <b>CO2</b> | <b>K3</b>    | Interface and program sensors and actuators including LEDs, buzzers, LDR, RGB LED, motors, and servo motors using Arduino.                         |
| <b>CO3</b> | <b>K3 K4</b> | Develop basic IoT applications for environmental sensing, soil-moisture monitoring, water-level control, and object-distance measurement.          |
| <b>CO4</b> | <b>K5</b>    | Implement wireless communication between Arduino and smartphones using Bluetooth modules.                                                          |
| <b>CO5</b> | <b>K5 K6</b> | Design and demonstrate simple IoT automation systems for applications such as smart lighting, automatic doors, traffic signals, and motor control. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-V Non Major Elective - II**  
**INTRODUCTION TO DISASTER MANAGEMENT**

**Course Code : 26UCA5NME02**  
**Credits : 2**

**Max. Marks :100**  
**Internal Marks : 30**  
**External Marks : 70**

**Course Objectives:**

- To understand the concepts, types, objectives, and management cycle of disasters.
- To explain the causes, effects, and safety measures of natural and man-made disasters.
- To apply disaster preparedness, emergency planning, first aid, evacuation, and rescue procedures.
- To analyze disaster risk reduction strategies and the roles of government, NGOs, and communities.

**UNIT I**

Introduction to Disaster Management – Definition, Concepts and Objectives<sup>1</sup> – Types of Disasters: Natural and Man-made Disasters – Hazard, Vulnerability, Risk and Capacity – Disaster Management Cycle: Prevention, Mitigation, Preparedness, Response, Recovery and Rehabilitation.

**UNIT II**

Natural Disasters–Earthquakes<sup>7</sup> – Floods – Cyclones – Drought – Landslides – Tsunami – Causes, Effects and Safety Measures.

**UNIT III**

Man-made Disasters - Industrial Accidents – Fire Accidents – Chemical and Nuclear Hazards – Road, Rail and Air Accidents – Environmental Pollution – Disaster Prevention and Safety Measures<sup>7</sup>.

**UNIT IV**

Disaster Preparedness and Response - Disaster Preparedness – Early Warning Systems – Emergency Planning – First Aid<sup>8</sup> – Evacuation Procedures – Search and Rescue Operations – Community Participation.

**UNIT V**

Disaster Risk Reduction – Mitigation Measures – Role of Government and Non-Governmental Organizations (NGOs) – National Disaster Management Authority (NDMA) – State Disaster Management Authority (SDMA) – Community-Based Disaster Management<sup>9</sup>.

**UNIT VI**

Preparation of Disaster Management Plan – Mock Drill – First Aid Demonstration<sup>12</sup> – Fire Safety Demonstration – Disaster Awareness Campaign – Case Study and Report Preparation.

**Pedagogical Method used:**

<sup>1</sup>Interactive Lectures

<sup>7</sup>Collaborative Learning

<sup>8</sup>Technology-Enabled Learning

<sup>9</sup>Inclusive and Accessible Learning

<sup>12</sup>Self-Directed and Lifelong Learning

## Materials for Study & Reference:

### Text Books:

1. Rajib Shaw & Yukiko Takeuchi., “Disaster Risk Reduction Approaches in India”, Springer Nature, 2023.
2. National Institute of Disaster Management (NIDM)., “Introduction to Disaster Risk Reduction”, 2022.
3. Ministry of Home Affairs, Government of India., “National Disaster Management Guidelines”, Updated Edition, 2023.

### Reference Books:

1. R. B. Singh., “Disaster Management: Global Challenges and Local Solutions”, Springer, 2021.
2. Satish Modh., “Disaster Management”, Macmillan Education India, Revised Edition, 2022.
3. National Disaster Management Authority (NDMA)., “Guidelines on Disaster Management”, Updated Edition, 2024.
4. World Health Organization (WHO)., “Health Emergency and Disaster Risk Management Handbook”, 2021.

### E-Resource:

1. [https://onlinecourses.swayam2.ac.in/e-learning/preview/cec26\\_hs107](https://onlinecourses.swayam2.ac.in/e-learning/preview/cec26_hs107)
2. [https://ndma.gov.in/?utm\\_source](https://ndma.gov.in/?utm_source)

### Course Outcomes:

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

|     |    |                                                                                                            |
|-----|----|------------------------------------------------------------------------------------------------------------|
| CO1 | K1 | Explain the basic concepts, types, risks, vulnerabilities, and management cycle of disasters.              |
| CO2 | K2 | Identify the causes, effects, and safety measures related to natural disasters.                            |
| CO3 | K3 | Describe major man-made disasters and appropriate prevention and safety measures.                          |
| CO4 | K4 | Demonstrate basic disaster preparedness, emergency response, first aid, evacuation, and rescue procedures. |
| CO5 | K3 | Analyze disaster risk reduction measures and the roles of government, NGOs, and communities.               |

### Mapping with Program Outcomes and Program Specific Outcomes:

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-V Skill Enhancement Course - IV**  
**ANIMATION LAB**

**Course Code : 26UCA5SEC04**  
**Credits : 2**

**Max. Marks :100**  
**Internal Marks : 40**  
**External Marks : 60**

**Course Objectives:**

- To develop practical skills in creating 2D animations using frame-by-frame, motion tween, and shape tween techniques.
- To enable students to apply text animation, object transformation, motion guides, and transition effects in animation projects.
- To develop competency in designing interactive and visually engaging animations using buttons, timelines, and basic interactivity.
- To provide practical experience in creating multimedia applications such as greeting cards, traffic signals, interactive quizzes, and object-based animations.

**EXERCISE <sup>2,3,4,5,6,12</sup>:**

1. Frame-by-Frame Animation – Create a simple animation using sequential frames.
2. Motion Tween Animation – Animate an object moving smoothly across the stage using motion Tweening.
3. Shape Tween Animation – Transform one shape or text object into another using shape Tweening.
4. Text Animation Effects – Create character-by-character text animation using different directions and effects.
5. Bouncing Ball Animation – Develop a bouncing ball animation using a motion guide and appropriate timing.
6. Object Transformation Animation – Animate an object using scaling, rotation, and colour transformation effects.
7. Animated Greeting Card – Design an animated greeting card incorporating text, images, decorative elements, and transition effects.
8. Interactive Car Movement – Develop an animation to control a car using interactive buttons.
9. Animated Traffic Signal – Design a traffic signal that automatically changes from Red → Yellow → Green.
10. Interactive Quiz Animation – Develop a simple animated quiz interface with buttons for selecting answers and displaying feedback.

**Pedagogical method used:**

- <sup>2</sup>Demonstration and Guided Practice
- <sup>3</sup>Laboratory-Based Learning
- <sup>4</sup>Problem-Based Learning
- <sup>5</sup>Project-Based Learning
- <sup>6</sup>Experiential and Activity-Based Learning
- <sup>12</sup>Self-Directed and Lifelong Learning

**Course Outcomes:**

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

|     |       |                                                                                                                                                           |
|-----|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2 | Create basic animations using frame-by-frame, motion tween, and shape tween techniques.                                                                   |
| CO2 | K 2K4 | Apply text effects, transformations, color changes, scaling, rotation, and motion guides to animated objects.                                             |
| CO3 | K3 K5 | Design visually appealing multimedia animations incorporating text, images, graphics, and transitions.                                                    |
| CO4 | K3 K4 | Develop basic interactive animations using buttons and user-controlled objects.                                                                           |
| CO5 | K5    | Create and present functional animation projects such as traffic signals, greeting cards, and interactive quizzes using appropriate animation techniques. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     |     | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-V**  
**INTERNSHIP / INDUSTRIAL TRAINING**

**Course Code : 26UCA5I / 26UCA5IT**  
**Credits : 2**

**Max. Marks : 100**  
**Internal Marks : 20**  
**External Marks : 80**

**Course Objectives:**

- To understand the practical working environment of Computer Applications and Information Technology organizations.
- To apply academic knowledge and technical skills in real-world organizational settings.
- To develop professional skills through participation in organizational activities and assigned tasks.
- To develop skills in observation, documentation, case study preparation, and presentation.

**Case Study Report:**

Students will be deputed to organizations working in the areas of Computer Applications and Information Technology for a period of 30 hours. At the end of the internship, students will present an institutional and individual case study based on their internship experience.

**Course Outcomes:**

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

|            |              |                                                                                                            |
|------------|--------------|------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K2 K3</b> | Describe the organizational structure, activities, and work processes of IT-related organizations.         |
| <b>CO2</b> | <b>K1 K2</b> | Apply relevant technical and professional skills in a real-world work environment.                         |
| <b>CO3</b> | <b>K4</b>    | Demonstrate professional communication, teamwork, and workplace practices.                                 |
| <b>CO4</b> | <b>K3</b>    | Analyze organizational practices and individual work experiences through case studies.                     |
| <b>CO5</b> | <b>K4</b>    | Present and document internship experiences effectively through institutional and individual case studies. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          |            | ✓          | ✓           | ✓           | ✓           |             |             |
| <b>CO2</b>                |            | ✓          | ✓          | ✓           | ✓           | ✓           |             |             |
| <b>CO3</b>                | ✓          | ✓          |            |             |             | ✓           | ✓           |             |
| <b>CO4</b>                |            |            | ✓          |             |             | ✓           | ✓           | ✓           |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-VI Core Course - VIII**  
**COMPUTER NETWORKS**

**Course Code : 26UCA6CC08**  
**Credits : 4**

**Max. Marks : 100**  
**Internal Marks : 30**  
**External Marks : 70**

**Course Objectives:**

- To develop a strong foundation in data communication and computer networking concepts, including network architectures, topologies, standards, and protocols.
- To enable students to understand and analyse the functions of the OSI and TCP/IP models and the principles of data transmission across network layers.
- To develop knowledge of network devices, switching techniques, routing algorithms, transport-layer services, and communication protocols.
- To introduce the fundamental concepts of network security and cryptography for secure and reliable data communication.

**UNIT I**

Fundamentals of data communication – Components, standards, standardization organizations, network classification, and network topologies. OSI Reference Model – Functions of its layers – TCP/IP protocol suite, architecture, and comparison with the OSI model<sup>1</sup>.

**UNIT II**

Physical Layer functions and services – Analog and digital data/signals – Signal characteristics, encoding, and transmission techniques. Guided media: twisted-pair, coaxial, and optical fiber – Unguided media: radio waves, microwaves, and infrared transmission<sup>3,4</sup>.

**UNIT III**

Data Link Layer functions and services – Framing – Error detection and correction – Block coding – Flow and error control mechanisms. HDLC and Point-to-Point Protocol (PPP) – Fundamentals of Bluetooth technology, communication, and applications<sup>5</sup>.

**UNIT IV**

Network Layer functions and services – Circuit, packet, and message switching – Networking and internetworking devices. Repeaters, bridges, routers, and gateways – Routing algorithms – Distance Vector and Link State routing protocols<sup>6</sup>.

**UNIT V**

Transport Layer services – Process addressing – Connection establishment, management, and termination – Simple Transport Protocol. Internet transport protocols: TCP and UDP – Fundamentals of network security – Cryptography, encryption, decryption, and basic security mechanisms<sup>8</sup>.

**UNIT VI**

The importance of Computer Network: seminar – discussions<sup>8</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>3</sup>Laboratory-Based Learning
- <sup>4</sup>Problem-Based Learning
- <sup>5</sup>Project-Based Learning
- <sup>6</sup>Experiential and Activity-Based Learning
- <sup>8</sup>Technology-Enabled Learning

**Materials for Study & Reference:****Text Books:**

1. Behrouz A. Forouzan, “*Data Communications and Networking (6th Edition)*”, McGraw-Hill Education, 2024.
2. Andrew S. Tanenbaum and Nick Feamster, “*Computer Networks (6th Edition)*”, Pearson, 2021.

**Reference Book:**

1. William Stallings, “*Data and Computer Communications (12th Edition)*”, Pearson, 2023.
2. James F. Kurose & Keith W. Ross, “*Computer Networking: A Top-Down Approach (9th Edition)*”, Pearson, 2024.

**E-Resources:**

1. [https://onlinecourses.nptel.ac.in/e-learning/preview/noc26\\_cs99](https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs99)
2. <https://www.geeksforgeeks.org/computer-networks/computer-network-tutorials/>

**Course Outcomes:**

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

|     |          |                                                                                                                                        |
|-----|----------|----------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2 K3 | Explain the fundamental concepts of data communication, network architectures, topologies, standards, and protocols.                   |
| CO2 | K1 K2    | Analyse OSI and TCP/IP models, transmission media, signal types, and Data Link Layer mechanisms.                                       |
| CO3 | K2 K3 K4 | Apply knowledge of switching techniques, networking devices, routing algorithms, and internetworking principles.                       |
| CO4 | K1 K3 K4 | Explain and differentiate transport-layer services, TCP/UDP protocols, addressing, and connection management.                          |
| CO5 | K4 K5    | Demonstrate an understanding of network security principles and basic cryptographic techniques for protecting data and communications. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     | ✓   | ✓   | ✓    | ✓    |      |      |      |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     | ✓   | ✓   |      |      | ✓    | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-VI Core Course - IX**  
**SOFTWARE ENGINEERING**

**Course Code :26UCA6CC09**  
**Credits : 4**

**Max. Marks :100**  
**Internal Marks : 30**  
**External Marks : 70**

**Course Objectives:**

- To develop a comprehensive understanding of software engineering principles, software processes, life-cycle models, and Agile development practices.
- To enable students to analyse software requirements and prepare Software Requirements Specifications (SRS) using appropriate analysis and design techniques.
- To develop practical knowledge of software design, coding, testing, debugging, software reliability, and quality assurance.
- To introduce software project management, cost estimation, risk management, and configuration management for effective software development.

**UNIT I**

Introduction to Software Engineering: Software – Definition and Characteristics<sup>1</sup> - Software Engineering – Definition and Need - Software Process and Process Models: Waterfall Model - Incremental Model - Spiral Model - Prototyping Model - Agile Process Model – Principles and Practices - Software Myths

**UNIT II**

Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS) Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object-oriented vs function-oriented design<sup>3,4</sup>.

**UNIT III**

Software Design: Design Concepts and Principles - Software Design Process - Cohesion and Coupling - Function-Oriented Design – Data Flow Diagrams (DFD), Structure Charts - Object-Oriented Design<sup>5</sup> – Concepts, UML Diagrams (Class, Use Case, Sequence) User Interface Design – Principles.

**UNIT IV**

Coding and Testing: Coding - code review testing - testing in the large vs testing in the small-unit testing - black-box testing - white-box testing - debugging; program analysis tools; integration testing - system testing - some general issues associated with testing<sup>6,8</sup> - Software Reliability and Quality Management

**UNIT V**

Software Project Management: Project Management Concepts - Project Planning and Scheduling - Software Cost Estimation: COCOMO Model - Function Point Analysis - Risk Management – Identification, Analysis, Mitigation<sup>8</sup> - Software Quality Assurance (SQA) - Software Configuration Management (SCM).

**UNIT VI**

Current status of software engineering in business environment: discussions<sup>10</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>3</sup>Laboratory-Based Learning
- <sup>4</sup>Problem-Based Learning
- <sup>5</sup>Project-Based Learning
- <sup>6</sup>Experiential and Activity-Based Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>10</sup>Industry-Oriented Learning

**Materials for Study & Reference:****Text Books:**

1. Pressman, Roger S., and Bruce R. Maxim., “*Software Engineering: A Practitioner’s Approach*”, 9th ed., McGraw Hill, 2023.
2. Richard Fairley, “*Software Engineering Concepts*”, McGraw Hill Education, 2017.

**Reference Books:**

1. Rajib Mall, “*Fundamentals of Software Engineering*”, Fifth Edition, Prentice – Hall of India, 2018.
2. Sommerville, Ian., “*Software Engineering*”, 10th ed., Pearson, 2015.

**E-Resources:**

1. [https://onlinecourses.nptel.ac.in/e-learning/preview/noc26\\_cs151](https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs151)
2. <https://www.geeksforgeeks.org/software-engineering/software-engineering/>

**Course Outcomes:**

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

|     |          |                                                                                                                                                          |
|-----|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2    | Explain and compare software engineering processes, life-cycle models, Agile practices, and software development principles.                             |
| CO2 | K1 K3    | Analyse user requirements and prepare SRS documents using appropriate requirements engineering techniques.                                               |
| CO3 | K2 K4    | Design software systems using DFDs, structure charts, UML diagrams, cohesion, coupling, and user interface design principles.                            |
| CO4 | K2 K3 K4 | Apply appropriate coding, testing, debugging, software reliability, and quality management techniques throughout the software development life cycle.    |
| CO5 | K3 K4 K5 | Apply project planning, scheduling, COCOMO, Function Point Analysis, risk management, SQA, and SCM techniques for effective software project management. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     | ✓   |     | ✓    | ✓    | ✓    |      |      |
| CO4           |     |     | ✓   |      |      |      | ✓    | ✓    |
| CO5           |     | ✓   | ✓   |      |      | ✓    |      | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-VI Core Course - X**  
**AI AND ML - CONCEPTS AND APPLICATIONS**

**Course Code: 26UCA6CC10**

**Credits : 4**

**Max. Marks :100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives**

- To develop a strong foundation in Artificial Intelligence and Machine Learning concepts, including intelligent agents, problem-solving, learning paradigms, and knowledge representation.
- To enable students to understand and apply supervised, unsupervised, and reinforcement learning techniques for solving computational problems.
- To develop knowledge of regression, classification, clustering, neural networks, and deep learning and their applications in real-world domains.
- To create awareness of AI and ML applications, emerging technologies, ethical considerations, data privacy, bias, and responsible AI practices.

**UNIT I**

Introduction to Artificial Intelligence – Definition, history, objectives, characteristics, and applications of AI – Intelligent agents and environments – Problem-solving and search strategies – Breadth-First Search, Depth-First Search, and heuristic search – Knowledge representation and reasoning – AI applications<sup>1,3</sup>.

**UNIT II**

Introduction to Machine Learning – Types of learning: supervised, unsupervised, and reinforcement learning – Machine learning workflow – Data collection, preprocessing, training, validation, and testing – Features and labels – Model evaluation and performance measures – Applications of Machine Learning<sup>3,4</sup>.

**UNIT III**

Regression and classification concepts – Linear Regression, Logistic Regression, Decision Trees, and K-Nearest Neighbours – Clustering techniques: K-Means and hierarchical clustering – Classification and clustering applications<sup>4,6</sup> – Model selection and basic performance evaluation.

**UNIT IV**

Introduction to Artificial Neural Networks – Biological and computational neurons – Perceptron and multilayer networks – Activation functions, loss functions, and backpropagation – Introduction to Deep Learning and Convolutional Neural Networks (CNNs) – Applications in image, speech, and pattern recognition<sup>8</sup>.

**UNIT V**

Applications of AI and ML in healthcare, education, finance, agriculture, e-commerce, cybersecurity, and smart systems – Natural Language Processing and computer vision – Generative AI and intelligent assistants – Ethical issues, privacy, bias, transparency, and responsible AI – Emerging trends and future applications of AI and ML<sup>10</sup>.

**UNIT VI**

Current status of AI and Machine Learning in business environment<sup>10</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>3</sup>Laboratory-Based Learning
- <sup>4</sup>Problem-Based Learning
- <sup>5</sup>Project-Based Learning
- <sup>6</sup>Experiential and Activity-Based Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>10</sup>Industry-Oriented Learning

**Materials for Study & Reference:****Text Books:**

1. Bhatia, Parteek. “*Machine Learning with Python: Principles and Practical Techniques*”. Cambridge University Press, 2025.
2. Singh, Pradeep, Tapan K. Gandhi, and Balasubramanian Raman.. “*Artificial Intelligence and Machine Learning*”, 1st ed., McGraw Hill, 2025.

**Reference Books:**

1. Gupta, Pramod, and Anupam Bagchi, “*Essentials of Python for Artificial Intelligence and Machine Learning*”, Springer, 2024.
2. Theobald, Oliver, “*Machine Learning & Python for Absolute Beginners*”, Packt, 2025.

**E-Resources:**

1. [https://www.w3schools.com/python/python\\_machine\\_learning.asp](https://www.w3schools.com/python/python_machine_learning.asp).
2. <https://nptel.ac.in/courses/112103280>.

**Course Outcomes:**

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

|     |          |                                                                                                                                                               |
|-----|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2    | Explain fundamental concepts of Artificial Intelligence, intelligent agents, problem-solving, search strategies, and knowledge representation.                |
| CO2 | K1 K3    | Differentiate and apply supervised, unsupervised, and reinforcement learning approaches based on problem requirements.                                        |
| CO3 | K2 K4    | Implement and evaluate basic regression, classification, and clustering techniques for analysing datasets.                                                    |
| CO4 | K2 K3 K4 | Explain the fundamentals of artificial neural networks and deep learning, including their applications in image, speech, and pattern recognition.             |
| CO5 | K3 K4 K5 | Analyse AI and ML applications across different domains and demonstrate awareness of ethical, privacy, bias, transparency, and responsible-AI considerations. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      | ✓    | ✓    |      |      |
| CO5           |     |     | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-VI Core Practical - VII**  
**AI TOOLS AND MACHINE LEARNING LAB**

**Course Code: 26UCA6CP07**

**Credits : 4**

**Max. Marks :100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To develop practical skills in using AI-powered tools for content creation, image generation, presentations, coding, and chatbot development.
- To provide hands-on experience in Python-based data handling, preprocessing, and statistical analysis using appropriate libraries and tools.
- To develop practical competency in applying basic machine learning techniques, particularly linear regression, for data analysis and prediction.
- To promote the responsible and effective use of AI and ML tools for academic, professional, and problem-solving applications.

**EXERCISE <sup>2,3,4,5,6</sup>:**

1. AI Image Generation – Create an image using an AI-powered image generation tool based on a suitable text prompt.
2. AI-Assisted Text Generation – Generate, refine, and format academic or professional content using an AI writing tool.
3. AI-Assisted Presentation Development – Design a simple presentation using an AI-powered presentation creation tool.
4. AI-Assisted Python Programming and Debugging – Generate, analyse, modify, and debug Python code using an AI coding assistant.
5. AI Chatbot Development – Create and configure a simple chatbot using an AI-powered chatbot development tool.
6. Dataset Import and Exploration Using Pandas – Import a dataset using Pandas and display its records, attributes, structure, and basic information.
7. Data Preprocessing Using Pandas – Identify and handle missing values in a dataset using appropriate Pandas functions.
8. Descriptive Statistical Analysis Using Python – Calculate and interpret the mean, median, and standard deviation of a given dataset.
9. Linear Regression for Prediction – Implement a linear regression model using Python to analyse relationships between variables and generate predictions.
10. Simple Linear Regression Using Sample Data – Develop and evaluate a simple linear regression model using a sample dataset and interpret the prediction results.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|            |              |                                                                                                                             |
|------------|--------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K2 K3</b> | Use AI tools to create and enhance images, text, presentations, Python programs, and simple chatbot applications.           |
| <b>CO2</b> | <b>K1 K2</b> | Apply AI-assisted coding techniques to generate, analyse, modify, and debug basic Python programs.                          |
| <b>CO3</b> | <b>K4</b>    | Import, explore, and preprocess datasets using Python and Pandas, including handling missing values.                        |
| <b>CO4</b> | <b>K3</b>    | Perform and interpret basic statistical analysis, including mean, median, and standard deviation, using Python.             |
| <b>CO5</b> | <b>K4</b>    | Implement and evaluate simple linear regression models to analyse relationships between variables and generate predictions. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO3</b>                |            | ✓          | ✓          |             |             | ✓           |             |             |
| <b>CO4</b>                |            |            | ✓          |             |             | ✓           | ✓           | ✓           |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-VI**  
**PROJECT**

**Course Code : 26UCA6CP01**  
**Credits : 4**

**Max. Marks :100**  
**Internal Marks : 40**  
**External Marks : 60**

**Course Objectives:**

- To develop the ability of students to apply theoretical and practical knowledge to real-life problems.
- To apply suitable tools and techniques to solve problems related to industry, academic institutions, and research laboratories.
- To improve students' practical knowledge and problem-solving skills.
- To develop the ability to understand and apply the Software Development Life Cycle (SDLC).

**PROJECT WORK PATTERN:**

**FIRST REVIEW:**

1. Project Title
2. Project Platform (Language/Package Selected)
3. Details of Guide with Designation & Qualification.
4. Presentation

**SECOND REVIEW:**

1. Work Observation
2. Modules in Project (Design Screens Sample)
3. DFD/ERD/System Flow Diagram (Whichever Applicable)
4. PowerPoint Presentation.

**FINAL REVIEW:**

1. Documentation
2. Screens Shots
3. DFD/ERD/System Flow Diagram (Whichever Applicable)
4. Final Project Report (with executable format including complete source code)

**Course Outcomes:**

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

|            |              |                                                                                                                   |
|------------|--------------|-------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K2</b>    | Identify suitable project topics, platforms, tools, and technologies for software development.                    |
| <b>CO2</b> | <b>K1 K2</b> | Design and develop functional project modules based on identified requirements.                                   |
| <b>CO3</b> | <b>K3K4</b>  | Prepare appropriate DFD, ERD, or system flow diagrams for the developed project.                                  |
| <b>CO4</b> | <b>K4</b>    | Demonstrate project functionality through presentations and working prototypes.                                   |
| <b>CO5</b> | <b>K4 K5</b> | Prepare and present a complete project report with documentation, screenshots, source code, and executable files. |

### Mapping with Program Outcomes and Program Specific Outcomes:

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    | ✓    |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |



**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-VI Skill Enhancement Course - V**  
**SOFTWARE TESTING LAB**

**Course Code : 26UCA6SEC05**  
**Credits : 2**

**Max. Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Course Objectives:**

- To develop fundamental knowledge of software testing principles, methodologies, test planning, and test case design.
- To provide hands-on experience in web application testing and test automation using Selenium IDE and Selenium WebDriver.
- To develop practical skills in functional testing, form validation, authentication, data validation, and automated test execution.
- To equip students with the ability to prepare test plans, execute test cases, identify defects, and document testing results for real-world applications.

**EXERCISE<sup>2,3,4,5,6</sup>:**

1. Develop a Selenium IDE test suite containing a minimum of four test cases and execute the test suite to verify application functionality.
2. Design and execute functional test cases for a Railway Reservation System using Selenium IDE.
3. Develop and execute Selenium test scripts to validate the fields and functionality of a web-based user registration form.
4. Develop and execute a Selenium test script to validate the login functionality of a specified web application.
5. Design and execute test cases to validate email verification functionality using One-Time Password (OTP) authentication.
6. Develop and test a program to identify employees whose salary is greater than ₹50,000 and whose age is between 25 and 30 years.
7. Develop and test a program to create, update, and maintain five employee records in an Excel spreadsheet.
8. Develop and execute a Selenium test script to identify and verify the number of items available in a list or combo box.
9. Design and execute functional test cases for a banking application covering major operations such as login, account management, transactions, and logout.
10. Prepare a comprehensive test plan document for a Library Management System covering test objectives, scope, test strategy, test environment, test cases, resources, schedule, and expected deliverables.

**Pedagogical method used:**

- <sup>2</sup>Demonstration and Guided Practice
- <sup>3</sup>Laboratory-Based Learning
- <sup>4</sup>Problem-Based Learning
- <sup>5</sup>Project-Based Learning
- <sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|            |              |                                                                                                                                          |
|------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Explain and apply software testing concepts including test cases, test suites, test plans, and functional testing.                       |
| <b>CO2</b> | <b>K2K3</b>  | Design and execute automated test cases for web applications using Selenium tools.                                                       |
| <b>CO3</b> | <b>K2K4</b>  | Validate web application components such as registration forms, login pages, email/OTP verification, lists, and combo boxes.             |
| <b>CO4</b> | <b>K3 K4</b> | Develop and execute test programs for validating application data and Excel-based employee records.                                      |
| <b>CO5</b> | <b>K1 K2</b> | Prepare test documentation and test plans and evaluate the functionality of applications such as banking and library management systems. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO3</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO4</b>                |            | ✓          | ✓          |             |             | ✓           | ✓           |             |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-VI**  
**GENDER STUDIES**

**Course Code : 26UCA6GS**  
**Credits : 1**

**Max. Marks :100**  
**Internal Marks : 30**  
**External Marks : 70**

**Course Objectives:**

- To understand the basic concepts of gender, gender discrimination, equality, and empowerment.
- To explain the development and significance of Women's Studies and Gender Studies.
- To analyze gender discrimination in family, education, health, employment, media, politics, and law.
- To understand women's development, empowerment initiatives, movements, and safeguarding mechanisms.

**UNIT I**

Concepts of Gender<sup>1</sup>: Sex - Gender - Biological Determinism - Patriarchy - Feminism - Gender Discrimination - Gender Division of labour - Gender Stereotyping - Gender Sensitivity - Gender Equity - Equality - Gender Mainstreaming - Empowerment.

**UNIT II**

Women's Studies vs Gender Studies: UGC's Guidelines - VII to XI Plans<sup>7</sup>- Gender Studies: Beijing Conference and CEDAW - Exclusiveness and Inclusiveness.

**UNIT III**

Areas of Gender Discrimination<sup>8</sup>: Family - Sex Ratio - Literacy - Health - Governance - Religion Work Vs Employment - Market - Media - Politics - Law - Domestic Violence - Sexual Harassment - State Policies and Planning.

**UNIT IV**

Women Development and Gender Empowerment<sup>9</sup>: Initiatives - International Women's Decade - International Women's Year - National Policy for Empowerment of Women - Women Empowerment Year 2001 - Mainstreaming Global Policies.

**UNIT V**

Women's Movements and Safeguarding Mechanism: In India National /State Commission for Women (NCW) - All Women Police Station - Family Court - Domestic Violence Act - Prevention of Sexual Harassment at Work Place Supreme Court Guidelines<sup>9</sup>- Maternity Benefit Act - PNDT Act - Hindu Succession Act 2005 - Eve Teasing Prevention Act - Self Help Groups - 73<sup>rd</sup> and 74<sup>th</sup> Amendment for PRIS<sup>12</sup>.

**UNIT VI**

The present status of gender equality in the society: discussions<sup>12</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>8</sup>Technology-Enabled Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>12</sup>Self-Directed and Lifelong Learning

**Materials for Study & Reference:****Text Books:**

1. Nivedita Menon., “*Seeing Like a Feminist (Revised Edition)*”, Penguin Random House India, 2023.
2. Kamla Bhasin, “*Understanding Gender*”, Women Unlimited, 2023.

**Reference Books:**

1. Judith Lorber, “*Gender Inequality: Feminist Theories and Politics*” (7th Edition), 2021.
2. Rajadurai. S.V, Geetha. V, “*Themes in Caste Gender and Religion*”, Tiruchirappalli : Bharathidasan University, 2007.

**E-Resources:**

1. [https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26\\_mg234](https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg234)
2. [https://www.wcd.gov.in/?utm\\_source](https://www.wcd.gov.in/?utm_source)

**Course Outcomes:**

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

|            |           |                                                                                                         |
|------------|-----------|---------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1</b> | Explain the fundamental concepts of gender, gender equality, equity, and empowerment.                   |
| <b>CO2</b> | <b>K3</b> | Describe the development of Women’s Studies and Gender Studies at national and international levels.    |
| <b>CO3</b> | <b>K2</b> | Analyze major areas and causes of gender discrimination in society.                                     |
| <b>CO4</b> | <b>K4</b> | Identify major policies, laws, movements, and mechanisms supporting women’s empowerment and protection. |
| <b>CO5</b> | <b>K3</b> | Discuss the present status and challenges of gender equality in society.                                |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO2</b>                | ✓          | ✓          |            | ✓           |             | ✓           |             |             |
| <b>CO3</b>                |            |            | ✓          |             | ✓           | ✓           |             |             |
| <b>CO4</b>                |            | ✓          | ✓          |             | ✓           | ✓           | ✓           |             |
| <b>CO5</b>                |            | ✓          | ✓          |             |             |             | ✓           | ✓           |

# Allied Papers (Optional)

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-I Allied Course - I**  
**OPTIMIZATION TECHNIQUES**

**Course Code : 26UCA1AC01B**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

## **Course Objectives:**

- To introduce the fundamental concepts, principles, and applications of Operations Research and optimization techniques.
- To develop skills in formulating and solving linear programming, transportation, and assignment problems using appropriate methods.
- To understand and apply sequencing, replacement, PERT, and CPM techniques for effective decision-making and resource management.
- To develop the ability to relate optimization techniques to real-life situations and identify suitable solutions for practical problems.

## **UNIT I**

Introduction to Operations Research - Mathematical Formulation of the problem - Graphical Solution Method - Simplex method <sup>1</sup>

## **UNIT II**

Transportation problem - North West corner rule - Least cost method - Vogel's approximation Method - Assignment problems<sup>7</sup>.

## **UNIT III**

Sequencing Problems: Introduction - Problem of sequencing - Basic term used in sequencing - Processing n Jobs through 2 machines - Processing n Jobs through k machines<sup>9</sup>.

## **UNIT IV**

Replacement Problems - Introduction - Replacement of Equipment / asset that Deteriorates Gradually - Replacement of Equipment that fails suddenly <sup>11</sup>.

## **UNIT V**

Network scheduling by PERT/CPM - Introduction - Network and basic components - Rules of network construction - Critical path analysis - Probability consideration in PERT - Distinction between PERT and CPM.

## **UNIT VI**

The relationship of Optimization Techniques in day-to-day applications in human life<sup>11</sup>.

## **Pedagogical method used:**

<sup>1</sup>Interactive Lectures

<sup>7</sup>Collaborative Learning

<sup>9</sup>Inclusive and Accessible Learning

<sup>11</sup>Continuous Assessment and Feedback

**Materials for Study & Reference:****Text Book:**

1. Swarup, Kanti, P. K. Gupta, and Man Mohan., “*Operations Research*”, 20th rev. ed., Sultan Chand & Sons, 2023.
2. Taha, Hamdy A, “*Operations Research: An Introduction*”, 11th ed., Pearson, 2025.

**References:**

1. Sharma, S.D., “*Operations Research*”, KedarNath Ram Nath & Co. (15<sup>th</sup> Edition), 2010.

**E-Resources:**

1. <https://nptel.ac.in/courses/111/107/111107128/>

**Course Outcomes:**

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

|     |          |                                                                                                                                           |
|-----|----------|-------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K3       | Explain the basic concepts of Operations Research and formulate mathematical models for real-world problems.                              |
| CO2 | K1 K2 K3 | Solve linear programming, transportation, and assignment problems using appropriate optimization techniques.                              |
| CO3 | K2 K3    | Apply sequencing and replacement models to improve the utilization and management of resources.                                           |
| CO4 | K4 K5    | Construct and analyze PERT/CPM networks, identify critical paths, and estimate project completion times.                                  |
| CO5 | K3 K4    | Apply optimization techniques to day-to-day and practical decision-making situations and select appropriate methods for solving problems. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-I Allied Practical - I**  
**OPTIMIZATION TECHNIQUES LAB**

**Course Code : 26UCA1AP01B**  
**Credits : 4**

**Max. Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Course Objectives:**

- To understand the basic concepts of optimization and decision-making techniques.
- To apply programming techniques for solving basic optimization problems.
- To develop programs for analyzing cost, profit, and alternative solutions.
- To evaluate and select optimal solutions using computational methods.

**EXERCISES <sup>2,3,4,5,6</sup>:**

1. Write a program to find the maximum and minimum values in a given set of numbers.
2. Write a program to calculate the total and average cost of a set of items.
3. Write a program to find the maximum profit from a given set of products.
4. Write a program to find the minimum cost among different alternatives.
5. Write a program to sort a given set of values in ascending order.
6. Write a program to find the optimum value from a given set of values.
7. Write a program to compare different alternatives and select the best alternative.
8. Write a program to calculate total cost and identify the least-cost option using arrays.
9. Write a program to calculate total profit and identify the maximum-profit option.
10. Write a program to analyze a set of values and determine the maximum and minimum solution.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|            |              |                                                                                    |
|------------|--------------|------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K1 K2</b> | Identify maximum, minimum, and optimum values from given data.                     |
| <b>CO2</b> | <b>K3</b>    | Apply programming techniques to solve basic cost and profit optimization problems. |
| <b>CO3</b> | <b>K3 K4</b> | Analyze and compare alternatives to determine the best solution.                   |
| <b>CO4</b> | <b>K5</b>    | Implement array-based programs for cost and profit analysis.                       |
| <b>CO5</b> | <b>K5 K6</b> | Evaluate given solutions and select the most appropriate optimal alternative       |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO2</b>                |            | ✓          |            | ✓           | ✓           |             |             |             |
| <b>CO3</b>                | ✓          | ✓          |            |             |             | ✓           | ✓           |             |
| <b>CO4</b>                |            | ✓          | ✓          |             |             | ✓           | ✓           |             |
| <b>CO5</b>                |            | ✓          | ✓          |             | ✓           |             | ✓           | ✓           |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-II Allied Course - II**  
**NUMERICAL METHODS**

**Course Code : 26UCA2AC02B**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To introduce the fundamental concepts of numerical methods, errors, and numerical solutions to mathematical problems.
- To develop skills in solving nonlinear equations and systems of linear equations using appropriate numerical techniques.
- To understand and apply interpolation, curve fitting, numerical differentiation, and numerical integration methods.
- To develop the ability to apply numerical methods for solving differential equations and practical problems in science, engineering, business, and data analysis.

**UNIT I**

Errors and Solutions of Nonlinear Equations - Sources of errors-Absolute, relative, and percentage errors-Truncation and round-off errors-Bisection Method-False Position (Regula-Falsi) method-Newton-Raphson Method-Secant method<sup>1</sup>.

**UNIT II**

System of Linear Equations - Gaussian Elimination-Gauss-Jordan Method-LU Decomposition-Jacobi Iteration-Gauss-Seidel Iteration<sup>1</sup>.

**UNIT III**

Interpolation and Curve Fitting<sup>1</sup> - Finite differences-Newton's Forward and Backward Interpolation<sup>7</sup>-Lagrange Interpolation-Newton's Divided Difference Formula-Least Squares Curve Fitting.

**UNIT IV**

Numerical Differentiation and Integration - Numerical Differentiation-Trapezoidal Rule-Simpson's 1/3 Rule-Simpson's 3/8 Rule-Error estimation<sup>9</sup>.

**UNIT V**

Numerical Solution of Differential Equations - Euler's Method-Modified Euler Method-Runge-Kutta Second Order Method-Runge-Kutta -Fourth Order Method-Introduction to Predictor-Corrector Methods<sup>11</sup>.

**UNIT VI**

Applications of numerical methods in science, engineering, business, and data analysis<sup>11</sup>.

**Pedagogical method used:**

<sup>1</sup>Interactive Lectures

<sup>7</sup>Collaborative Learning

<sup>9</sup>Inclusive and Accessible Learning

<sup>11</sup>Continuous Assessment and Feedback

## Materials for Study & Reference:

### Text Book

1. S. R. K. Iyengar and R. K. Jain, “*Numerical Methods: Problems and Solutions*”, 4th Edition, New Age International Publishers, 2023.

### Reference Books:

1. C. Xavier, “*C Language and Numerical Methods*”, New Age International Publishers, 2021.
2. B. S. Grewal, “*Higher Engineering Mathematics (Numerical Methods Chapters)*”, 46th Edition, Khanna Publishers, New Delhi, 2022.

### E- Resources:

1. <https://nptel.ac.in/courses>
2. <https://swayam.gov.in/>

### Course Outcomes:

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

|     |       |                                                                                                                                    |
|-----|-------|------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1    | Explain different types of numerical errors and apply appropriate methods for finding solutions to nonlinear equations.            |
| CO2 | K1K2  | Solve systems of linear equations using direct and iterative numerical methods.                                                    |
| CO3 | K2 K3 | Apply interpolation and least-squares curve fitting techniques to estimate and analyze data.                                       |
| CO4 | K2K4  | Perform numerical differentiation and integration and estimate the associated errors using suitable methods.                       |
| CO5 | K4    | Analyse numerical methods for differential equations and real-world problems in science, engineering, business, and data analysis. |

### Mapping with Program Outcomes and Program Specific Outcomes:

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   |     |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    | ✓    |      |      |
| CO3           | ✓   | ✓   |     |      | ✓    | ✓    | ✓    |      |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    | ✓    |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-II Allied Practical - II**  
**NUMERICAL METHODS LAB**

**Course Code : 26UCA2AP02B**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objective:**

- To develop practical skills in implementing basic numerical methods and error calculations using computer programs.
- To develop programming skills for solving nonlinear equations and simultaneous linear equations using numerical techniques.
- To implement interpolation and numerical integration methods for solving mathematical and data-related problems.
- To apply programming techniques for solving first-order differential equations using Euler's and Runge-Kutta methods.

**EXERCISES <sup>2,3,4,5,6</sup>**

1. Write a program to calculate the absolute error between the actual value and approximate value.
2. Write a program to calculate the relative error and percentage error.
3. Write a program to find the root of a simple equation using the Bisection Method.
4. Write a program to find the root of a simple equation using the Newton-Raphson Method.
5. Write a program to solve two simultaneous linear equations.
6. Write a program to find the interpolated value using Newton's Forward Interpolation Method.
7. Write a program to find the interpolated value using Lagrange Interpolation Method.
8. Write a program to calculate the integral of a function using the Trapezoidal Rule.
9. Write a program to find the solution of a first-order differential equation using Euler's Method.
10. Write a program to find the solution of a first-order differential equation using the Runge-Kutta Method.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|     |       |                                                                                                                                         |
|-----|-------|-----------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K2    | Develop programs to calculate absolute, relative, and percentage errors and analyze numerical accuracy.                                 |
| CO2 | K2 K3 | Implement numerical algorithms to solve nonlinear equations and simultaneous linear equations.                                          |
| CO3 | K4    | Develop programs for Newton's Forward and Lagrange interpolation to estimate unknown values from given data.                            |
| CO4 | K3 K4 | Implement the Trapezoidal Rule for numerical integration and obtain approximate integral values.                                        |
| CO5 | K4 K5 | Develop and execute programs using Euler's and Runge-Kutta methods to obtain numerical solutions of first-order differential equations. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     |     | ✓   |      |      | ✓    |      |      |
| CO4           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-III Allied Course - III**

**COST AND MANAGEMENT ACCOUNTING**

**Course Code: 26UCA3AC03B**

**Credits: 4**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To introduce the concepts, objectives, functions, and significance of Management Accounting and its relationship with Cost Accounting.
- To develop an understanding of marginal costing, differential costing, transfer pricing, and their applications in managerial decision-making.
- To develop skills in budget preparation, budgetary control, standard costing, and variance analysis.
- To understand the concepts and applications of learning curves and experience curves in cost and management decision-making.

**UNIT I**

Introduction - Management Accounting - Definition - Objectives of Management Accounting - Role of Management Accounting Process - Functions of Management Accounting - Significance of Management Accounting - Limitations of Management Accounting - Relationship between Management Accounting and Cost Accounting<sup>1,7</sup>

**UNIT II**

Marginal Costing - Determination of Cost and Profit under Marginal Costing - Realities about Marginal Costing - Techniques of Marginal Costing - Differential Cost Analysis - Differences between Absorption Costing and Marginal Costing - Application of Marginal Costing in Decision Making - Transfer Pricing - Methods of Transfer Pricing<sup>9</sup>

**UNIT III**

Budgetary Control – Meaning, Objectives, Importance and Process – Preparation of Functional Budgets: Sales, Production, Materials, Labour and Cash Budgets – Master Budget – Fixed, Flexible, Variable and Semi-Variable Budgets – Zero-Based Budgeting (ZBB) – Budgetary Control Techniques – Performance Evaluation and Responsibility Accounting<sup>10</sup>.

**UNIT IV**

Computation of Variances for each of the Elements of Costs, Sales Variances - Investigation of Variances & Reporting of Variances - Valuation of Stock under Standard Costing - Uniform Costing and Inter-firm Comparison<sup>11</sup>.

**UNIT V**

Phases in Learning Curve - Uses of Learning Curve - Limitations of the usefulness of the Learning Curve - Factors affecting Learning Curve - The Experience Curve - Reasons for use of Learning Curve - Application of Learning Curve.

**UNIT VI**

Application of cost accounting in our day-to-life: discussions<sup>11</sup>

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>7</sup>Collaborative Learning
- <sup>9</sup>Inclusive and Accessible Learning
- <sup>10</sup>Industry-Oriented Learning
- <sup>11</sup>Continuous Assessment and Feedback

**Materials for Study & Reference:****Text Books:**

1. Kishore, Ravi M, "*Cost & Management Accounting*". 6th ed., Taxmann Publications, 2025.
2. M. N. Arora, "*Cost and Management Accounting*", 13th Edition, Himalaya Publishing House, 2023.

**Books for References:**

1. S. N. Maheshwari and S. K. Maheshwari, "*Cost Accounting*", 2nd Edition, Vikas Publishing House, 2024.
2. Jain, S. P., and K. L. Narang. "*Advanced Cost Accounting: Methods and Techniques*", Kalyani Publishers, 2024.

**Web Reference:**

1. <https://nptel.ac.in/courses/111/107/111107128/>

**Course Outcomes:**

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

|     |       |                                                                                                 |
|-----|-------|-------------------------------------------------------------------------------------------------|
| CO1 | K1 K2 | Explain the concepts, functions, significance, and limitations of Management Accounting.        |
| CO2 | K3    | Apply marginal costing and transfer pricing techniques for business decision-making.            |
| CO3 | K3    | Prepare functional, master, and zero-based budgets for planning and control.                    |
| CO4 | K4    | Compute and analyze cost and sales variances under standard costing.                            |
| CO5 | K6    | Apply learning curve and experience curve techniques to evaluate cost and production decisions. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      | ✓    |      | ✓    |
| CO5           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-III Allied Practical - III**

**COST AND MANAGEMENT ACCOUNTING LAB**

**Course Code: 26UCA3AP03B**

**Credits: 4**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To introduce the concepts, objectives, functions, and significance of Management Accounting and its relationship with Cost Accounting.
- To develop an understanding of marginal costing, differential costing, transfer pricing, and their applications in managerial decision-making.
- To develop skills in budget preparation, budgetary control, standard costing, and variance analysis.
- To understand the concepts and applications of learning curves and experience curves in cost and management decision-making.

**EXERCISES:** 2,3,4,5,6

1. Create a company in Tally and configure the basic accounting and financial year settings.
2. Create ledgers for capital, purchases, sales, expenses, income, debtors, and creditors.
3. Record purchase and sales transactions and generate the Purchase and Sales Registers.
4. Record cash and bank transactions and prepare a Cash Book and Bank Book.
5. Prepare a Trial Balance and verify the debit and credit balances.
6. Prepare a Profit and Loss Account to determine the net profit or net loss.
7. Prepare a Balance Sheet and analyze the financial position of the business.
8. Create a budget and compare budgeted amounts with actual expenses using Budget Variance.
9. Enter stock transactions and prepare Inventory and Stock Summary reports.
10. Generate accounting reports and analyze income, expenses, profit, and outstanding balances using Tally.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

**Course Outcomes:**

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

|            |              |                                                                                                                                        |
|------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K2 K3</b> | Explain the concepts, functions, significance, and limitations of Management Accounting and Cost Accounting in the management process. |
| <b>CO2</b> | <b>K1 K2</b> | Apply marginal costing and differential cost analysis to evaluate alternatives and support managerial decision-making.                 |
| <b>CO3</b> | <b>K4</b>    | Prepare functional and master budgets and apply budgetary control techniques for effective planning and control.                       |
| <b>CO4</b> | <b>K3</b>    | Calculate and interpret cost and sales variances and use variance analysis for performance evaluation and reporting.                   |
| <b>CO5</b> | <b>K4</b>    | Apply learning curve and experience curve techniques to analyze cost behaviour and improve operational decision-making.                |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   |     |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO3           | ✓   | ✓   |     |      |      | ✓    | ✓    |      |
| CO4           |     | ✓   | ✓   |      |      |      | ✓    | ✓    |
| CO5           |     | ✓   | ✓   |      |      | ✓    | ✓    |      |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**  
**Centre for Differently Abled Persons**  
**Bachelor of Computer Applications**  
**Semester-IV Allied Course - IV**  
**ORGANIZATIONAL BEHAVIOUR**

**Course Code : 26UCA4AC04B**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 30**

**External Marks : 70**

**Course Objectives:**

- To introduce the fundamental concepts, principles, and importance of Organizational Behaviour (OB) and its contributing disciplines.
- To develop an understanding of personality, perception, learning, values, and attitudes and their influence on workplace behaviour.
- To develop skills in group dynamics, conflict management, cross-cultural communication, leadership, and employee motivation.
- To understand organizational structure, culture, climate, job satisfaction, organizational development, and contemporary workplace trends.

**UNIT I**

Definition of organizational Behavior (OB)-Various Disciplines Contributing to OB-Hawthorne Experiment-Need and Importance of organizational Behavior<sup>1</sup>

**UNIT II**

Personality-Types of Personality-Factors Affecting Personality-Perception Learning-Types of Learning Styles-Learning Process-Learning Theories<sup>1,4</sup>

**UNIT III**

Values and Attitudes--Characteristics of Values and Attitudes-Components of Attitude-Group Dynamics-Types of Groups-Conflict Management-Nature and Types of Conflict - Cross-cultural Communication and Workplace Sensitivity - Digital Workplace Etiquette and Professional Behaviour in Virtual Teams<sup>6,7</sup>

**UNIT IV**

Leadership: Meaning and Importance-Leadership Styles-Leaders vs. Managers-Motivation Theories of Motivation-Importance of Motivation-Types of Motivation-Motivation at Work<sup>10</sup>

**UNIT V**

Organizational Structure and Design-organizational Climate-Job Satisfaction-organizational Development (OD)-organizational Culture-organizational Change-Current Trends in organizational Behavior<sup>7</sup>

**UNIT VI**

Contemporary Organizational Behavior – Workplace Diversity and Inclusion – Employee Well-being – Remote and Hybrid Work – Emotional Intelligence – Technology and AI in the Workplace<sup>12</sup>.

**Pedagogical method used:**

- <sup>1</sup>Interactive Lectures
- <sup>4</sup>Problem-Based Learning
- <sup>6</sup>Experiential and Activity-Based Learning
- <sup>7</sup>Collaborative Learning
- <sup>10</sup>Industry-Oriented Learning
- <sup>12</sup>Self-Directed and Lifelong Learning

**Materials for Study & Reference:****Text Books:**

1. Stephen P. Robbins and Timothy A. Judge, "*Organizational Behavior*", 19th Edition, Pearson, 2023.
2. K. Aswathappa, "*Organizational Behaviour*", 13th Edition, Himalaya Publishing House, 2022.

**References:**

1. Fred Luthans, "*Organizational Behavior*", 14th Edition, McGraw Hill, 2021.
2. Gregory Moorhead and Ricky W. Griffin, "*Organizational Behavior*", 13th Edition, Cengage Learning, 2022.

**E-Resources:**

1. <https://openstax.org/details/books/organizational-behavior>

**Course Outcomes:**

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

|     |          |                                                                                                                                                             |
|-----|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | K1 K2    | Explain the fundamental concepts of Organizational Behaviour and analyze the contribution of various disciplines to workplace behaviour.                    |
| CO2 | K1 K2 K3 | Analyze the influence of personality, perception, learning, values, and attitudes on individual behaviour in organizations.                                 |
| CO3 | K3 K4    | Apply principles of group dynamics, conflict management, cross-cultural communication, and digital workplace etiquette in professional settings.            |
| CO4 | K4 K2    | Explain and apply leadership and motivation theories to improve employee performance and workplace effectiveness.                                           |
| CO5 | K4 K5    | Analyze organizational structure, culture, climate, job satisfaction, organizational change, and current trends to understand organizational effectiveness. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| CO/<br>PO&PSO | PO1 | PO2 | PO3 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---------------|-----|-----|-----|------|------|------|------|------|
| CO1           | ✓   | ✓   |     | ✓    | ✓    |      |      |      |
| CO2           | ✓   | ✓   |     |      | ✓    | ✓    |      |      |
| CO3           |     |     | ✓   |      |      |      | ✓    | ✓    |
| CO4           |     |     | ✓   |      |      | ✓    | ✓    |      |
| CO5           |     | ✓   | ✓   |      |      |      |      | ✓    |

**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI**

**Centre for Differently Abled Persons**

**Bachelor of Computer Applications**

**Semester-IV Allied Practical - IV**

**ORGANIZATIONAL BEHAVIOUR LAB**

**Course Code : 26UCA4AP04B**

**Credits : 4**

**Max. Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Course Objectives:**

- To develop practical understanding of organizational structure, personality, employee satisfaction, and group behaviour in IT workplaces.
- To develop skills in applying conflict management, leadership, motivation, and organizational culture concepts through practical activities and case studies.
- To develop effective digital communication, virtual meeting etiquette, teamwork, and professional behaviour skills.
- To familiarize students with emerging trends in the IT workplace, including AI, remote work, diversity, and employee well-being.

**EXERCISES <sup>2,3,4,5,6,10</sup>:**

1. Prepare an organizational chart for a software company.
2. Conduct a simple personality assessment and identify personality traits.
3. Prepare a questionnaire to study employee satisfaction in an IT workplace.
4. Conduct a group activity to demonstrate teamwork and group behaviour.
5. Prepare a case study on conflict between employees in a software company.
6. Conduct a role-play to demonstrate different leadership styles in an IT organization.
7. Prepare a simple motivation plan for software employees.
8. Analyze a case study on organizational culture in an IT company.
9. Demonstrate proper digital communication and virtual meeting etiquette.
10. Prepare a presentation on AI, remote work, diversity, and employee well-being in the IT industry.

**Pedagogical method used:**

<sup>2</sup>Demonstration and Guided Practice

<sup>3</sup>Laboratory-Based Learning

<sup>4</sup>Problem-Based Learning

<sup>5</sup>Project-Based Learning

<sup>6</sup>Experiential and Activity-Based Learning

<sup>10</sup>Industry-Oriented Learning

**Course Outcomes:**

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

|            |              |                                                                                                                                                                                           |
|------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | <b>K2 K3</b> | Prepare and interpret organizational charts, personality assessments, and employee satisfaction questionnaires for IT workplaces.                                                         |
| <b>CO2</b> | <b>K1 K2</b> | Demonstrate effective teamwork, group behaviour, conflict management, and interpersonal skills through activities and case studies.                                                       |
| <b>CO3</b> | <b>K4</b>    | Demonstrate different leadership styles and motivation techniques suitable for software organizations.                                                                                    |
| <b>CO4</b> | <b>K3</b>    | Analyze organizational culture and employee behaviour using case studies and practical workplace situations.                                                                              |
| <b>CO5</b> | <b>K5</b>    | Demonstrate appropriate digital communication and virtual workplace etiquette and explain emerging trends such as AI, remote work, diversity, and employee well-being in the IT industry. |

**Mapping with Program Outcomes and Program Specific Outcomes:**

| <b>CO/<br/>PO&amp;PSO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|---------------------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b>                | ✓          | ✓          |            |             | ✓           | ✓           |             |             |
| <b>CO2</b>                |            | ✓          | ✓          | ✓           | ✓           |             |             |             |
| <b>CO3</b>                |            |            | ✓          |             |             | ✓           |             |             |
| <b>CO4</b>                |            |            | ✓          | ✓           |             | ✓           | ✓           | ✓           |
| <b>CO5</b>                |            |            | ✓          |             |             |             | ✓           | ✓           |