



Learn Beyond

**KPR Institute of  
Engineering and  
Technology**

(Autonomous, Affiliated to Anna University)

# **CURRICULUM AND SYLLABI REGULATIONS – 2025 (REVISED)**

Department of  
Civil Engineering

## **I. Vision and Mission of the Institute**

### **Vision**

To become a premier institute of academic excellence by imparting technical, intellectual and professional skills to students for meeting the diverse needs of industry, society, the nation and the world at large

### **Mission**

- Commitment to offer value-based education and enhancement of practical skills
- Continuous assessment of teaching and learning processes through scholarly activities
- Enriching research and innovation activities in collaboration with industry and institutes of repute
- Ensuring the academic processes to uphold culture, ethics and social responsibilities

## **II. Vision and Mission of the Department**

### **Vision**

To be recognised in Civil Engineering through quality education, research and innovation for the sustainable development

### **Mission**

The mission of the department is to

- Provide holistic education to students on emerging technologies in Civil Engineering
- Promote research and consultancy activities
- Instill in individuals a sense of ethical values and lifelong learning

## **III. Program Educational Objectives (PEOs)**

The Program Educational Objectives (PEOs) of the CIVIL ENGINEERING (CE) represent major accomplishments that the graduates are expected to achieve after three to five years of graduation.

PEO1: Acquire adequate knowledge in the core areas of Civil Engineering, with relevant communication and presentation skills and excel in their chosen profession

PEO2: Engage in research activities, conduct innovative studies and contribute to the advancement of knowledge in the fields of Civil Engineering

PEO3: Exhibit commitment to ethical behaviour and integrity, upholding professional and moral values in their profession

## **IV. Program Outcomes (POs)**

Graduates of the CIVIL ENGINEERING will be able to

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions (WK8)



- PO5:** Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems (WK2 and WK6)
- PO6:** The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment (WK1, WK5, and WK7)
- PO7:** Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws (WK9)
- PO8:** Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams
- PO9:** Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
- PO10:** Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments
- PO11:** Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8)

#### Knowledge and Attitude Profile (WK)

- WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences
- WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline
- WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
- WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
- WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area
- WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
- WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development
- WK8:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues
- WK9:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

#### V. Program Specific Outcomes (PSOs)

Graduates of the CIVIL ENGINEERING will be able to

- PSO1:** Construct civil engineering systems ensuring safety and cost-effective execution
- PSO2:** Develop sustainable and environmental-friendly solutions by adopting green building concepts

#### VI. PEO / PO Mapping

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 Arasur, Coimbatore - 641 407.

Following three levels of correlation should be used:

- 1: Low
- 2: Medium
- 3: High

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| PEO 1      | 3   | 3   | 3   | 2   | 3   | 2   | 2   | 3   | 3   | 3    | 3    | 3    | 3    |
| PEO 2      | 2   | 3   | 3   | 3   | 3   | 2   | 2   | 2   | 2   | 3    | 3    | 2    | 2    |
| PEO 3      | 2   | 2   | 2   | 1   | 1   | 3   | 3   | 2   | 2   | 3    | 2    | 2    | 3    |

### VII. Mapping of Course Outcomes (COs) with Program Outcomes (POs)

| Sem | Course Title                                     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|--------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| I   | Professional Communication - I                   | -   | -   | -   | -   | -   | -   | -   | ✓   | ✓   | -    | ✓    | -    | -    |
|     | Multivariable Calculus and Applications          | ✓   | ✓   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
|     | Engineering Physics                              | ✓   | ✓   | ✓   | -   | ✓   | -   | -   | ✓   | ✓   | -    | -    | -    | -    |
|     | C Programming                                    | ✓   | ✓   | ✓   | ✓   | ✓   | -   | -   | -   | -   | -    | ✓    | -    | -    |
|     | Engineering Graphics                             | ✓   | ✓   | -   | -   | -   | -   | ✓   | ✓   | ✓   | -    | ✓    | ✓    | -    |
|     | Makerspace                                       | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓    | ✓    | -    | -    |
|     | C Programming Laboratory                         | ✓   | ✓   | ✓   | ✓   | -   | -   | -   | -   | -   | -    | ✓    | -    | -    |
|     | Induction Program                                |     |     |     |     |     |     |     |     |     |      |      |      |      |
|     | Universal Human Values                           | -   | -   | -   | -   | -   | ✓   | ✓   | ✓   | -   | -    | ✓    | -    | -    |
|     | தமிழர் மரபு / Heritage of Tamils                 | -   | -   | -   | -   | -   | -   | ✓   | ✓   | -   | ✓    | -    | -    | -    |
|     | Environmental Governance and Sustainability      | ✓   | ✓   | -   | -   | -   | ✓   | ✓   | -   | ✓   | -    | ✓    | -    | -    |
| II  | Professional Skill Development - I               | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓    | ✓    | ✓    | -    |
|     | Professional Communication - II                  | -   | -   | -   | -   | -   | -   | -   | ✓   | ✓   | -    | ✓    | -    | -    |
|     | Mathematical Transforms in Engineering           | ✓   | ✓   | ✓   | -   | ✓   | -   | -   | -   | ✓   | -    | -    | -    | -    |
|     | Physics for Civil Engineers                      | ✓   | ✓   | ✓   | -   | -   | ✓   | -   | -   | -   | -    | -    | ✓    | ✓    |
|     | Engineering Chemistry                            | ✓   | ✓   | ✓   | -   | ✓   | -   | -   | ✓   | ✓   | -    | ✓    | -    | -    |
|     | Python Programming                               | ✓   | ✓   | ✓   | ✓   | -   | -   | -   | -   | -   | -    | ✓    | -    | -    |
|     | Engineering Mechanics                            | ✓   | ✓   | ✓   | ✓   | -   | -   | -   | -   | -   | -    | ✓    | ✓    | -    |
|     | Civil Engineering Perspectives                   | ✓   | ✓   | ✓   | ✓   | -   | -   | ✓   | ✓   | -   | -    | -    | ✓    | -    |
|     | Python Programming Laboratory                    | ✓   | ✓   | ✓   | ✓   | -   | -   | -   | -   | -   | -    | ✓    | -    | -    |
|     | Design Thinking                                  | ✓   | ✓   | ✓   | -   | -   | ✓   | ✓   | ✓   | ✓   | ✓    | ✓    | -    | -    |
|     | தமிழரும் தொழில்நுட்பமும் / Tamils and Technology | -   | -   | -   | -   | -   | -   | ✓   | ✓   | -   | ✓    | -    | -    | -    |
| III | Professional Skill Development - II              | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓    | ✓    | ✓    | -    |
|     | Probability and Statistics                       | ✓   | ✓   | -   | -   | ✓   | -   | -   | -   | -   | -    | -    | -    | -    |
|     | Strength of Materials                            | ✓   | ✓   | -   | -   | ✓   | -   | -   | -   | -   | -    | ✓    | ✓    | -    |
|     | Construction Materials and Techniques            | ✓   | ✓   | -   | -   | ✓   | -   | -   | -   | -   | -    | ✓    | ✓    | ✓    |



| Sem | Course Title                                         | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
|     | Engineering Survey                                   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | -   | -   | -   | -    | ✓    | ✓    | -    |
|     | Concrete Technology                                  | ✓   | ✓   | ✓   | ✓   | -   | ✓   | ✓   | ✓   | ✓   | -    | ✓    | ✓    | ✓    |
|     | Materials Testing Laboratory                         | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | -   | -    | ✓    | ✓    | ✓    |
|     | Surveying Laboratory                                 | ✓   | ✓   | ✓   | -   | ✓   | -   | ✓   | ✓   | -   | -    | -    | -    | -    |
|     | Essence of Indian Traditional Knowledge              | -   | ✓   | -   | ✓   | -   | -   | ✓   | -   | -   | -    | -    | -    | -    |
|     | Professional Skill Development - III                 | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓    | ✓    | -    | -    |
| IV  | Numerical Methods and Partial Differential Equations | ✓   | ✓   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
|     | Fluid Mechanics and Hydraulic Engineering            | ✓   | ✓   | ✓   | ✓   | -   | ✓   | -   | -   | -   | -    | ✓    | ✓    | -    |
|     | Highway Engineering                                  | ✓   | ✓   | ✓   | ✓   | -   | ✓   | ✓   | -   | -   | -    | -    | ✓    | ✓    |
|     | Water Supply and Wastewater Engineering              | ✓   | ✓   | ✓   | ✓   | -   | ✓   | ✓   | -   | -   | -    | -    | ✓    | ✓    |
|     | Geotechnical Engineering I                           | ✓   | ✓   | ✓   | ✓   | -   | ✓   | ✓   | ✓   | -   | -    | ✓    | ✓    | -    |
|     | Water and Wastewater Analysis Laboratory             | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | -    | -    | ✓    | ✓    |
|     | Hydraulic Engineering Laboratory                     | ✓   | ✓   | ✓   | ✓   | -   | ✓   | ✓   | ✓   | -   | -    | -    | ✓    | -    |
|     | Indian Constitution                                  | -   | -   | -   | -   | -   | ✓   | ✓   | ✓   | -   | -    | -    | -    | -    |
|     | Professional Skill Development - IV                  | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓    | ✓    | -    | -    |

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**CIVIL ENGINEERING**  
**Regulations 2025**  
**For the students admitted from 2025 onwards**  
**CHOICE BASED CREDIT SYSTEM**  
**CURRICULUM FOR I - VIII SEMESTERS**



**SEMESTER I**

| No                                                                                    | Course Code | Title                                       | Category | Type          | L | T | P | J | C         |
|---------------------------------------------------------------------------------------|-------------|---------------------------------------------|----------|---------------|---|---|---|---|-----------|
| 1                                                                                     | U25REN101   | Professional Communication - I              | HSMC     | TwL           | 2 | - | 2 | - | 3         |
| 2                                                                                     | U25RMA101   | Multivariable Calculus and Applications     | BSC      | T             | 3 | 1 | - | - | 4         |
| 3                                                                                     | U25RPH01    | Engineering Physics                         | BSC      | TwL           | 2 | - | 2 | - | 3         |
| 4                                                                                     | U25RCSG01   | C Programming                               | ESC      | T             | 3 | - | - | - | 3         |
| 5                                                                                     | U25RMEG01   | Engineering Graphics                        | ESC      | L             | - | - | 4 | - | 2         |
| 6                                                                                     | U25RGE01    | Makerspace                                  | ESC      | L             | - | - | 4 | - | 2         |
| 7                                                                                     | U25RCSG03   | C Programming Laboratory                    | ESC      | L             | - | - | 2 | - | 1         |
| <b>Total</b>                                                                          |             |                                             |          |               |   |   |   |   | <b>18</b> |
| <b>MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)</b> |             |                                             |          |               |   |   |   |   |           |
| 8                                                                                     | U25RMNC01   | Induction Program                           | MNC      | MNC           | - | - | - | - | -         |
| 9                                                                                     | U25RMCC01   | Universal Human Values                      | MCC      | MCC           | 3 | - | - | - | 3         |
| 10                                                                                    | U25RMCC02   | தமிழர் மரபு / Heritage of Tamils            | MCC      | Tamil Courses | 1 | - | - | - | 1         |
| 11                                                                                    | U25RMCC04   | Environmental Governance and Sustainability | MCC      | MCC           | 2 | - | - | - | 2         |
| 12                                                                                    | U25RMCC06   | Professional Skill Development - I          | MCC      | MCC           | - | - | - | - | 1         |
| <b>Total</b>                                                                          |             |                                             |          |               |   |   |   |   | <b>7</b>  |

**SEMESTER II**

| No                                                                                    | Course Code | Title                                            | Category | Type          | L | T | P | J | C         |
|---------------------------------------------------------------------------------------|-------------|--------------------------------------------------|----------|---------------|---|---|---|---|-----------|
| 1                                                                                     | U25REN201   | Professional Communication - II                  | HSMC     | TwL           | 2 | - | 2 | - | 3         |
| 2                                                                                     | U25RMA203   | Mathematical Transforms in Engineering           | BSC      | TwL           | 3 | - | 2 | - | 4         |
| 3                                                                                     | U25RPH06    | Physics for Civil Engineers                      | BSC      | T             | 2 | - | - | - | 2         |
| 4                                                                                     | U25RCY01    | Engineering Chemistry                            | BSC      | TwL           | 2 | - | 2 | - | 3         |
| 5                                                                                     | U25RCSG04   | Python Programming                               | ESC      | T             | 3 | - | - | - | 3         |
| 6                                                                                     | U25RME201   | Engineering Mechanics                            | PCC      | T             | 3 | - | - | - | 3         |
| 7                                                                                     | U25RCE201   | Civil Engineering Perspectives                   | PCC      | TwL           | 1 | - | 4 | - | 3         |
| 8                                                                                     | U25RCSG06   | Python Programming Laboratory                    | ESC      | L             | - | - | 2 | - | 1         |
| <b>Total</b>                                                                          |             |                                                  |          |               |   |   |   |   | <b>22</b> |
| <b>MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)</b> |             |                                                  |          |               |   |   |   |   |           |
| 9                                                                                     | U25RMCC03   | Design Thinking                                  | MCC      | MCC           | 1 | - | 2 | - | 2         |
| 10                                                                                    | U25RMCC05   | தமிழரும் தொழில்நுட்பமும் / Tamils and Technology | MCC      | Tamil Courses | 1 | - | - | - | 1         |



| No    | Course Code | Title                               | Category | Type | L | T | P | J | C |
|-------|-------------|-------------------------------------|----------|------|---|---|---|---|---|
| 11    | U25RMCC07   | Professional Skill Development - II | MCC      | MCC  | - | - | - | - | 1 |
| Total |             |                                     |          |      |   |   |   |   | 4 |

## SEMESTER III

| No                                                                             | Course Code | Title                                   | Category | Type | L | T | P | J | C  |
|--------------------------------------------------------------------------------|-------------|-----------------------------------------|----------|------|---|---|---|---|----|
| 1                                                                              | U25MA302    | Probability and Statistics              | BSC      | TwL  | 2 | - | 2 | - | 3  |
| 2                                                                              | U25CE301    | Strength of Materials                   | PCC      | T    | 3 | 1 | - | - | 4  |
| 3                                                                              | U25CE302    | Construction Materials and Techniques   | PCC      | T    | 3 | - | - | - | 3  |
| 4                                                                              | U25CE303    | Engineering Survey                      | PCC      | T    | 3 | - | - | - | 3  |
| 5                                                                              | U25CE304    | Concrete Technology                     | PCC      | TwL  | 3 | - | 2 | - | 4  |
| 6                                                                              | U25CE305    | Materials Testing Laboratory            | PCC      | L    | - | - | 4 | - | 2  |
| 7                                                                              | U25CE306    | Surveying Laboratory                    | PCC      | L    | - | - | 4 | - | 2  |
| Total                                                                          |             |                                         |          |      |   |   |   |   | 21 |
| MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC) |             |                                         |          |      |   |   |   |   |    |
| 8                                                                              | U25MNC02    | Essence of Indian Traditional Knowledge | MNC      | MNC  | 1 | - | - | - | -  |
| 9                                                                              | U25RMCC08   | Professional Skill Development - III    | MCC      | MCC  | - | - | - | - | 1  |
| Total                                                                          |             |                                         |          |      |   |   |   |   | 1  |

## SEMESTER IV

| No                                                                             | Course Code | Title                                                | Category | Type | L | T | P | J | C  |
|--------------------------------------------------------------------------------|-------------|------------------------------------------------------|----------|------|---|---|---|---|----|
| 1                                                                              | U25MA403    | Numerical Methods and Partial Differential Equations | BSC      | T    | 3 | - | - | - | 3  |
| 2                                                                              | U25CE401    | Fluid Mechanics and Hydraulic Engineering            | PCC      | T    | 3 | - | - | - | 3  |
| 3                                                                              | U25CE402    | Highway Engineering                                  | PCC      | T    | 3 | - | - | - | 3  |
| 4                                                                              | U25CE403    | Water Supply and Wastewater Engineering              | PCC      | T    | 3 | - | - | - | 3  |
| 5                                                                              | U25CE404    | Geotechnical Engineering I                           | PCC      | TwL  | 3 | - | 2 | - | 4  |
| 6                                                                              | U25CE405    | Water and Wastewater Analysis Laboratory             | PCC      | LwP  | - | - | 2 | 2 | 2  |
| 7                                                                              | U25CE406    | Hydraulic Engineering Laboratory                     | PCC      | L    | - | - | 2 | - | 1  |
| 8                                                                              | -           | Open Elective I                                      | OEC      | T    | 3 | - | - | - | 3  |
| Total                                                                          |             |                                                      |          |      |   |   |   |   | 22 |
| MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC) |             |                                                      |          |      |   |   |   |   |    |
| 9                                                                              | U25MNC03    | Indian Constitution                                  | MNC      | MNC  | 1 | - | - | - | -  |
| 10                                                                             | U25RMCC09   | Professional Skill Development - IV                  | MCC      | MCC  | - | - | - | - | 1  |
| Total                                                                          |             |                                                      |          |      |   |   |   |   | 1  |

T - Theory, L - Laboratory, TwL - Theory with Laboratory, TwP - Theory with Project

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## SEMESTER I

| U25REN101 | Professional Communication - I<br>(Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC) | Category: HSMC |   |   |   |   |
|-----------|------------------------------------------------------------------------------------------------------|----------------|---|---|---|---|
|           |                                                                                                      | L              | T | P | J | C |
|           |                                                                                                      | 2              | 0 | 2 | 0 | 3 |

## COURSE OBJECTIVES:

- To develop professional communication skills for academic, technical and workplace environments
- To enhance the listening skills and facilitate effective pronunciation
- To enable students to communicate confidently in individual and team-based situations

## COURSE OUTCOMES:

|                                                                                                   |            |
|---------------------------------------------------------------------------------------------------|------------|
| CO 1: Use appropriate vocabulary and grammatical structures in professional communication         | Understand |
| CO 2: Communicate confidently in academic, social and workplace situations                        | Apply      |
| CO 3: Develop reading and writing skills for technical and professional purposes                  | Apply      |
| CO 4: Infer and present information using appropriate communication strategies                    | Analyze    |
| CO 5: Demonstrate effective listening, presentation, and teamwork skills in professional contexts | Apply      |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | -    | 1    | -    | -    |
| CO 2       | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | -    | 1    | -    | -    |
| CO 3       | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | -    | 1    | -    | -    |
| CO 4       | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | -    | 1    | -    | -    |
| CO 5       | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | -    | 1    | -    | -    |

## SYLLABUS:

## UNIT I: FOUNDATIONS OF PROFESSIONAL COMMUNICATION

6 + 6

Verbal, Non-verbal and Digital Communication - Word chain - Professional Etiquette - Self-Introduction and Elevator Pitch - Growth Mindset and Workplace Communication - Cross-cultural Communication - Professional Terminology - AI-assisted Communication Tools

## UNIT II: PROFESSIONAL READING AND WRITING

6 + 6

Reading Technical Articles - Error correction - Manuals and SOPs - Infographics and Data - Email Etiquette - Email Writing - AI-assisted Writing Tools - Ethical Use of AI - Verbal Analogy

## UNIT III: LISTENING AND INTERPERSONAL COMMUNICATION

6 + 6

Listening Barriers - Note-taking Techniques - Listening for Problem Solving - Team Communication - Conflict Resolution - Workplace Discussions - Idioms and Phrases



#### UNIT IV: DIGITAL COMMUNICATION AND PRESENTATION SKILLS

6 + 6

Storytelling Techniques - Discourse markers, linkers and cohesive devices - Data Presentation - Presentation Anxiety Management - Digital Presentation Platforms - Branding - Commonly Confused Words

#### UNIT V: EMPLOYABILITY AND PROFESSIONALISM

6 + 6

Prefixes, Suffixes and Root Words - LinkedIn Profile - Interview Skills - Group Discussion Strategies - Art of Persuasion - Entrepreneurial Communication - AI in Future Workplace

#### LIST OF EXPERIMENTS

1. Self-Introduction
2. Group Presentation
3. Listening to TED Talks
4. Listening to Documentaries
5. Digital Profiling

#### CONTACT PERIODS:

Lecture: 30 Periods      Tutorial: - Periods      Practical: 30 Periods      Project: - Periods      Total: 60 Periods

#### TEXTBOOKS:

1. Ashraf Rizvi, Effective Technical Communication, 3rd Edition, McGraw-Hill Education, 2023
2. Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice, 4th Edition, Oxford University Press, 2022
3. Sanjay Kumar & Pushp Lata, Communication Skills, 3rd Edition, Oxford University Press, New Delhi, 2018

#### REFERENCES:

1. Stephen E. Lucas, The Art of Public Speaking, 14th Edition, McGraw Hill Education, New York, 2023
2. Dale Carnegie, The Quick and Easy Way to Effective Speaking, Updated Edition, Simon & Schuster, New York, 2019
3. Matt Abrahams, Think Faster, Talk Smarter: How to Speak Successfully When You're Put on the Spot, Simon & Schuster, New York, 2024

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## SEMESTER I

| U25RMA101 | Multivariable Calculus and Applications<br>(Common to all programmes) | Category: BSC |   |   |   |   |
|-----------|-----------------------------------------------------------------------|---------------|---|---|---|---|
|           |                                                                       | L             | T | P | J | C |
|           |                                                                       | 3             | 1 | 0 | 0 | 4 |

## COURSE OBJECTIVES:

- To provide a comprehensive knowledge of multivariable calculus, including, partial derivatives integral calculus, and vector calculus
- For constructing more convenient for students to apply their calculus knowledge to their various fields of study
- To develop skills in solving first and second order linear differential equations for engineering applications

## COURSE OUTCOMES:

- CO 1:** Explain the concepts of multivariable differential calculus, estimate the extreme values and Taylor's Understand formula of two variable functions
- CO 2:** Apply integral calculus to evaluate double integrals over various regions and compute area and volume using double integration Apply
- CO 3:** Apply vector calculus to compute directional derivative, divergence, curl, Green's, Stokes' and Gauss divergence theorems Apply
- CO 4:** Solve first order ordinary differential equations, model physical phenomena, determine appropriate methods for solving them, and interpret the results Apply
- CO 5:** Formulate second-order differential equations, solve the equations, and interpret the solutions for physical models Apply

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 2       | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 3       | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 4       | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 5       | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |

## SYLLABUS:

## UNIT I: DIFFERENTIAL CALCULUS

9 + 3

Functions of two variables – Partial derivatives – Total derivatives – Taylor's formula for functions of two variables – Extreme Values

## UNIT II: INTEGRAL CALCULUS

9 + 3

UNIT II Double integrals – Over rectangles – Over general regions – Fubini's theorem (statement only), Area and Volume by double integration – Reversing the order of integration

  
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**UNIT III: VECTOR CALCULUS**

9 + 3

Differentiation in vector field – Gradient of a scalar field – Directional derivative – Divergence of a vector field – Curl of a vector field – Integration in vector field – Line integrals – Work– circulation and flux – Path independence – Conservative fields – Green's – Gauss divergence and Stoke's theorems

**UNIT IV: FIRST ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS**

9 + 3

Basic concepts of ordinary differential equations – Separable and exact differential equations – Integrating factors and first-order linear differential equations – Mathematical modelling of real-world problems

**UNIT V: SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS**

9 + 3

Homogeneous linear equations of second order – linearity principle – second order homogeneous equations with constant coefficients – Euler–Cauchy equation – Non-homogeneous linear second order-solution by variation of parameters

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: 15 Periods      Practical: - Periods      Project: - Periods      Total: 60 Periods

**TEXTBOOKS:**

1. Thomas G. B. and Finney R. L., "Calculus and Analytic Geometry", Pearson Education, New Delhi, 2012
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Pvt Ltd, New Delhi, 2012

**REFERENCES:**

1. Wylie C. R. and Barrett L. C., "Advanced Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2013
2. Peter V.O Neil, "Advanced Engineering Mathematics", Cengage, New Delhi, 2010
3. Michael D. G., "Foundations of Applied Mathematics", Dover Publications, INC, New York, 2013
4. Gilbert Strang, "Calculus", Wellesley Cambridge Press, USA, 2017

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## SEMESTER I &amp; II

| U25RPH01 | Engineering Physics<br>(Common to all programmes) | Category: BSC |   |   |   |   |
|----------|---------------------------------------------------|---------------|---|---|---|---|
|          |                                                   | L             | T | P | J | C |
|          |                                                   | 2             | 0 | 2 | 0 | 3 |

## COURSE OBJECTIVES:

- To understand the fundamental mechanical and thermal properties of solids and fluids for real-world engineering applications
- To explore advanced concepts in ultrasonic waves and their applications in imaging, testing, and sensing technologies
- To gain insights into semiconductor physics and photonics for their role in modern electronic and optical systems

## COURSE OUTCOMES:

|       |                                                                                                                             |       |
|-------|-----------------------------------------------------------------------------------------------------------------------------|-------|
| CO 1: | Apply the stress-strain behavior concepts in engineering materials and structures                                           | Apply |
| CO 2: | Apply principles of heat transfer and fluid mechanics to evaluate thermal systems and engineering applications              | Apply |
| CO 3: | Demonstrate the operation of ultrasonic wave generation and detection techniques for industrial and biomedical applications | Apply |
| CO 4: | Analyze the electrical properties and carrier transport mechanisms in semiconductors and semiconductor devices              | Apply |
| CO 5: | Demonstrate the principles of lasers and optical fibers in communication, sensing, and biomedical applications              | Apply |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 1   | -   | 1   | -   | -   | 1   | 1   | -    | -    | -    | -    |
| CO 2       | 3   | 2   | 1   | -   | 1   | -   | -   | 1   | 1   | -    | -    | -    | -    |
| CO 3       | 3   | 2   | 1   | -   | 1   | -   | -   | 1   | 1   | -    | -    | -    | -    |
| CO 4       | 3   | 2   | 1   | -   | 1   | -   | -   | 1   | 1   | -    | -    | -    | -    |
| CO 5       | 3   | 2   | 1   | -   | 1   | -   | -   | 1   | 1   | -    | -    | -    | -    |

## SYLLABUS:

## UNIT I: MECHANICAL PROPERTIES OF SOLIDS

6 + 6

Modulus of Elasticity – Stress-strain diagram – Poisson's ratio – Elastic and plastic deformation – Stress-strain behaviour in metals, polymers and ceramics – Bending Moment – Cantilever – Applications (GIRDERS, MEMS)

## UNIT II: FUNDAMENTALS OF HEAT TRANSFER AND FLUIDS

6 + 6

Heat transfer – Thermal expansion – Heat conductivity – Lee's Disc method – Surface tension – Viscosity – Coefficient of viscosity using Poiseuille's flow experiment – Solar water heater – Microwave oven – Heat exchangers – Radiators – Cooling towers



**UNIT III: ULTRASONICS AND ITS APPLICATIONS**

6 + 6

Properties of Ultrasonic waves – Production of ultrasonic waves – Piezoelectric Oscillator – Magnetostriction Oscillator – Velocity measurement of Ultrasonic waves – SONAR – Non-Destructive Testing – Ultrasound imaging – Ultrasonic scanning methods

**UNIT IV: SEMICONDUCTOR PHYSICS**

6 + 6

Properties – Direct and Indirect bandgap-semiconductor – Intrinsic and extrinsic Semiconductors – Carrier concentration in n-type semiconductor – P-type semiconductor – Carrier Transport in Semiconductor – Hall effect – Ohmic contacts – Schottky diode

**UNIT V: PHOTONICS**

6 + 6

Interaction of Radiation with Matter – Laser Characteristics – Population Inversion – CO<sub>2</sub> laser – Semiconductor Diode Laser – Laser applications – Total Internal Reflection – Structure and working principle of Optical fibre – Fiber optic Endoscopy – Fiber optic sensors

**LIST OF EXPERIMENTS**

1. Determine the moduli of elasticity of the given beams and evaluate them for different structural applications. (High/Medium/Low modulus)
2. Evaluate the shear moduli of the different materials and rank them for suitable applications with reference to their strength
3. Select the most effective thermal insulation material from mica, cardboard, and glass for optimal heat protection
4. Determine the Viscosity of Liquids Using Poiseuille's Method and Identify the Fastest-Flowing Liquid
5. Measure the speed of ultrasound in liquids and calculate their compressibility for different hydraulic purposes
6. Categorize the specified semiconducting materials according to their energy bandgap values
7. Determine a semiconducting material's Hall coefficient and identify its type
8. Determination of wavelength of given laser and the particle size of the given samples using diffraction method
9. Use an optical fiber to measure its light-gathering capacity and calculate the propagation angle
10. Calculate the surface tension of different liquids and examine how surfactants affect it
11. Determination of wavelength of various spectral lines by using spectrometer and grating
12. Determination of velocity of light passing through glass medium using spectrometer

**CONTACT PERIODS:**

Lecture: 30 Periods      Tutorial: - Periods      Practical: 30 Periods      Project: - Periods      Total: 60 Periods

**TEXTBOOKS:**

1. M.N. Avadhanulu, P.G. Kshirsagar, and T.V.S. Arun Murthy, "A Textbook of Engineering Physics", 11th edition, S. Chand Publishing, New Delhi, 2022
2. R.K. Gaur and S.L. Gupta, "Engineering Physics", 8th edition, Dhanpat Rai Publications, New Delhi, 2017

**REFERENCES:**

1. Harald Ibach and Hans Luth, "Solid State Physics: An Introduction", 4th edition, Springer Publications, 2020
2. Charles Kittel, revised by David Pines (Editor) "Introduction to Solid State Physics", 9th edition, Wiley & Sons, US, 2020
3. H.K. Malik and A.K. Singh "Engineering Physics" Publisher: McGraw Hill Education India, 2022
4. [https://onlinecourses.nptel.ac.in/noc20\\_cy17/preview](https://onlinecourses.nptel.ac.in/noc20_cy17/preview)

  
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## SEMESTER I

| U25RCSG01 | C Programming<br>(Common to all programmes) | Category: ESC |   |   |   |   |
|-----------|---------------------------------------------|---------------|---|---|---|---|
|           |                                             | L             | T | P | J | C |
|           |                                             | 3             | 0 | 0 | 0 | 3 |

## COURSE OBJECTIVES:

- To enable students to understand the fundamentals of problem-solving and C programming, including algorithms, flowcharts, pseudocode, and the structure of a C program
- To develop programming skills using input/output operations, control structures, arrays, strings, functions, pointers, and dynamic memory allocation
- To introduce user-defined data types such as structures and unions for handling complex data effectively
- To familiarize students with file handling concepts and develop C-based solutions for real-world applications

## COURSE OUTCOMES:

- CO 1:** Explain fundamental programming concepts, problem-solving techniques, and the basic structure of C Understand programs
- CO 2:** Develop C programs using input/output functions, operators, decision-making, and iterative control structures Apply
- CO 3:** Implement arrays and string handling concepts to solve data processing and real-world applications Apply
- CO 4:** Develop modular and efficient programs using functions, recursion, pointers, and dynamic memory allocation techniques Apply
- CO 5:** Apply user-defined data types and file handling operations to manage and process data effectively Apply

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 2       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | -    | -    |
| CO 3       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | -    | -    |
| CO 4       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | -    | -    |
| CO 5       | 3   | 2   | 1   | 1   | 1   | -   | -   | -   | -   | -    | 2    | -    | -    |

## SYLLABUS:

## UNIT I: PROBLEM SOLVING APPROACHES AND C PROGRAMMING BASICS

10

Problem Solving Techniques: Problem Statement and Analysis – Problem Modelling – Identifying Input and Output Requirements – Algorithms – Flowcharts – Pseudocode for Solving Basic Scientific and Business Problems. Introduction to C: Characteristics of C – Structure of a C Program – Compiling and Executing C Program – Pre-processor Directives – Tokens – Character Set – Keywords – Identifiers – Constants – Variables – Operators – Data Types – Typecasting – Input/Output Statements in C

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**UNIT II: DECISION CONTROL AND LOOPING STATEMENTS**

8

Conditional Statements: if Statement – if-else Statement – Nested if Statements – else-if Ladder – switch Statement. Looping Statements: while Loop – do-while Loop – for Loop – Nested Loops. Jump Statements: break Statement – continue Statement – goto Statement

**UNIT III: ARRAYS AND STRINGS**

9

Arrays: Declaration and Initialization – Accessing and Manipulating Array Elements – One-Dimensional Arrays – Two-Dimensional Arrays – Applications of Arrays. Strings: Declaration and Initialization of Strings – String Handling Functions – String Arrays

**UNIT IV: FUNCTIONS AND POINTERS**

9

Functions: Definition – Function Call – Function Prototype – Return Statement – Types of Functions – Recursive Functions – Command Line Arguments. Pointers: Declaration and Initialization – Pointer Arithmetic – Passing Arguments by Value and by Reference – Pointer to Pointer – Pointers and Arrays. Dynamic Memory Allocation: malloc(), calloc(), realloc(), free()

**UNIT V: USER-DEFINED DATA TYPES AND FILE MANAGEMENT**

9

Structures: Declaration and Initialization – Accessing Structure Members – Arrays of Structures – Nested Structures – Pointer to Structures. Unions – Storage Classes. Files: File Access Methods – File Modes – File Operations – File Pointers – Binary File Operations

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 45 Periods

**TEXTBOOKS:**

1. Reema Thareja, "Computer Fundamentals and Programming in C", 3rd Edition, Oxford University Press, 2023
2. Brian W. Kernighan and Dennis Ritchie, "The C Programming Language", 2nd Edition, Pearson, 2015

**REFERENCES:**

1. Paolo Ferragina and Fabrizio Luccio, "Computational Thinking First Algorithms", Then Code", 1st Edition, Springer International Publishing, 2018
2. Paul Deitel and Harvey Deitel, "C How to Program", 7th Edition, Pearson Publication
3. Juneja, B. L and Anita Seth, "Programming in C", 1st Edition, Cengage Learning India Pvt. Ltd., 2011
4. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", 1st Edition, Oxford University Press, 2009

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## SEMESTER I &amp; II

| U25RMEG01 | Engineering Graphics<br>(Common to AD, AM, BM, CB, CE, CH, CHY, CS, EC, EE, ENG, IT,<br>Maths, ME, MI, PHY, S & H (IET), SC, Tamil) | Category: ESC |   |   |   |   |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------|---------------|---|---|---|---|
|           |                                                                                                                                     | L             | T | P | J | C |
|           |                                                                                                                                     | 0             | 0 | 4 | 0 | 2 |

## COURSE OBJECTIVES:

- To impart knowledge of BIS standards and conventions in engineering graphics for the accurate construction of curves, projections and developments
- To develop the ability to visualize and represent 3D objects in 2D space through orthographic projections, sectional views and development of surfaces
- To enhance the drafting skills to interconvert between isometric and orthographic views for practical engineering

## COURSE OUTCOMES:

- CO 1: Illustrate engineering curves with BIS standards for effective engineering communication Understand
- CO 2: Apply the principles of orthographic projection to represent points, straight lines, plane surfaces, and solids Understand  
on engineering drawing sheets
- CO 3: Construct projections of truncated and frustums solids and develop the lateral surfaces of solids Understand
- CO 4: Convert the isometric views of simple objects to orthographic views and vice versa Understand

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | -   | -   | -   | -   | 2   | 1   | 2   | -    | 2    | 2    | -    |
| CO 2       | 3   | 1   | -   | -   | -   | -   | 1   | 1   | 2   | -    | -    | 2    | -    |
| CO 3       | 3   | 1   | -   | -   | -   | -   | -   | 1   | 2   | -    | -    | 2    | -    |
| CO 4       | 3   | 2   | -   | -   | -   | -   | 1   | 1   | 2   | -    | 2    | 2    | -    |

## LIST OF EXPERIMENTS

1. Introduction, drawing instruments and its uses, sheet layout, BIS conventions, lines, lettering and dimensioning practices lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. agency, parallelism, inclination and perpendicularity (Not for Exam)
2. Manual construction of ellipse, parabola, and hyperbola by eccentricity method
3. Construction of involute of square and circle by manual drafting
4. Projection of points in all four quadrants by manual drafting
5. Projection of lines inclined to both horizontal and vertical planes by manual drafting
6. Projection of planes inclined to both horizontal and vertical planes by manual drafting
7. Projection of solids inclined to one plane and parallel to other planes
8. Section of solids with base resting on HP
9. Development of lateral surfaces of solids with base on HP
10. Construction of isometric views of simple and truncated solids
11. Sketching orthographic views from pictorial representation of 3D objects
12. Sketching simple components using modelling software



**CONTACT PERIODS:**

Lecture: - Periods      Tutorial: - Periods      Practical: 60 Periods      Project: - Periods      Total: 60 Periods

**TEXTBOOKS:**

1. N.D. Bhatt and V.M. Panchal, "Engineering Drawing", Charotar Publishing House, Gujarat, 55th edition, 2025
2. K. Venugopal and V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited, 2022
3. D.M.Kulkarni, A.P.Rastogi and A.K.Sarkar, "Engineering Graphics with AutoCAD", PHI Learning Private Limited, New Delhi, Revised Edition, 2021

**REFERENCES:**

1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2017
2. Sam Tickoo, "AutoCAD 2024 for Engineers and Designers", Dreamtech Press, 2024

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## SEMESTER I &amp; II

| U25RGE01 | Makerspace<br>(Common to all programmes) | Category: ESC |   |   |   |   |
|----------|------------------------------------------|---------------|---|---|---|---|
|          |                                          | L             | T | P | J | C |
|          |                                          | 0             | 0 | 4 | 0 | 2 |

## COURSE OBJECTIVES:

- Apply fundamental fabrication, electrical, electronics, programming, and digital manufacturing techniques for engineering applications
- Develop practical skills in prototyping, automation, robotics, and emerging technologies through experiential learning activities
- Design and construct interdisciplinary engineering prototypes by integrating concepts from multiple engineering domains

## COURSE OUTCOMES:

|                                                                                                                    |        |
|--------------------------------------------------------------------------------------------------------------------|--------|
| CO 1: Fabricate simple components using basic mechanical engineering tools and additive manufacturing              | Apply  |
| CO 2: Carry out electrical wiring installations applying safety measures in domestic applications                  | Apply  |
| CO 3: Interface electronic devices to develop functional engineering solutions                                     | Apply  |
| CO 4: Illustrate the role of automation and artificial intelligence in engineering applications                    | Apply  |
| CO 5: Develop interdisciplinary engineering prototype addressing specific problems through teamwork and innovation | Create |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | -   | -   | 3   | -   | -   | 3   | 2   | -    | 2    | -    | -    |
| CO 2       | 3   | 2   | -   | -   | 3   | -   | -   | 3   | 2   | -    | 2    | -    | -    |
| CO 3       | 3   | 2   | -   | -   | 3   | -   | -   | 3   | 2   | -    | 2    | -    | -    |
| CO 4       | 2   | -   | -   | -   | 3   | -   | -   | -   | -   | -    | 2    | -    | -    |
| CO 5       | 3   | 3   | 2   | 1   | 3   | 2   | 2   | 3   | 3   | 2    | 2    | -    | -    |

## LIST OF EXPERIMENTS

## MODULE 1: FABRICATION AND MAKING SKILLS (10 Hours)

1. Welding procedure, selection & safety Measures - Hands-on session for preparing base material and joining of steel materials using arc welding
2. Study on basic pipe connections with different joining components.
3. Demo on laser cutting of acrylic boards and wire arc welding

## MODULE 2: DIGITAL DESIGN AND RAPID PROTOTYPING (10 Hours)

4. 3D Modelling of simple components using software's
5. Fabrication of simple components / parts using 3D printers
6. Demonstration of assembly modelling of components

## MODULE 3: AUTOMATION AND ROBOTICS (8 Hours)

7. Demonstration on mechatronics components/systems



8. Demonstration on basic robotics system
9. Demonstration on automobiles, performance measures
10. Demonstration on programmable logic control circuit

**MODULE 4: ELECTRICAL PRACTICES (10 Hours)**

11. Study on basic electrical installation tools, equipment and safety measures
12. Basic electrical wiring and connections such as soldering, fuses, earthing, miniature circuit breakers and switch wiring
13. Hands-on session of electrical connections for lightings, fans, calling bells etc
14. Hands-on session of electrical connections for motors and uninterruptible power supply

**MODULE 5: ELECTRONICS AND EMBEDDED SYSTEMS (8 Hours)**

15. Electronic components, equipment and safety measures
16. Interfacing of sensors and actuator with microcontrollers (Arduino)
17. Integration of electronic circuits with IoT system
18. Interfacing of components with printed circuit board

**MODULE 6: ARTIFICIAL INTELLIGENCE (4 Hours)**

19. Demonstration on artificial intelligence technologies
20. Demonstration on AR/VR technologies

**MODULE 7: INTERDISCIPLINARY PROTOTYPE CHALLENGE (10 Hours)**

21. Students work in teams to develop and demonstrate an interdisciplinary product/prototype for the problem identified

**CONTACT PERIODS:**

Lecture: - Periods      Tutorial: - Periods      Practical: 60 Periods      Project: - Periods      Total: 60 Periods

**TEXTBOOKS:**

1. Mikell P. Groover, "Fundamentals of Modern Manufacturing: Materials, Processes and Systems", 7th Edition, Wiley, 2020
2. Simon Monk, "Programming Arduino: Getting Started with Sketches", 3rd Edition, McGraw-Hill Education, 2022
3. Richard H. Barnett, "Introduction to Mechatronics and Measurement Systems", 6th Edition, McGraw-Hill Education, 2023
4. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apress, 2016

**REFERENCES:**

1. Arduino Documentation – <https://www.arduino.cc>
2. Tinkercad Learning Portal – <https://www.tinkercad.com>
3. FreeCAD Documentation – <https://www.freecad.org>
4. Ultimaker Cura Resources – <https://ultimaker.com/software/ultimaker-cura>
5. ESP32 Documentation – <https://docs.espressif.com>

  
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## SEMESTER I

| U25RCSG03 | C Programming Laboratory<br>(Common to all programmes) | Category: ESC |   |   |   |   |
|-----------|--------------------------------------------------------|---------------|---|---|---|---|
|           |                                                        | L             | T | P | J | C |
|           |                                                        | 0             | 0 | 2 | 0 | 1 |

## COURSE OBJECTIVES:

- To provide hands-on experience in problem solving and structured programming using the C programming language
- To develop programming skills using control structures, arrays, strings, functions, pointers, and dynamic memory management techniques
- To enable students to design and implement applications using user-defined data types and file handling concepts for real-world problems

## COURSE OUTCOMES:

- CO 1: Demonstrate problem-solving techniques, algorithms, flowcharts, and basic C programming constructs in program development Apply
- CO 2: Develop C programs using input/output operations, decision-making statements, and iterative constructs Apply
- CO 3: Demonstrate the use of arrays and strings for data processing and manipulation Apply
- CO 4: Develop modular applications using functions, recursion, pointers, and dynamic memory management techniques Apply
- CO 5: Develop applications using structures, unions, storage classes, and file handling operations for data management Apply

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 2   | 1   | -   | -   | -   | -   | -   | -    | 1    | -    | -    |
| CO 2       | 3   | 2   | 2   | 1   | -   | -   | -   | -   | -   | -    | 1    | -    | -    |
| CO 3       | 3   | 2   | 2   | 1   | -   | -   | -   | -   | -   | -    | 1    | -    | -    |
| CO 4       | 3   | 2   | 2   | 1   | -   | -   | -   | -   | -   | -    | 1    | -    | -    |
| CO 5       | 3   | 2   | 2   | 1   | -   | -   | -   | -   | -   | -    | 1    | -    | -    |

## LIST OF EXPERIMENTS

1. Design and implementation of algorithms, flowcharts, and pseudo code for basic problem-solving applications
2. Development of C programs demonstrating data types, operators, and formatted input/output operations
3. Implementation of decision-making applications using conditional statements and switch-case constructs
4. Development of iterative applications using looping and loop control statements
5. Design and implementation of console-based applications for real-world mathematical and logical problem solving
6. Implementation of one-dimensional array operations for searching, sorting, and statistical analysis
7. Development of matrix manipulation applications using two-dimensional arrays
8. Design and implementation of string processing applications using standard string handling functions
9. Development of modular applications using user-defined functions and recursive techniques
10. Implementation of applications demonstrating parameter passing mechanisms using call by value and call by reference
11. Development of applications using pointers, pointer arithmetic, and array-pointer relationships



12. Implementation of dynamic memory management applications using malloc(), calloc(), realloc(), and free()
13. Design and implementation of applications using structures, nested structures, unions, and storage classes
14. Development of file processing applications using text and binary file operations in C
15. Implementation of command-line and console-based applications integrating functions, pointers, structures, and file management concepts for real-world use cases

**CONTACT PERIODS:**

Lecture: - Periods      Tutorial: - Periods      Practical: 30 Periods      Project: - Periods      Total: 30 Periods

**REFERENCES:**

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson Education, 2015
2. Reema Thareja, "Computer Fundamentals and Programming in C", 3rd Edition, Oxford University Press, 2023
3. Yashavant Kanetkar, "Let Us C", 17th Edition, BPB Publications, 2023
4. Byron Gottfried, "Programming with C", 4th Edition, Schaum's Outline Series, McGraw Hill Education

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## SEMESTER I

|           |                                                                                         |               |   |   |   |   |
|-----------|-----------------------------------------------------------------------------------------|---------------|---|---|---|---|
| U25RMNC01 | Induction Program<br>(Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC) | Category: MNC |   |   |   |   |
|           |                                                                                         | L             | T | P | J | C |
|           |                                                                                         | 3 Weeks       |   |   |   | 0 |

## GUIDELINES:

Students come with diverse thoughts, backgrounds and preparations. It is important to assist them adjust in the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Keeping the above thought in mind AICTE proposes a 3-week induction program for the UG students entering the institution before the commencement of normal classes which will start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, set a healthy daily routine, create bonding in the batch as well as between faculty, develop awareness, sensitivity and understanding of the self, society at large, and nature. The following are the activities under the induction program in which the student should be fully and actively engaged throughout the entire duration of the program.

**Physical Activity:** To inculcate team spirit, competitiveness, group cohesion and bonding as well as physical & mental health, physical activities like team sports, yoga, physical exercises should be conducted daily during early morning & evening. Activities like gardening may also be encouraged.

**Creative Arts:** Every student should choose one skill related to arts /visual arts/ performing arts like painting, sculpture, pottery, music, dance etc. to develop a sense of aesthetics and also to enhance creativity. The student should pursue it daily for the duration of the program.

**Universal Human Values:** Universal Human Values module will help the student to explore oneself and experience the joy of learning, stand up to peer pressure, take decisions with courage, create awareness about the relationship with colleagues and supporting staff in the hostel and department, etc.

**Literary:** Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

**Proficiency Modules:** To establish the command over skills like English, a computer familiarity etc. these modules can be taught earlier so that when norm

## CONTACT PERIODS:

Lecture: - Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 0 Periods



## SEMESTER I

| U25RMCC01 | Universal Human Values<br>(Common to all programmes) | Category: MCC |   |   |   |   |
|-----------|------------------------------------------------------|---------------|---|---|---|---|
|           |                                                      | L             | T | P | J | C |
|           |                                                      | 3             | 0 | 0 | 0 | 3 |

## COURSE OBJECTIVES:

- To understand the significance of universal human values and their role in complementing technical, intellectual, and professional skills for holistic development.
- To apply a holistic perspective in addressing personal, societal, professional, and environmental challenges through ethical and value-based approaches.
- To demonstrate responsible citizenship, professional ethics, mutual respect, and sustainable practices that contribute positively to society, industry, and the environment.

## COURSE OUTCOMES:

- CO 1:** Explain the significance of Universal Human Values and self-exploration in developing a holistic **Understand** perspective, enabling students to harmonize technical competence with ethical responsibility and value-based living.
- CO 2:** Differentiate the needs of the Self and the Body, and apply self-exploration to develop healthy habits, **Understand** value-based decision-making, and holistic well-being.
- CO 3:** Explain the concepts of natural acceptance, competence, and respect, and apply them to foster **Understand** harmonious relationships, resolve social conflicts, promote value education for children, and develop holistic perspectives for societal development.
- CO 4:** Demonstrate an understanding of the interconnectedness of existence and integrate holistic perspectives **Apply** into academic, professional, and societal contexts.
- CO 5:** Apply human values and professional knowledge to promote sustainable development, family harmony, **Apply** societal well-being, and responsible participation in nature.

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | -   | -   | -   | -   | -   | 3   | 3   | -   | -   | -    | 3    | -    | -    |
| CO 2       | -   | -   | -   | -   | -   | 3   | 3   | 3   | -   | -    | 3    | -    | -    |
| CO 3       | -   | -   | -   | -   | -   | 3   | 3   | -   | -   | -    | 3    | -    | -    |
| CO 4       | -   | -   | -   | -   | -   | 3   | 3   | -   | -   | -    | 3    | -    | -    |
| CO 5       | -   | -   | -   | -   | -   | 3   | 3   | 3   | -   | -    | 3    | -    | -    |

## SYLLABUS:

## UNIT I: INTRODUCTION TO VALUE EDUCATION

9

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) – Understanding Value Education – Self-exploration as the Process for Value Education – Continuous Happiness and Prosperity – the Basic Human Aspirations – Happiness and Prosperity: Current Scenario – Method to Fulfil the Basic Human Aspirations. Self-Exploration Activity Topics: Sharing about Oneself, Exploring Human Consciousness

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**UNIT II: HARMONY IN THE HUMAN BEING**

9

Understanding Human being as the Co-existence of the Self and the Body – Distinguishing between the Needs of the Self and the Body – The Body as an Instrument of the Self – Understanding Harmony in the Self – Harmony of the Self with the Body – Programme to ensure self-regulation and Health. Self-Exploration Activity Topics: Exploring the difference of Needs of Self and Body – Exploring Sources of Imagination in the Self – Exploring Harmony of Self with the Body

**UNIT III: HARMONY IN THE FAMILY AND SOCIETY**

9

Harmony in the Family – the Basic Unit of Human Interaction – 'Trust': the Foundational Value in Relationship – 'Respect': as the Right Evaluation – Other Feelings, Justice in Human-to-Human Relationship – Understanding Harmony in the Society – Vision for the Universal Human Order. Self-Exploration Activity Topics: Exploring the Feeling of Trust – Exploring the Feeling of Respect – Exploring Systems to fulfil Human Goal

**UNIT IV: HARMONY IN THE NATURE/EXISTENCE**

9

Understanding Harmony in the Nature – Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders – Realizing Existence as Co-existence at All Levels – The Holistic Perception of Harmony in Existence. Self-Exploration Activity Topics: Exploring the Four Orders of Nature – Exploring Co-existence in Existence

**UNIT V: HARMONY ON PROFESSIONAL ETHICS : HOLISTIC UNDERSTANDING**

9

Natural Acceptance of Human Values – Definitiveness of (Ethical) Human Conduct – A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order – Competence in Professional Ethics – Holistic Technologies, Production Systems and Management Models: Typical Case Studies – Strategies for Transition towards Value-based Life and Profession. Self-Exploration Activity Topics: Exploring Natural Acceptance – Exploring Ethical Human Conduct – Exploring Humanistic Models in Education – Exploring Steps of Transition towards Universal Human Order

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 45 Periods

**TEXTBOOKS:**

1. R R Gaur, R. Asthana, G P Bagaria, "A Foundation course in Human Values and Professional Ethics", 3rd Edition, Excel Books, New Delhi, 2024. ISBN 978-93-87034- 47-1
2. Prof. K. V. Subba Raju, "Success Secrets for Engineering Students", Smart Student Publications, 3rd Edition, 2013.
3. R R Gaur, R Asthana, G P Bagaria, "Teachers Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

**REFERENCES:**

1. Ivan Illich, "Energy & Equity", The Trinity Press, Worcester, and HarperCollins, USA, 1974.
2. E. F. Schumaner, "Small is Beautiful: a study of economics as if people mattered.", Blond & Briggs, Britain, 1973.
3. A Nagraj, "Jeevan Vidya ek Parichay", Divya Path Sansthan, Amarkantak, 1998.





## SEMESTER I

| U25RMCC02 | தமிழர் மரபு / Heritage of Tamils<br>(Common to all programmes) | Category: MCC |   |   |   |   |
|-----------|----------------------------------------------------------------|---------------|---|---|---|---|
|           |                                                                | L             | T | P | J | C |
|           |                                                                | 1             | 0 | 0 | 0 | 1 |

## COURSE OBJECTIVES:

- Learn the extensive literature of classical Tamil
- Review the fine arts heritage of Tamil culture
- Realize the contribution of Tamils in Indian freedom struggle

## COURSE OUTCOMES:

|       |                                                                                                            |            |
|-------|------------------------------------------------------------------------------------------------------------|------------|
| CO 1: | Understand the extensive literature of Tamil and its classical nature                                      | Understand |
| CO 2: | Understand the heritage of sculpture, painting and musical instruments of ancient people                   | Understand |
| CO 3: | Review on folk and martial arts of Tamil people                                                            | Understand |
| CO 4: | Realization of Thina concepts, trade and victory of Chozha dynasty                                         | Understand |
| CO 5: | Understand the contribution of Tamils in Indian freedom struggle, Self-esteem movement and siddha medicine | Understand |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | -   | -   | -   | -   | -   | -   | 3   | 3   | -   | 2    | -    | -    | -    |
| CO 2       | -   | -   | -   | -   | -   | -   | 3   | 3   | -   | 2    | -    | -    | -    |
| CO 3       | -   | -   | -   | -   | -   | -   | 3   | 3   | -   | 2    | -    | -    | -    |
| CO 4       | -   | -   | -   | -   | -   | -   | 3   | 3   | -   | 2    | -    | -    | -    |
| CO 5       | -   | -   | -   | -   | -   | -   | 3   | 3   | -   | 2    | -    | -    | -    |

## SYLLABUS:

## UNIT I: LANGUAGE AND LITERATURE

3

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature – Management Principles in Thirukural – Tamil Epics and Impact of Buddhism & Jainism in Tamil Land – Bakthi Literature Azhwars and Nayanmars – Forms of minor Poetry – Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidhasan

## UNIT II: HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE

3

Hero stone to modern sculpture – Bronze icons – Tribes and their handicrafts – Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments – Mridhangam, Parai, Veenai, Yash and Nadhaswaram – Role of Temples in Social and Economic Life of Tamils

## UNIT III: FOLK AND MARTIAL ARTS

3

Tattooing, basket weaving, Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils

## UNIT IV: THINAI CONCEPT OF TAMILS

3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram Concept of Tamils – Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age – Overseas Conquest of Cholas

## UNIT V: CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE

3

Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books

**CONTACT PERIODS:**

**Lecture: 15 Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 15 Periods**

**TEXTBOOKS:**

1. Jayanthi Ravikrishna K, Heritage of Tamils, Sri Krishna publications, First Edition, 2023
2. S. Priyadarshini, Heritage of Tamils, V. K. Publications

**REFERENCES:**

1. தமிழக வரலாறும் மக்களும் பண்பாடும் - கே. கே. பிள்ளை, உலகத் தமிழாராய்ச்சி நிறுவனம் (International Institute of Tamil Studies), C.P.T கேம்பஸ், சென்னை.
2. கணினித் தமிழ் - மு0னவர். இல. சுந்தரம், விகடன் பிரசுரம், அண்ணொ சொ0ல, .சன்0ன, திசம்பர் 2016
3. கீழடி - 0வ0க நதிக்க0ரயில் சங்ககொல நகர நொகரிகம், .தொல்லியல் து0றை .வனையீடு, தமிழ்நொடு அரசு, .சன்0ன, ஆறொம் பதிப்பு 2020
4. Social Life of Tamils, Dr. K. K. Pillay, A joint publication of TNTB & ESC and RMRL (in print) University of Madras, Chennai, Second Edition 1975
5. The Contributions of the Tamils to Indian Culture, Dr.M.Valarmathi, International Institute of Tamil Studies, C.I.T Campus, Tharamani, Chennai, First Edition 1995

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## SEMESTER I &amp; II

| U25RMCC04 | Environmental Governance and Sustainability<br>(Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC) | Category: MCC |   |   |   |   |
|-----------|-------------------------------------------------------------------------------------------------------------------|---------------|---|---|---|---|
|           |                                                                                                                   | L             | T | P | J | C |
|           |                                                                                                                   | 2             | 0 | 0 | 0 | 2 |

## COURSE OBJECTIVES:

- To provide basic concepts of ecosystem, biodiversity, atmospheric and hydrological processes
- To inculcate knowledge on the lithosphere, waste management practices, environmental laws and disaster management strategies
- To apply the principles of sustainable living and green technologies in alignment with the UN Sustainable Development Goals

## COURSE OUTCOMES:

- CO 1:** Explain the role of biodiversity conservation and wildlife protection in addressing environmental issues **Understand**
- CO 2:** Apply pollution control methods, environmental laws, and water management practices for environmental protection **Apply**
- CO 3:** Implement sustainable waste management practices for efficient resource utilization **Apply**
- CO 4:** Explain the role of disaster management, governance, and IT tools in environmental and health sustainability **Understand**
- CO 5:** Employ sustainable practices and national environmental initiatives for sustainable development **Apply**

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 1   | -   | -   | -   | 3   | 2   | -   | 1   | -    | 1    | -    | -    |
| CO 2       | 2   | 1   | -   | -   | -   | 3   | 2   | -   | 1   | -    | 1    | -    | -    |
| CO 3       | 2   | 1   | -   | -   | -   | 3   | 2   | -   | 1   | -    | 1    | -    | -    |
| CO 4       | 2   | 1   | -   | -   | -   | 3   | 2   | -   | 1   | -    | 1    | -    | -    |
| CO 5       | 3   | 1   | -   | -   | -   | 3   | 2   | -   | 1   | -    | 1    | -    | -    |

## SYLLABUS:

## UNIT I: ENVIRONMENT AND BIODIVERSITY

6

Scope of Environmental Science – Ecology – Ecosystem – Classification, structure, productivity – Energy flow and nutrient cycles – Nitrogen cycle – Ecological succession – Biodiversity – Types and values of biodiversity – Biodiversity at Global, National and Local Levels – Bio-geographical Classification of India – India as a Mega-diversity Nation – Red Data Book – Hotspots of Indian Biodiversity – Endangered and endemic species – Conservation of biodiversity

Self - Learning & Case Studies – Species conservation projects in India – Species Reintroduction – National Biodiversity Action Plan 2015 – Role of International Union for Conservation of Nature (IUCN)

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**UNIT II: ATMOSPHERE AND HYDROSPEHERE**

Atmosphere – Structure and composition – Earth's Albedo – Carbon cycle and oxygen cycle – Air Quality Standards – Air Pollution – Sources, effects and control measures – Indian Environmental Laws – Air Act 1981. Hydrosphere – Hydrosphere – Hydrological Cycle, Water Quality Parameters, Water Pollution – Sources, effects, and control measures - Water conservation – Rainwater harvesting, Dams, and watershed Management – Wastewater treatment, Ocean acidification, Blue economy, Water Act, 1974 and Environment Protection Act, 1986

Self - Learning & Case Studies – Clean Development Mechanism (CDM) – Greenhouse Gas Protocol – ISO 14064 – Jal Shakti Abhiyan – Implementation of CNG in NCT of Delhi – Taj Trapezium Case – Narmada River – Sardar Sarovar Project

**UNIT III: LITHOSPHERE AND SOLID WASTE MANAGEMENT**

Lithosphere – Structure of the lithosphere – Continental drift – Forest resources – Deforestation – Causes and effects – Agriculture – Effects of modern agriculture – Soil Pollution – Causes, effects and control measures. Solid Waste Management – Solid Waste – Sources, classification, and effects, Waste reduction strategies – Circular Economy and 5R Principles, Solid waste treatment, Disposal techniques, Refuse-Derived Fuel and Waste-to-Energy technologies, Biomedical, E-Waste and Hazardous waste management, Resource recovery – Environmental Standards and Waste Management Regulations (ISO 14001 and Waste Rules)

Self - Learning & Case Studies – Solid Waste Management rules, 2024 – Plastic Waste Management Rules (PWMR) – Degradation of Soil in Rajasthan – Indore's Waste Management System

**UNIT IV: GLOBAL ISSUES, HUMAN WELFARE AND ROLE OF TECHNOLOGY**

EIA- Concepts, stages – Land clearing projects – Environmental and social Impacts, Resettlement and Rehabilitation – Concepts and challenges – Disaster management – Floods, Landslides, Disaster management cycle and mitigation – Environmental Governance, Global Governance and Fundamental Human Rights – Importance. Human Population – Population growth, explosion and its challenges – Trends and variation among nations – Role of IT – Remote sensing, GIS and Google earth engine – Disease tracking and prediction using big data and AI (e.g., COVID-19 apps)

Self - Learning & Case Studies – Mission Amrit Sarovar – Beti Bachao Beti Padhao mission – Kerala Flood (2018) – Sterlite Copper Plant Case – Thoothukudi

**UNIT V: SUSTAINABLE DEVELOPMENT AND GREEN PRACTICES**

Sustainable Development – Concept, significance of sustainability – UN Sustainable Development Goals (UN SDGs) – Sustainability assessment – Carbon footprint, accounting, Carbon Neutrality – Net Zero Emissions – Carrying Capacity of the Earth – Carbon Sequestration and Carbon Capture – Blue Carbon and Green Carbon. Green Practices – Sustainable Agriculture – Green Energy – Biofuels, Green Hydrogen, Solar, wind and biomass Energy – Sustainable Transport – Electric Vehicles (EVs)

Self - Learning & Case Studies – National Solar Mission, Green India Mission – Ambikapur, Chhattisgarh – Zero Waste Model – Delhi Metro – Energy Efficiency and Sustainable Transport

**CONTACT PERIODS:**

Lecture: 30 Periods

Tutorial: - Periods

Practical: - Periods

Project: - Periods

Total: 30 Periods



**TEXTBOOKS:**

1. E. Bharucha, "Environmental Studies for Undergraduate Courses", 2nd edition, Hyderabad, University Press (India) Pvt. Ltd, 2005
2. R. Rajagopalan, "Environmental Studies: From Crisis to Cure", 3rd edition, New Delhi, Oxford University Press, 2016
3. R. R. Hiremath, "Sustainable Development", 1st edition, New Delhi, Himalaya Publishing House, 2008

**REFERENCES:**

1. Anubha Kaushik and C.P. Kaushik, "Environmental Studies" 6th edition, New Age International Publishers, New Delhi, 2018
2. Benny Joseph, "Environmental Studies", 3rd edition, New Delhi, McGraw Hill Education, 2017
3. M. Anji Reddy, "Textbook of Environmental Science and Technology", 3rd edition, BS Publications, 2019
4. R. B. Singh, "Disaster Management", 1st edition, New Delhi, Rawat Publications, 2006
5. V. Desai, "Environment and Sustainable Development" 1st edition, Mumbai, Himalaya Publishing House, 2009

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## SEMESTER I

|           |                                                                  |               |   |   |   |   |
|-----------|------------------------------------------------------------------|---------------|---|---|---|---|
| U25RMCC06 | Professional Skill Development - I<br>(Common to all programmes) | Category: MCC |   |   |   |   |
|           |                                                                  | L             | T | P | J | C |
|           |                                                                  | 15 Hours      |   |   |   | 1 |

## COURSE OUTCOMES:

- CO 1:** Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities **Apply**
- CO 2:** Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation **Apply**
- CO 3:** Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning **Apply**

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 2   | 1   | 3   | 1   | -   | -   | 2   | 2    | -    | 2    | -    |
| CO 2       | 3   | 2   | 2   | 1   | 2   | 2   | -   | -   | 1   | 1    | -    | -    | -    |
| CO 3       | 3   | 2   | 2   | 1   | -   | 2   | 2   | 3   | 3   | 3    | 2    | -    | -    |

## GUIDELINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

## CONTACT PERIODS:

Lecture: - Periods

Tutorial: - Periods

Practical: - Periods

Project: - Periods

Total: 0 Periods

*h/tw 30/1/2026*

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## SEMESTER II

| U25REN201 | Professional Communication - II<br>(Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME,<br>MI, SC) | Category: HSMC |   |   |   |   |
|-----------|----------------------------------------------------------------------------------------------------------|----------------|---|---|---|---|
|           |                                                                                                          | L              | T | P | J | C |
|           |                                                                                                          | 2              | 0 | 2 | 0 | 3 |

## COURSE OBJECTIVES:

- To strengthen advanced communication and interpersonal skills required for academic and professional success
- To integrate AI-enabled communication tools for content creation, presentations and professional documentation
- To prepare students for modern workplace communication in global and digital environments

## COURSE OUTCOMES:

|                                                                                                            |            |
|------------------------------------------------------------------------------------------------------------|------------|
| CO 1: Apply advanced verbal, written and digital communication strategies in professional contexts         | Apply      |
| CO 2: Analyze technical information and produce effective workplace documents                              | Analyze    |
| CO 3: Demonstrate negotiation, leadership and collaborative communication skills                           | Understand |
| CO 4: Deliver impactful technical presentations and communicate innovative ideas effectively               | Apply      |
| CO 5: Utilize AI-assisted communication tools ethically for professional growth and workplace productivity | Apply      |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | -    | 1    | -    | -    |
| CO 2       | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | -    | 1    | -    | -    |
| CO 3       | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | -    | 1    | -    | -    |
| CO 4       | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | -    | 1    | -    | -    |
| CO 5       | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | -    | 1    | -    | -    |

## SYLLABUS:

## UNIT I: TECHNICAL WRITING AND DOCUMENTATION

6 + 6

Technical Reports - Proposal Writing - Meeting Agenda and Minutes - Technical Instructions and Process Description - AI-assisted Technical Documentation - Technical Vocabulary

## UNIT II: COGNITIVE PROFESSIONALISM

6 + 6

Critical Thinking Strategies - Problem-solving Communication - Case Study - Brainstorming Techniques - Collaborative Decision Making - One-word Substitutions

## UNIT III: CAREER PLANNING

6 + 6

Self-Assessment Techniques - SWOT Analysis - Goal Setting - AI-assisted Documentation - Digital Content Writing - Collocations

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**UNIT IV: CORPORATE COMMUNICATION AND NETWORKING**

Public Speaking - Welcome Address - Vote of Thanks - Anchoring and Event Hosting - Audience Engagement - Cloze tests - Discourse markers - linkers and cohesive devices

**UNIT V: CRITICAL THINKING AND COLLABORATIVE PROBLEM SOLVING**

Problem-solving Techniques - Mind Mapping - Negotiation Skills - Book Review / Film Review - Podcast and Media Analysis - Critical Reading - Group Discussion

**LIST OF EXPERIMENTS**

1. Public Speaking
2. Group Discussion
3. Case Study
4. Blog Writing
5. Mind Mapping

**CONTACT PERIODS:**

Lecture: 30 Periods      Tutorial: - Periods      Practical: 30 Periods      Project: - Periods      Total: 60 Periods

**TEXTBOOKS:**

1. Ashraf Rizvi, Effective Technical Communication, 3rd Edition, McGraw Hill Education, 2023
2. Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice, 4th Edition, Oxford University Press, 2023
3. Sanjay Kumar & Pushp Lata, Communication Skills, 3rd Edition, Oxford University Press, New Delhi, 2018

**REFERENCES:**

1. Stephen E. Lucas, The Art of Public Speaking, 14th Edition, McGraw Hill Education, New York, 2023
2. Dale Carnegie, The Quick and Easy Way to Effective Speaking, Updated Edition, Simon & Schuster, New York, 2019
3. Matt Abrahams, Think Faster, Talk Smarter: How to Speak Successfully When You're Put on the Spot, Simon & Schuster, New York, 2024

  
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## SEMESTER II

| U25RMA203 | Mathematical Transforms in Engineering<br>(Common to CE, CH, EE, ME, MI) | Category: BSC |   |   |   |   |
|-----------|--------------------------------------------------------------------------|---------------|---|---|---|---|
|           |                                                                          | L             | T | P | J | C |
|           |                                                                          | 3             | 0 | 2 | 0 | 4 |

## PRE-REQUISITES:

- U25MA101 - Calculus and Differential Equations / U25RMA101 - Multivariable Calculus and Applications

## COURSE OBJECTIVES:

- To impart the knowledge on continuous transforms: Fourier analysis and Laplace transform
- For constructing more convenient for students to apply their transforms knowledge to their various fields of study
- To provide students with a good understanding the concepts of Z-transforms for analyzing discrete-time systems

## COURSE OUTCOMES:

- CO 1:** Understand and construct Fourier series representations of periodic functions, and apply them to solve Understand basic signal analysis and engineering problems
- CO 2:** Apply Fourier transform techniques to analyze and interpret continuous-time signals in the frequency domain Apply
- CO 3:** Compute Laplace transforms and its inverse of standard functions and use them to model and analyze engineering systems Apply
- CO 4:** Use Laplace transforms and convolution technique to solve ordinary differential equations and system of differential equations in engineering applications Apply
- CO 5:** Apply discrete-time systems using Z-transforms, and solve difference equations relevant to digital signal processing and control systems Apply

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 2   | 1   | -   | 2   | -   | -   | -   | 1   | -    | -    | -    | -    |
| CO 2       | 3   | 2   | 1   | -   | 2   | -   | -   | -   | 1   | -    | -    | -    | -    |
| CO 3       | 3   | 2   | 1   | -   | 2   | -   | -   | -   | 1   | -    | -    | -    | -    |
| CO 4       | 3   | 2   | 1   | -   | 2   | -   | -   | -   | 1   | -    | -    | -    | -    |
| CO 5       | 2   | 2   | 1   | -   | 2   | -   | -   | -   | 1   | -    | -    | -    | -    |

## SYLLABUS:

## UNIT I: FOURIER SERIES

9 + 6

Fourier Series –  $\pi$  and arbitrary period – Even and odd functions – Half-range expansions – Convergence and sum of a Fourier series

## UNIT II: FOURIER TRANSFORMS

9 + 6

Fourier transform – Basic properties – Fourier Cosine and Sine transforms – Convolution theorem – Discrete Fourier transform – Fast Fourier transform – DIT algorithm.

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9 + 6

**UNIT III: LAPLACE TRANSFORMS**

Laplace transform – Inverse transform – Linearity, s-shifting, transforms of derivatives and integrals – Unit step function – Dirac's delta functions – Transform of periodic functions – Differentiation and integration of transforms

9 + 6

**UNIT IV: APPLICATION OF LAPLACE TRANSFORMS**

Solving linear ODEs with constant coefficients – System of ODEs – Convolution theorem – Solving integral equations – Modelling- damped vibrating system and hammer blow responses of a mass spring system

9 + 6

**UNIT V: Z-TRANSFORM**

Z-transform – Standard functions and properties – Formation of difference equation – Inverse Z-transform – Initial and final value theorems – Application of Z-transform to solve difference equations.

**LIST OF EXPERIMENTS**

1. Fourier Series – Fourier series approximations – Half-Range Expansions
2. Fourier Transforms – Fourier transform for non-periodic functions – Find the convolution for non-periodic functions
3. Laplace Transforms – Laplace Transform of special functions – Laplace transform of Periodic function
4. Application of Laplace Transform – System response using Laplace transform – Solving systems of ODEs using Laplace transform technique
5. Z-Transform Applications – Z-Transform of standard sequence – Solving difference equations using Z-transform technique

**CONTACT PERIODS:**

|                            |                            |                              |                           |                          |
|----------------------------|----------------------------|------------------------------|---------------------------|--------------------------|
| <b>Lecture:</b> 45 Periods | <b>Tutorial:</b> - Periods | <b>Practical:</b> 30 Periods | <b>Project:</b> - Periods | <b>Total:</b> 75 Periods |
|----------------------------|----------------------------|------------------------------|---------------------------|--------------------------|

**TEXTBOOKS:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Pvt Ltd, New Delhi, 2018
2. Dennis G. Z, "Advanced Engineering Mathematics", Jones and Bartlett Pvt Ltd, New Delhi, 2017

**REFERENCES:**

1. Andrews, L.C & Shivamoggi, B., "Integral Transforms for Engineers", SPIE Press, 2016
2. Peter V. O'Neil, Advanced Engineering Mathematics, Cengage, 2016
3. Wylie C. R. & Barrett L. C., Advanced Engineering Mathematics, Tata McGraw-Hill, 2016
4. Grewal B. S., Higher Engineering Mathematics, 44th ed., Khanna Publishers, 2017

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## SEMESTER II

| U25RPH06 | Physics for Civil Engineers | Category: BSC |   |   |   |   |
|----------|-----------------------------|---------------|---|---|---|---|
|          |                             | L             | T | P | J | C |
|          |                             | 2             | 0 | 0 | 0 | 2 |

## COURSE OBJECTIVES:

- To understand the principles of thermal performance, acoustical behavior, and lighting design in buildings to enhance indoor environmental quality and energy efficiency
- To analyze the properties, functions, and potential applications of smart materials in modern construction and building systems
- To analyze the properties, functions, and potential applications of smart materials in modern construction and building systems

## COURSE OUTCOMES:

- CO 1:** Explain the properties and applications of smart materials such as composites, metallic glasses, shape memory alloys, and ceramics Understand
- CO 2:** Describe the thermal properties, ventilation principles, and heat management techniques used in buildings Understand
- CO 3:** Apply the principles of lighting design and photometry in building illumination systems Apply
- CO 4:** Explain the concepts of acoustics, sound insulation, and noise control in buildings Understand
- CO 5:** Apply the knowledge of natural and manmade hazards, fire protection materials, and safety measures in engineering practice Apply

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | 2    | -    |
| CO 2       | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | 1    | -    |
| CO 3       | 3   | 2   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | 1    | 1    |
| CO 4       | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | 1    | 1    |
| CO 5       | 3   | 2   | 1   | -   | -   | 1   | -   | -   | -   | -    | -    | 1    | 1    |

## SYLLABUS:

## UNIT I: SMART MATERIALS

6

Composites – Classification, properties and applications of fiber reinforced plastics (FRP) and fiber reinforced metals (FRM) – Metallic glasses – Shape memory alloys – Ceramics – Types, properties and applications (High alumina ceramics)

## UNIT II: THERMAL PROPERTIES OF BUILDINGS

6

Thermal insulation and its benefits – Heat gain and heat loss estimation – Factors affecting the thermal performance of buildings – Central heating – Principle and design of natural ventilation – Ventilation measurement – Smoke tube method

## UNIT III: LIGHTING DESIGNS

6

Radiation and spectral quantities – Photometry: Cosines law, Inverse square law – Vision: Photopic, mesopic and scotopic visions – Luminous efficiency function – Visual field glare, colour – Day light calculations – Day light design of windows – Principle of artificial lighting

6

**UNIT IV: ACOUSTICS**

Classification of sound – Decibel – Weber-Fechner law – Sabine's formula – Growth and decay method – Absorption coefficient and its determination – Factors affecting acoustics of buildings – Remedies – Sound insulation and its measurements

6

**UNIT V: NATURAL AND MANMADE HAZARDS**

Seismology and seismic waves – Earth quake ground motion – Magnitude and intensity – Cyclone and flood hazards – Fire hazards and fire protection – Materials for Fire proof – Prevention and safety measures

**CONTACT PERIODS:**

|                            |                            |                             |                           |                          |
|----------------------------|----------------------------|-----------------------------|---------------------------|--------------------------|
| <b>Lecture:</b> 30 Periods | <b>Tutorial:</b> - Periods | <b>Practical:</b> - Periods | <b>Project:</b> - Periods | <b>Total:</b> 30 Periods |
|----------------------------|----------------------------|-----------------------------|---------------------------|--------------------------|

**TEXTBOOKS:**

1. Kenneth G. Budinski and Michael K. Budinski., "Engineering Materials Properties and Selection, 9th edition, Pearson Education, 2010
2. William D. Callister Jr. and David G. Rethwisch., "Materials Science and Engineering: An Introduction", 10th edition, John Wiley and Sons, London, 2020

**REFERENCES:**

1. Stevens W. R., "Building Physics: Seeing in the Artificial Environment", 1st edition, Pergamon Press, 2013
2. Mohsen Shahinpoor., "Fundamentals of Smart Materials", 1st edition, Royal Society of Chemistry, 2020
3. Brain Culshaw, "Smart Structures and Materials", 1st edition, Boston: Artech House, London, 2004
4. <https://archive.nptel.ac.in/noc/courses/105/>

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## SEMESTER I &amp; II

| U25RCY01 | Engineering Chemistry<br>(Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME,<br>MI, SC) | Category: BSC |   |   |   |   |
|----------|------------------------------------------------------------------------------------------------|---------------|---|---|---|---|
|          |                                                                                                | L             | T | P | J | C |
|          |                                                                                                | 2             | 0 | 2 | 0 | 3 |

## COURSE OBJECTIVES:

- To introduce the fundamentals, properties, industrial applications of polymeric materials and advanced energy storage devices
- To impart knowledge about corrosion prevention, surface treatment methods and nanomaterials
- To provide a basic understanding of semiconductor materials, microelectronics, quantum, computational chemistry and their applications

## COURSE OUTCOMES:

|       |                                                                                                                           |       |
|-------|---------------------------------------------------------------------------------------------------------------------------|-------|
| CO 1: | Apply the concepts of polymer materials and their properties in solving industrial and technological challenges           | Apply |
| CO 2: | Interpret the performance of batteries, solar cells, and supercapacitors for their effective energy storage applications  | Apply |
| CO 3: | Utilize suitable corrosion prevention methods, surface treatment techniques and nanomaterials for industrial requirements | Apply |
| CO 4: | Apply suitable semiconductor materials, microfabrication processes and display technologies for specific applications     | Apply |
| CO 5: | Utilize quantum chemistry principles and AI-assisted techniques to model, visualize, and predict material properties      | Apply |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PS01 | PS02 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 1   | -   | 1   | -   | -   | 1   | 1   | -    | 1    | -    | -    |
| CO 2       | 3   | 2   | 1   | -   | 1   | -   | -   | 1   | 1   | -    | 1    | -    | -    |
| CO 3       | 3   | 2   | 1   | -   | 1   | -   | -   | 1   | 1   | -    | 1    | -    | -    |
| CO 4       | 3   | 2   | 1   | -   | 1   | -   | -   | 1   | 1   | -    | 1    | -    | -    |
| CO 5       | 3   | 2   | 1   | -   | 1   | -   | -   | 1   | 1   | -    | 1    | -    | -    |

## SYLLABUS:

## UNIT I: POLYMERIC MATERIALS

6 + 6

Polymers – Introduction – Compounding – Compression, Injection – Smart Polymers – Temperature responsive (PNIPAM), pH responsive (PAA), Light responsive (Azobenzene), 3D Printable (PLA), flexible and wearable polymers (PDMS – E-skin, RFID) – Conductive Polymers (PEDOT) – Synthesis, working and applications – Biopolymers – Classification, PEG, Alginate Hydrogel – Synthesis and applications

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6 + 6

**UNIT II: ENERGY CONVERSION AND STORAGE**

Batteries – Classification,  $\text{LiFePO}_4$  – Construction, working and applications – Fuel Cells – Proton Exchange Membrane( PEM), Solid Oxide Fuel Cells (SOFC) – Green Hydrogen – Classification, production method, electrolysis – Organic photovoltaics – P3HT and PCBM – Working and applications – Solar Cells – Dye-Sensitized Solar Cells (DSSC), Supercapacitors – Electrostatic Double Layer– Working and application

6 + 6

**UNIT III: CORROSION AND NANO SCIENCE**

Types of corrosion – Factors influencing corrosion – Cathodic protection, Coatings – Galvanization, Epoxy, Polyurethane, Enamel, Superhydrophobic coatings – Process and applications. Surface treatments – Carburizing, Nitriding, Cyaniding – Process and applications. Nanomaterials – Introduction, 0D (Quantum dots), 1D (nanowire, nanorods and carbon nanotubes) 2D nanomaterials ( $\text{MoS}_2$ ), Size effects and quantum confinement, Synthesis – Laser ablation and Chemical Vapour Deposition (CVD), Various applications of nanomaterials

6 + 6

**UNIT IV: SEMICONDUCTOR AND DISPLAY TECHNOLOGY**

Semiconductors – Perfluoropentacene, GaN – Characteristics and applications, Neuromorphic Materials – Phase-Change Memory and Memristors – Working and applications – Liquid Crystal Displays, OLED, QLED – Working and applications – Wafer Manufacturing – Purification – Czochralski and Float Zone methods – Photolithography and microfabrication

6 + 6

**UNIT V: QUANTUM AND COMPUTATIONAL CHEMISTRY**

Quantum Chemistry – Basics, quantum numbers, shapes of atomic orbitals, Molecular Orbital Theory – ( $\text{H}_2$ ,  $\text{O}_2$ ,  $\text{N}_2$ ), Schrödinger equation (Derivation) – Qubits and Quantum Memory, Computational Chemistry – Molecular modeling – Basic Computational Methods – Software tools – iGemdock, Chem draw, Molview, Jmol – Introduction to AI and its role in the field of Chemistry

**LIST OF EXPERIMENTS**

1. Estimate the viscosity of a given polymer solution using an Ostwald viscometer and determine molecular weight of the given polymer
2. Synthesis of a polymer (Bakelite / polyaniline (PANI) and assess the physical properties of the polymer
3. Potentiometric determination and comparative study of EMF in different solutions
4. Determine maximum wavelength of absorption of a given solution to verify Beer's Law and to find unknown concentration of the given sample by Spectrophotometry / Colorimetry
5. Determination of corrosion rate of Iron and its prevention by electroplating / electroless plating
6. Synthesis of  $\text{ZnO}$  /  $\text{TiO}_2$  / Ag nanoparticles and study of their photocatalytic degradation of Methylene Blue dye
7. Recovery of Copper from waste Printed Circuit Boards (PCBs) and quantitative determination of copper content
8. Measurement of electrical conductivity of solutions using a conductometric Sensor
9. Perform molecular docking using freely available online software to investigate the binding affinity a ligand with the protein
10. Construct the 2D structure of a given compound and generate its 3D molecular model using computational tools for visualization and structural analysis

**CONTACT PERIODS:**

Lecture: 30 Periods

Tutorial: - Periods

Practical: 30 Periods

Project: - Periods

Total: 60 Periods

**TEXTBOOKS:**

1. Wiley India Pvt. Ltd., "Engineering Chemistry", 2nd edition, Wiley India Pvt. Ltd., New Delhi, 2013
2. S.S. Dara and S.S. Umare, "A Textbook of Engineering Chemistry", 12th edition, Chand Publishing, New Delhi, 2024


  
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3. R.V. Gadag and A. Nityananda Shetty, "Engineering Chemistry", 3rd edition, I.K. International Publishing House, New Delhi, 2014

#### REFERENCES:

1. Fred W Billmeyer, "Textbook of Polymer Science", 4th edition, John Wiley & Sons, New York, 1999
2. Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E. Lemons, "Biomaterials Science: An Introduction to Materials in Medicine", 4th edition, Academic Press, London, 2020
3. Kirby W Beard, Linden's "Handbook of Batteries", 5th edition, McGraw Hill, New York, 2019
4. John Larminie and Andrew Dicks, "Fuel Cell Systems Explained", 3rd edition, John Wiley & Sons, Chichester, 2012
5. Fontana M. G., "Corrosion Engineering", 3rd edition, McGraw-Hill Book Company, New York, 1986
6. V. Raghavan, "Materials Science and Engineering: A First Course", 6th edition, Prentice Hall of India, New Delhi, 2015
7. M.F. Ashby and D.R.H. Jones, "Engineering Materials" 2: An Introduction to Microstructures, Processing and Design, 4th edition, Elsevier, UK, 2012
8. Ira N Levine, "Quantum Chemistry", 7th edition, Pearson, Boston, 2013

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## SEMESTER II

| U25RCSG04 | Python Programming<br>(Common to all programmes) | Category: ESC |   |   |   |   |
|-----------|--------------------------------------------------|---------------|---|---|---|---|
|           |                                                  | L             | T | P | J | C |
|           |                                                  | 3             | 0 | 0 | 0 | 3 |

## COURSE OBJECTIVES:

- To introduce the fundamental concepts of Python programming, including syntax, data types, operators, and input/output operations
- To develop problem-solving skills through the use of control structures, functions, recursion, and modular programming techniques
- To provide proficiency in Python collections, file handling, exception handling, and program organization using modules and packages
- To familiarize students with basic object-oriented programming concepts and the use of Python libraries for data analysis applications

## COURSE OUTCOMES:

- CO 1:** Explain Python programming fundamentals, including data types, operators, input/output operations, and debugging techniques **Understand**
- CO 2:** Develop Python programs using decision-making statements, iterative constructs, functions, recursion, and variable scope concepts **Apply**
- CO 3:** Implement string processing and Python collections such as lists, tuples, sets, and dictionaries to solve computational problems **Apply**
- CO 4:** Develop modular Python programs using file handling, exception handling, modules, and packages **Apply**
- CO 5:** Develop simple object-oriented programs and apply NumPy and Pandas libraries for basic data analysis applications **Apply**

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 2       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | -    | -    |
| CO 3       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | -    | -    |
| CO 4       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | -    | -    |
| CO 5       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | -    | -    |

## SYLLABUS:

## UNIT I: PYTHON FUNDAMENTALS

9

Introduction to Python – Features and Applications of Python – Installing Python – Python Interpreter – Script and Interactive Modes – Identifiers and Keywords – Variables – Data Types – Type Conversion – Operators and Expressions – Input and Output Operations – Comments and Documentation – Error Types – Testing and Debugging Basics

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**UNIT II: CONTROL STRUCTURES AND FUNCTIONS**

9

Conditional Statements – Nested Conditional Statements – Iterative Statements: while Loop and for Loop – Loop Control Statements – Functions – Function Definition and Invocation – Function Arguments and Return Values – Scope of Variables – Recursive Functions – Applications of Functions in Problem Solving

**UNIT III: STRINGS AND PYTHON COLLECTIONS**

9

Strings and String Operations – Lists and List Operations – List Comprehensions – Tuples and Tuple Operations – Sets and Set Operations – Dictionaries and Dictionary Operations – Packing and Unpacking

**UNIT IV: FILE HANDLING, MODULES AND EXCEPTION HANDLING**

9

Modules and Packages – Importing Modules – Built-in Functions – File Handling – Opening and Closing Files – Reading and Writing Files – File Methods – Exception Handling – try, except, else and finally Blocks – User Defined Exceptions

**UNIT V: OBJECT-ORIENTED PROGRAMMING AND DATA ANALYSIS**

9

Classes and Objects – Creating Classes and Objects – Constructors – Instance Variables and Methods – Introduction to NumPy – Creating Arrays – Array Operations – Indexing and Slicing – Introduction to Pandas – Series and DataFrames – Reading and Displaying Data – Simple Data Analysis Applications.

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 45 Periods

**TEXTBOOKS:**

1. Reema Thareja, "Python programming: Using problem solving approach", 1st Edition, Oxford Press, 2017
2. William McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition, Shroff/O'Reilly Publication, 2017

**REFERENCES:**

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, "Programming and Problem Solving with Python", 2nd Edition, McGrawHill Education, 2018
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", 1st Edition, Pearson India Education Services Pvt. Ltd., 2016

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## SEMESTER II

| U25RME201 | Engineering Mechanics<br>(Common to CE, ME, MI) | Category: PCC |   |   |   |   |
|-----------|-------------------------------------------------|---------------|---|---|---|---|
|           |                                                 | L             | T | P | J | C |
|           |                                                 | 3             | 0 | 0 | 0 | 3 |

## COURSE OBJECTIVES:

- To expose various laws of force for equilibrium of rigid bodies
- To introduce the concepts of properties of surfaces and solids
- To impart knowledge on the fundamentals of dynamics of particles and friction

## COURSE OUTCOMES:

|                                                                                                  |         |
|--------------------------------------------------------------------------------------------------|---------|
| CO 1: Apply the principles of forces, moments, and equilibrium to analyze engineering systems    | Apply   |
| CO 2: Determine the centroid and moment of inertia of simple and composite plane areas           | Apply   |
| CO 3: Analyze the behavior of bodies subjected to friction and evaluate equilibrium conditions   | Analyze |
| CO 4: Solve engineering problems involving kinematics and kinetics of particles and rigid bodies | Apply   |
| CO 5: Apply the principles of work, energy, impulse, and momentum to engineering applications    | Apply   |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | -    | -    |
| CO 2       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | 2    | -    |
| CO 3       | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -   | -    | 2    | -    | -    |
| CO 4       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | 1    | -    |
| CO 5       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | 1    | -    |

## SYLLABUS:

## UNIT I: EQUILIBRIUM OF FORCES

9

Types of force systems – Coplanar concurrent forces – Resultant – Moment of a force and its application – Couples and resultant of a force system – Equations of equilibrium of coplanar concurrent and non – concurrent force systems – Lami's theorem – Polygon law of forces for resultant

## UNIT II: EQUILIBRIUM OF RIGID BODIES

9

Free body diagram – Types of supports – Support reactions – Moment of a force about a point – Moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force – Equilibrium of rigid bodies in two dimensions

## UNIT III: PROPERTIES OF SURFACES AND SOLIDS

9

Centroids and centre of mass – Centroids of lines and areas – Rectangular, circular, triangular areas by integration – T section, I section and Hollow section by using standard formula – Theorems of Pappus – Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Mass moment of inertia for prismatic and cylindrical solids

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**UNIT IV: DYNAMICS OF PARTICLES**

9

Displacements, velocity and acceleration – Rectilinear motion – Curvilinear motion – Newton's laws of motion – D'Alembert's Law – Work energy equation – Impulse and momentum – Impact of elastic bodies

**UNIT V: FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS**

9

Friction force – Laws of sliding friction – Equilibrium analysis of simple systems with sliding friction – Wedge friction – Rolling resistance (Basics) – Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 45 Periods

**TEXTBOOKS:**

1. R.C. Hibbeler, "Engineering Mechanics: Statics", Pearson Education, 15th Edition, 2023
2. K. L. Kumar, "Engineering Mechanics", McGraw Hill Education, New Delhi, 5th Edition, 2021.

**REFERENCES:**

1. S. S. Bhavikatti and K. G. Rajashekarappa, "Engineering Mechanics", New Age International Publishers, New Delhi, 5th Edition, 2021.
2. Irving H. Shames, "Engineering Mechanics: Statics and Dynamics", Pearson Education, Noida, 4th Edition, 2007.
3. Ferdinand P. Beer, E. Russell Johnston Jr., David F. Mazurek and Phillip J. Cornwell, "Vector Mechanics for Engineers: Statics and Dynamics", McGraw Hill Education, New York, 13th Edition, 2021.

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## SEMESTER II

| U25RCE201 | Civil Engineering Perspectives | Category: PCC |   |   |   |   |
|-----------|--------------------------------|---------------|---|---|---|---|
|           |                                | L             | T | P | J | C |
|           |                                | 1             | 0 | 4 | 0 | 3 |

## COURSE OBJECTIVES:

- To provide foundational knowledge of Civil Engineering and its various disciplines
- To familiarize students with key construction materials
- To introduce the importance of National Building Code (NBC) and byelaws in construction practices.

## COURSE OUTCOMES:

|       |                                                                                               |            |
|-------|-----------------------------------------------------------------------------------------------|------------|
| CO 1: | Describe the role of Civil Engineering in infrastructure development                          | Understand |
| CO 2: | Explain the functional requirements of buildings using the National Building Code.            | Understand |
| CO 3: | Demonstrate the applications of various construction materials through experiential learning. | Apply      |
| CO 4: | Examine industrial practices and construction methodologies                                   | Apply      |
| CO 5: | Prepare detailed technical reports from site visit observations and findings.                 | Apply      |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | 2    | -    |
| CO 2       | 2   | 1   | -   | -   | -   | -   | 2   | -   | -   | -    | -    | 2    | -    |
| CO 3       | 3   | 2   | 1   | 1   | -   | -   | -   | 2   | -   | -    | -    | 2    | -    |
| CO 4       | 3   | 2   | 1   | 1   | -   | -   | -   | 2   | -   | -    | -    | 2    | -    |
| CO 5       | 3   | 2   | 1   | 1   | -   | -   | -   | 2   | -   | -    | -    | 2    | -    |

## SYLLABUS:

## UNIT I: INTRODUCTION TO CIVIL ENGINEERING

7 + 30

Overview of Civil Engineering – Role of Civil Engineers – Branches of Civil Engineering – Importance of Civil Engineering in infrastructure development – Building Materials – Cement, Bricks, Steel and Aggregates – Types, Properties and Applications

## UNIT II: UNIT CONVERSIONS AND CODAL PROVISIONS

8 + 30

Basic unit conversions – Buildings and structures in general – Functional requirements of buildings and necessity of byelaws – Importance of National Building Code – Indian Standard Codal provisions for Materials and testing – Cement, Fine aggregate, Coarse aggregate and Water

## LIST OF EXPERIMENTS

1. Visit to Experience Engineering – Study of Materials
2. Learn It Masonry Yard – Types of Brick Bonds
3. Site visit to RMC Plant
4. Bridge / Flyover / Road Construction Site Visit
5. Visit to Renowned Structures
6. Study of drawings

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**CONTACT PERIODS:**

**Lecture:** 15 Periods      **Tutorial:** - Periods      **Practical:** 60 Periods      **Project:** - Periods      **Total:** 75 Periods

**TEXTBOOKS:**

1. S K Duggal, "Building Materials", Chaukhamba Auriyantaliya Publication, 5th Edition, April, 2024
2. P C Varghese, "Building Materials", Second Edition, PHI Learning Ltd, 2015

**REFERENCES:**

1. B C Punmia, "Building Construction", Laxmi Publications Limited, New Delhi. 2016.
2. M S Shetty, "Concrete Technology", S Chand and Company Limited, New Delhi, 2017
3. National Building of India, published by Bureau of Indian Standards(BIS), part 1-12, 2016
4. G S Birdie, T D Ahuja, "Building Construction and construction materials", Dhanpatrai publishing company, New Delhi, 2012

  
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## SEMESTER II

| U25RCSG06 | Python Programming Laboratory<br>(Common to all programmes) | Category: ESC |   |   |   |   |
|-----------|-------------------------------------------------------------|---------------|---|---|---|---|
|           |                                                             | L             | T | P | J | C |
|           |                                                             | 0             | 0 | 2 | 0 | 1 |

## COURSE OBJECTIVES:

- To understand the fundamental concepts of Python programming and problem-solving using Python language constructs
- To apply control structures, functions, strings, and Python collections for developing efficient applications
- To develop modular applications using file handling, exception handling, modules, and packages.
- To implement basic object-oriented programming concepts and utilize Python libraries for data analysis applications

## COURSE OUTCOMES:

|                                                                                                                           |       |
|---------------------------------------------------------------------------------------------------------------------------|-------|
| CO 1: Implement Python programs using basic language constructs, data types, operators, and input/output operations       | Apply |
| CO 2: Develop Python programs using decision-making statements, looping constructs, functions, and recursion              | Apply |
| CO 3: Implement applications using strings, lists, tuples, sets, and dictionaries for data processing and problem solving | Apply |
| CO 4: Develop modular applications using file handling, exception handling, modules, and packages                         | Apply |
| CO 5: Design applications using basic object-oriented programming concepts and Python libraries such as NumPy and Pandas  | Apply |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 2       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 3       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 1    | -    | -    |
| CO 4       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 1    | -    | -    |
| CO 5       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 1    | -    | -    |

## LIST OF EXPERIMENTS

1. Development of Python programs demonstrating variables, data types, operators, and input/output operations
2. Implementation of applications using conditional statements and nested conditional constructs
3. Development of iterative applications using for loops, while loops, and loop control statements
4. Design and implementation of console-based applications for mathematical and logical problem solving
5. Development of applications using user-defined functions and recursive functions
6. Implementation of string processing applications using Python string operations and methods
7. Development of applications using lists, tuples, sets, and dictionaries
8. Implementation of applications using list comprehensions and collection-based problem solving
9. Development of modular applications using built-in and user-defined modules
10. Implementation of file handling applications for reading, writing, and appending data
11. Development of robust applications using exception handling and user-defined exceptions



**B.E. - CE - R2025 - CBCS**

12. Design and implementation of applications using classes, objects, constructors, and instance methods
13. Development of applications demonstrating inheritance and method overriding
14. Implementation of numerical computing applications using NumPy arrays and array operations
15. Development of simple data analysis applications using Pandas Series and DataFrames

**CONTACT PERIODS:**

**Lecture:** - Periods      **Tutorial:** - Periods      **Practical:** 30 Periods      **Project:** - Periods      **Total:** 30 Periods

**REFERENCES:**

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd Edition, O'Reilly Media, 2016
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, Programming and Problem Solving with Python, 2nd Edition, McGraw Hill Education, 2018

## SEMESTER I &amp; II

| U25RMCC03 | Design Thinking<br>(Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC) | Category: MCC |   |   |   |   |
|-----------|---------------------------------------------------------------------------------------|---------------|---|---|---|---|
|           |                                                                                       | L             | T | P | J | C |
|           |                                                                                       | 1             | 0 | 2 | 0 | 2 |

## COURSE OBJECTIVES:

- To Understand the basics of Design Thinking, its principles, processes, and tools used
- To empathize with stakeholders and frame problems using structured tools and techniques
- To generate ideas and present solutions effectively using design tools

## COURSE OUTCOMES:

|                                                                                     |            |
|-------------------------------------------------------------------------------------|------------|
| CO 1: Explain purpose and features of design thinking process                       | Understand |
| CO 2: Use required tools to empathize with the stockholders to identify the problem | Apply      |
| CO 3: Comment the identified problem elaborately and clearly                        | Apply      |
| CO 4: Develop a conceptual solution for a societal problem                          | Apply      |
| CO 5: Present the identified solution to all the stakeholders                       | Apply      |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 1   | -   | -   | -   | 1   | 1   | -   | 1   | 1    | 2    | -    | -    |
| CO 2       | 2   | 1   | -   | -   | -   | 1   | 1   | -   | 1   | 1    | 2    | -    | -    |
| CO 3       | 2   | 1   | 1   | -   | -   | 1   | 1   | 3   | 1   | 1    | 2    | -    | -    |
| CO 4       | 3   | 3   | 2   | -   | -   | 1   | 1   | 3   | 1   | 1    | 2    | -    | -    |
| CO 5       | 3   | 2   | -   | -   | -   | 1   | 1   | 3   | 3   | 1    | 2    | -    | -    |

## SYLLABUS:

## UNIT I: FUNDAMENTALS OF DESIGN THINKING

5 + 10

Introduction to Design Thinking: Definition, relevance, and applications – Design The Thinking – Personal Visualization, The Wheel of Life, and Balancing Priorities – Understanding and appreciating the concept of 'Design' – The 3 Laws of Design Thinking

## UNIT II: THE EMPHATHIZE AND DEFINE STAGE

5 + 10

Understanding Stakeholders – Role of Empathy in Design Thinking – Tools: Persona, Journey Mapping, Stakeholder Mapping, CATWOE, Cartographic Perspective (LO), and Empathy Map – Case Study. Problem Framing and Reframing – Role of a Design Thinker – Tools: Five Whys, Anti-Pattern, Problem Paraphrasing, Introduction to LORD Skillset – Case Study

## UNIT III: THE DIVERGENCE AND CONVERGENCE AND COMMUNICATION STAGE

5 + 10

Ideation through Divergent and Convergent Thinking – Tools: Brainstorming, 10gm – 100gm–1000gm. Presenting Design Outcomes – Tools: 4Cs Framework – Case Study



**LIST OF EXPERIMENTS**

1. Design a solution for a societal problem that can be in line with sustainable development, thrust areas, industrial problems etc. under various themes like Health & Wellness: MedTech, Biotech, and HealthTech Agriculture & Rural: Agriculture, FoodTech, and Rural Development Green Energy: Renewable/Sustainable Energy and Clean and Green Technology Advanced Tech: Blockchain and Cyber Security, Robotics and Drones, and Space Technology Smart Infrastructure: Smart Automation, Smart Education, Smart Vehicles, Transportation and Logistics Daily Utility & Leisure: Fitness and Sports, Tourism, Disaster Management, Games, and Toys Sustainability & Smart Cities: waste-to-wealth, disaster management, or digital twin models for resource management

**CONTACT PERIODS:**

**Lecture:** 15 Periods      **Tutorial:** - Periods      **Practical:** 30 Periods      **Project:** - Periods      **Total:** 45 Periods

**TEXTBOOKS:**

1. Tim Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", 1st edition, New York, HarperCollins Publishers Ltd, New York, 2018
2. Idris Mootee, "Design Thinking for Strategic Innovation", 1st edition, John Wiley & Sons Inc, 2013

**REFERENCES:**

1. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009
2. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
3. Liedtka, Andrew King, Kevin Bennett, Book – "Solving Problems with Design Thinking – Ten Stories of What Works", Columbia Business School Publishing, 2013
4. Maurício Vianna, Ysmar Vianna, Isabel K. Adler, Brenda Lucena, Beatriz Russo, "Design thinking: Business Innovation", MJV Press, 2011
5. Burgelman, Christensen, and Wheelwright, "Strategic Management of Technology and Innovation", 5th Edition, McGraw Hill Publications, 2017

  
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## SEMESTER II

| U25RMCC05 | தமிழரும் தொழில்நுட்பமும் / Tamils and Technology<br>(Common to all programmes) | Category: MCC |   |   |   |   |
|-----------|--------------------------------------------------------------------------------|---------------|---|---|---|---|
|           |                                                                                | L             | T | P | J | C |
|           |                                                                                | 1             | 0 | 0 | 0 | 1 |

## COURSE OBJECTIVES:

- To learn weaving, ceramic and construction technology of Tamils
- To understand the agriculture, irrigation and manufacturing technology of Tamils
- To realize the development of scientific Tamil and Tamil computing

## COURSE OUTCOMES:

|                                                                                                    |            |
|----------------------------------------------------------------------------------------------------|------------|
| CO 1: Understand the weaving and ceramic technology of ancient Tamil people nature                 | Understand |
| CO 2: Understand the construction technology, building materials in Sangam period and case studies | Understand |
| CO 3: Infer the metal process, coin and beads manufacturing with relevant archeological evidence   | Understand |
| CO 4: Realize the agriculture methods, irrigation technology and pearl diving                      | Understand |
| CO 5: Apply the knowledge of scientific Tamil and Tamil computing                                  | Understand |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | -   | -   | -   | -   | -   | -   | 3   | 3   | -   | 2    | -    | -    | -    |
| CO 2       | -   | -   | -   | -   | -   | -   | 3   | 3   | -   | 2    | -    | -    | -    |
| CO 3       | -   | -   | -   | -   | -   | -   | 3   | 3   | -   | 2    | -    | -    | -    |
| CO 4       | -   | -   | -   | -   | -   | -   | 3   | 3   | -   | 2    | -    | -    | -    |
| CO 5       | -   | -   | -   | -   | -   | -   | 3   | 3   | -   | 2    | -    | -    | -    |

## SYLLABUS:

## UNIT I: WEAVING AND CERAMIC TECHNOLOGY

3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries

## UNIT II: DESIGN AND CONSTRUCTION TECHNOLOGY

3

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple) – Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo-Saracenic architecture at Madras during British Period

## UNIT III: MANUFACTURING TECHNOLOGY

3

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel, Copper and gold – Coins as source of history – Minting of Coins – Bead-making industries – Stone beads – Glass beads – Terracotta beads – Shell beads/ bone beads – Archeological evidences – Gem stone types described in Silappathikaram



**UNIT IV: AGRICULTURE AND IRRIGATION TECHNOLOGY****3**

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society

**UNIT V: SCIENTIFIC TAMIL & TAMIL COMPUTING****3**

Development of Scientific Tamil – The role of journals in the development of scientific Tamil – Scientific Tamil vocabulary – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project

**CONTACT PERIODS:**

**Lecture:** 15 Periods      **Tutorial:** - Periods      **Practical:** - Periods      **Project:** - Periods      **Total:** 15 Periods

**TEXTBOOKS:**

1. Tamils and Technology, K. Jayanthi Ravikrishna, Sri Krishna publications, Mahalakshmi Nagar, Velappanchavadi, First Edition 2023
2. Tamils and Technology, S. Priyadharshini, V. K. Publications

**REFERENCES:**

1. The Contributions of the Tamils to Indian Culture, Dr. M. Valarmathi, International Institute of Tamil Studies, C.I.T Campus, Tharamani, Chennai, First Edition 1995
2. Studies in the History of India with Special Reference to Tamil Nadu, Dr. K. K. Pillay, 1979

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## SEMESTER II

|           |                                                                   |               |   |   |   |   |
|-----------|-------------------------------------------------------------------|---------------|---|---|---|---|
| U25RMCC07 | Professional Skill Development - II<br>(Common to all programmes) | Category: MCC |   |   |   |   |
|           |                                                                   | L             | T | P | J | C |
|           |                                                                   | 15 Hours      |   |   |   | 1 |

## COURSE OUTCOMES:

- CO 1:** Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities Apply
- CO 2:** Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation Apply
- CO 3:** Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning Apply

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 2   | -   | 3   | 1   | -   | -   | 2   | 2    | -    | 2    | -    |
| CO 2       | 2   | 3   | 3   | 3   | 2   | 2   | -   | -   | 1   | 1    | -    | -    | -    |
| CO 3       | -   | -   | 3   | -   | -   | 2   | 2   | 3   | 3   | 3    | 2    | -    | -    |

## GUIDELINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

## CONTACT PERIODS:

Lecture: - Periods

Tutorial: - Periods

Practical: - Periods

Project: - Periods

Total: 0 Periods



## SEMESTER III

| U25MA302 | Probability and Statistics<br>(Common to BM, CE, CH, EC, EE, ME, MI) | Category: BSC |   |   |   |   |
|----------|----------------------------------------------------------------------|---------------|---|---|---|---|
|          |                                                                      | L             | T | P | J | C |
|          |                                                                      | 2             | 0 | 2 | 0 | 3 |

## PRE-REQUISITES:

- U25MA101 - Calculus and Differential Equations / U25RMA101 - Multivariable Calculus and Applications

## COURSE OBJECTIVES:

- To introduce the fundamental concepts of probability and statistics relevant to engineering
- To facilitate with students, use their understanding of statistical methods for data analysis and inference in their areas of study
- To develop probabilistic models to handle uncertainty and charts to check for quality control in engineering systems

## COURSE OUTCOMES:

|       |                                                                                                                                            |            |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------|------------|
| CO 1: | Explain the fundamental concepts of probability and examine discrete probability distributions                                             | Understand |
| CO 2: | Apply suitable continuous distributions, such as uniform, exponential and normal to interpret and analyse statistical data                 | Apply      |
| CO 3: | Calculate and evaluate covariance and correlation to examine the relationship between two random variables using pairs of random variables | Apply      |
| CO 4: | Determine the estimation theory of parameters, testing of hypotheses for means and apply the Chi-square test for attribute independence    | Apply      |
| CO 5: | Perform analysis of variances to compare the means of multiple samples and apply control charts to check for quality control               | Apply      |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 1   | -   | -   | 1   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 2       | 3   | 2   | -   | -   | 2   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 3       | 3   | 2   | -   | -   | 2   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 4       | 3   | 2   | -   | -   | 2   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 5       | 3   | 2   | -   | -   | 2   | -   | -   | -   | -   | -    | -    | -    | -    |

## SYLLABUS:

## UNIT I: ONE-DIMENSIONAL DISCRETE RANDOM VARIABLES

6 + 6

Probability – Conditional probability, independence – Baye's theorem – Discrete random variables, probability mass functions – Cumulative distribution functions – Mean and variance – Binomial, Poisson and geometric distributions

## UNIT II: ONE-DIMENSIONAL CONTINUOUS RANDOM VARIABLES

6 + 6

Continuous random variables – Probability density functions – Cumulative distribution functions – Mean and variance – Uniform, exponential, normal distributions

**UNIT III: TWO-DIMENSIONAL PROBABILITY DISTRIBUTIONS**

6 + 6

Two dimensional discrete and continuous random variables – Marginal probability distributions – Independence – Covariance – Correlation

**UNIT IV: INFERENCE STATISTICS**

6 + 6

Estimation - Point estimation – Interval estimation – Hypothesis testing – Hypotheses concerning means – Large, small samples - Chi square test for independence of attributes

**UNIT V: ANOVA AND STATISTICAL QUALITY CONTROL**

6 + 6

Analysis of variance – Completely randomized designs – Randomized block designs – Control charts for measurements ( $\bar{X}$ , R charts) – Control charts for attributes (p, np)

**LIST OF EXPERIMENTS**

1. One-Dimensional Discrete Random Variables – Mean and Variance of discrete RVs. – Discrete Probability distributions
2. One-Dimensional Continuous Random Variables – Mean and Variance of Continuous RVs. – Continuous Probability distributions
3. Two- Dimensional Probability Distributions – Marginal Probability distributions – Covariance and Correlation
4. Inferential Statistics – Estimation theory – Testing of hypotheses
5. ANOVA and SQC – Analysis of Variance. – Control charts ( $\bar{X}$ , R, p, np)

**CONTACT PERIODS:**

**Lecture:** 30 Periods      **Tutorial:** - Periods      **Practical:** 30 Periods      **Project:** - Periods      **Total:** 60 Periods

**TEXTBOOKS:**

1. Douglas C. Montgomery and George C. Runger, "Applied Statistics and Probability for Engineers", Wiley, 2018
2. Richard A. Johnson, "Miller & Freund's Probability and Statistics for Engineers", Pearson Education, New Delhi, 2017

**REFERENCES:**

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, "Probability & Statistics for Engineers & Scientists", Pearson Education, New Delhi, 2016
2. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi 2020
3. Sheldon M Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Academic press, USA, 2020
4. Robert V. Hogg, Elliot Tanis and Dale Zimmerman, "Probability and Statistical Inference", Pearson Education, USA, 2014

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## SEMESTER III

| U25CE301 | Strength of Materials | Category: PCC |   |   |   |   |
|----------|-----------------------|---------------|---|---|---|---|
|          |                       | L             | T | P | J | C |
|          |                       | 3             | 1 | 0 | 0 | 4 |

## COURSE OBJECTIVES:

- To learn the fundamental concepts of stress, strain and deformation.
- To evaluate the shear force, bending moment and deflection.
- To comprehend the stress distribution mechanism of beams.
- To know the different failure theories adopted in designing of structural members.

## COURSE OUTCOMES:

|                                                                                       |         |
|---------------------------------------------------------------------------------------|---------|
| CO 1: Compute the stress and strain of deformable bodies                              | Apply   |
| CO 2: Examine the shear force, bending moment and deflection in beams                 | Analyze |
| CO 3: Determine the flexural and shear stresses for various beam sections             | Apply   |
| CO 4: Solve load carrying capacity of columns with different end conditions           | Apply   |
| CO 5: Predict the stresses due to know symmetrical and unsymmetrical bending of beams | Analyze |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | 2    | -    |
| CO 2       | 3   | 3   | 2   | 2   | -   | 2   | -   | -   | -   | -    | 2    | 2    | -    |
| CO 3       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 1    | 1    | -    |
| CO 4       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 2    | 1    | -    |
| CO 5       | 3   | 3   | 2   | 2   | -   | 2   | -   | -   | -   | -    | -    | 2    | -    |

## SYLLABUS:

## UNIT I: STRESSES AND STRAINS ON DEFORMABLE BODIES

9 + 3

Concept of Stress and Strain – Principle of Superposition – Hooke's law – St. Venant's Principle – Stress under Tension, Compression and Shear – Bars of varying section – Composite bars – Thermal stresses – Relation between Elastic constants – Poisson's ratio – Principal stresses and strains

## UNIT II: SHEAR FORCE, BENDING MOMENTS AND DEFLECTION

9 + 3

Types of beams – Loads, Supports and Reactions – Concept of Shear force and bending moment – SFD and BMD for cantilever, simply supported with and without overhangs subjected to point loads, uniformly distributed load, uniformly varying load, couple and combination of these loads – Point of contraflexure – Slope and deflection of beam – Double integration and Macaulay's method

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**UNIT III: FLEXURAL AND SHEAR STRESSES****9 + 3**

Flexural stresses: Theory of simple bending – Assumptions – Bending equation – Section modulus – Determination of flexural bending stresses of rectangular and circular sections (Solid, Hollow), I, T, Angle and Channel sections Shear stresses and Torsion: Shear stress at a section – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T, angle and channel sections – Theory of torsion – Torsion of circular and hollow circular shafts – Shear stresses due to torsion – Helical springs

**UNIT IV: COLUMNS AND THEORIES OF FAILURES****9 + 3**

Columns: Long and short columns – Stability of columns – Euler's formula – Rankine formula – Combined bending and direct stresses – Middle third rule Theories of Failure: Maximum Principal Stress Theory – Maximum Principal Strain Theory – Maximum Shear Stress Theory – Maximum Strain Energy Theory – Maximum Shear Strain Energy Theory

**UNIT V: UNSYMMETRICAL BENDING****9 + 3**

Unsymmetrical bending of beams – Symmetrical and unsymmetrical sections – Shear centre – Curved bars – Resultant stresses due to direct and bending stresses

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: 15 Periods      Practical: - Periods      Project: - Periods      Total: 60 Periods

**TEXTBOOKS:**

1. Ferdinand, P., E. Russell Johnson Jr., John DeWolf, T., David Mazurek, F., "Mechanics of Materials", McGraw Hill Education, 8th Edition, 2020
2. Russell C. Hibbeler., "Mechanics of materials", Pearson Education Inc, 9th Edition, 2018

**REFERENCES:**

1. Rajput, R K., "Strength of Materials (Mechanics of Solids)", 4th Edition, S. Chand & Company Ltd, New Delhi, 2019.
2. Bansal, R K., "Strength of Materials", Laxmi Publications Pvt. Ltd., 7th Edition, 2024
3. Khurmi, R.S., Khurmi, N., "A Textbook of Strength of Materials (Mechanics of Solids)", 26th Edition, S. Chand & Company Ltd, New Delhi, 2018
4. Gere, J M., Goodno, B.J., "Mechanics of Materials", Cengage Learning India Pvt., 9th Edition, 2019

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## SEMESTER III

| U25CE302 | Construction Materials and Techniques | Category: PCC |   |   |   |   |
|----------|---------------------------------------|---------------|---|---|---|---|
|          |                                       | L             | T | P | J | C |
|          |                                       | 3             | 0 | 0 | 0 | 3 |

## COURSE OBJECTIVES:

- To develop a comprehensive understanding of advanced construction materials, their performance characteristics.
- To familiarize with the latest construction, modern construction techniques used in sub-structure, super-structure, equipment usage and demolition works.
- To select suitable materials, methods, and equipment applying safety, economy, and environmental considerations.

## COURSE OUTCOMES:

- CO 1:** Explain the properties and applications of advanced construction materials Understand
- CO 2:** Interpret modern and sustainable construction materials based on durability, functional performance, and life-cycle sustainability criteria Understand
- CO 3:** Identify modern sub-structure construction techniques and foundation methods Apply
- CO 4:** Illustrate super-structure construction techniques, equipment, and digital technologies used in construction projects Apply
- CO 5:** Select safe, sustainable demolition techniques and circular construction practices Apply

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | 2    | 2    | 2    |
| CO 2       | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | 2    | 2    | 2    |
| CO 3       | 3   | 2   | 1   | 1   | -   | 1   | -   | -   | -   | -    | 2    | 2    | 2    |
| CO 4       | 3   | 2   | 1   | 1   | -   | 1   | -   | -   | -   | -    | 2    | 2    | 2    |
| CO 5       | 3   | 2   | 1   | 1   | -   | 1   | -   | -   | -   | -    | 2    | 2    | 2    |

## SYLLABUS:

## UNIT I: ADVANCED CONSTRUCTION MATERIALS

9

Fibre Reinforced Polymer (FRP) composites using glass, carbon and aramid fibres with polymer matrices – Manufacturing methods such as pultrusion, filament winding and hand lay-up – Structural and infrastructure applications – Geopolymer-based construction materials produced using industrial by-products as binders – Engineered timber products including Cross Laminated Timber (CLT), Glued Laminated Timber (GLT) and Laminated Veneer Lumber (LVL) – Performance characteristics, advantages and limitation

## UNIT II: MODERN AND SMART CONSTRUCTION MATERIALS

9

Nano-engineered construction materials and surface coatings for improved strength and durability – Phase Change Materials (PCM) for thermal energy storage and temperature regulation in buildings – Shape Memory Alloys (SMA) and piezoelectric materials for sensing and actuation – Bio-based construction materials derived from natural resources – Recycled and waste-derived construction materials – Environmental impact, durability assessment and life-cycle assessment methods

  
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**UNIT III: SUB-STRUCTURE CONSTRUCTION TECHNIQUES**

9

Excavation practices for shallow foundations – Construction of bored cast-in-situ piles and driven piles – Diaphragm wall construction procedure including panels, slurry support and concreting – Ground improvement techniques such as stone columns and jet grouting – Dewatering systems for deep excavations – Health, safety and quality control in sub-structure works

**UNIT IV: SUPER-STRUCTURE CONSTRUCTION TECHNIQUES**

9

Prefabricated and modular building construction sequence – High-rise construction using reinforced concrete core wall systems – Composite structural construction combining steel and concrete elements – Tower cranes, concrete pumps and mechanized material handling equipment – Application of Building Information Modelling (BIM), drones, robotics and Internet of Things (IoT) in super-structure execution

**UNIT V: DEMOLITION AND CIRCULAR CONSTRUCTION**

9

Selective demolition and deconstruction methodology – Robotic demolition systems for hazardous environments – Construction and demolition waste segregation – Recovery, reuse and recycling of materials including concrete, steel and timber under circular construction practices

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 45 Periods

**TEXTBOOKS:**

1. Sarkar, S.K. & Saraswati, S., "Construction Technology", Oxford University Press, New Delhi, 2nd Edition, 2023
2. Peurifoy, R.L., Schexnayder, C.J. & Shapira, A., "Construction Planning, Equipment and Methods", McGraw-Hill Education, 10th Edition, 2023
3. Arora, S.P. & Bindra, S.P., "Building Construction, Planning Techniques and Methods of Construction", Dhanpat Rai & Sons, 2021

**REFERENCES:**

1. Kibert, C.J., "Sustainable Construction: Green Building Design and Delivery", John Wiley & Sons, 5th Edition, 2022
2. Deodhar, S.V., "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, Revised Edition, 2021
3. Velumani, P., "Construction Techniques and Practices", SIA Publishers & Distributors Pvt Ltd, 2nd Edition, 2022
4. Sharma, S.C., "Construction Equipment and Management", Khanna Publishers, New Delhi, 2023
5. Mamlouk, M.S. & Zaniewski, J.P., "Materials for Civil and Construction Engineers", Pearson, 5th Edition, 2023

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## SEMESTER III

| U25CE303 | Engineering Survey | Category: PCC |   |   |   |   |
|----------|--------------------|---------------|---|---|---|---|
|          |                    | L             | T | P | J | C |
|          |                    | 3             | 0 | 0 | 0 | 3 |

## COURSE OBJECTIVES:

- To study the various methods of surveying
- To understand the concept of control, astronomical and modern survey
- To use various survey instruments

## COURSE OUTCOMES:

|       |                                                                                                                            |            |
|-------|----------------------------------------------------------------------------------------------------------------------------|------------|
| CO 1: | Explain the fundamental principles of surveying and demonstrate the use of basic surveying instruments                     | Understand |
| CO 2: | Interpret terrain features using appropriate levelling and contouring methods                                              | Apply      |
| CO 3: | Apply tachometric principles to find angles and distances using theodolite instruments                                     | Apply      |
| CO 4: | Make use of Total Station and GPS for data acquisition, processing and mapping                                             | Apply      |
| CO 5: | Utilize modern surveying techniques such as DGPS and Drone-based surveys for advanced spatial data collection and analysis | Apply      |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | 1    | 1    | -    |
| CO 2       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | 1    | 1    | -    |
| CO 3       | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | 1    | -    |
| CO 4       | 3   | 2   | 1   | 1   | 1   | 1   | -   | -   | -   | -    | 2    | 2    | -    |
| CO 5       | 3   | 2   | 1   | 1   | 2   | 1   | -   | -   | -   | -    | 2    | 2    | -    |

## SYLLABUS:

## UNIT I: FUNDAMENTALS OF SURVEYING

9

Definition – Classification – Principles – Equipment and accessories used for ranging and chaining – Methods of ranging – Compass Surveying – Types – Bearing – System and conversions – Plane table Surveying

## UNIT II: LEVELLING

9

Datum – Benchmarks – Levels – Temporary and permanent adjustments – Methods of levelling – Fly levelling – Check levelling – Booking – Reduction – Contouring – Characteristics of contours – Methods of contouring – Area and volume calculation.

## UNIT III: THEODOLITE SURVEYING

9

Theodolite survey – Horizontal and Vertical angle Measurements and Distance – Temporary and permanent adjustments – Tangential and Stadia tachometric – Analytical lens

## UNIT IV: HYDROGRAPHIC SURVEYING AND TOTAL STATION

9

Hydrographic surveying – Tides – MSL – Sounding methods – EDM – Principles – Total stations – Parts and accessories – Advantages and applications – Working principles – Errors

**UNIT V: MODERN SURVEYING**

9

Photogrammetric surveying – GPS Surveying – Segments – Applications – GIS – Objectives – Data structures – Errors – Remote Sensing – Concepts – Applications – DGPS – Working principles – Drone Survey – Concept

**CONTACT PERIODS:**

**Lecture:** 45 Periods      **Tutorial:** - Periods      **Practical:** - Periods      **Project:** - Periods      **Total:** 45 Periods

**TEXTBOOKS:**

1. Punmia, B.C., Jain, A.K., & Jain, A.K., "Surveying (Vol. 1 & 2)", Laxmi Publications, 17th Edition, 2021
2. Kanetkar, T.P. & Kulkarni, S.V., "Surveying and Levelling", Pune Vidyarthi Griha Prakashan, 24th Edition, 2019

**REFERENCES:**

1. Basak N N, "Surveying & Levelling", 2nd Edition, Tata McGraw-Hill Education, 2014
2. Venkatramaiah, "Text book of Surveying", 1st edition, University press, New Delhi, 2014
3. Bhavikatti, S.S., "Surveying and Levelling, Vol. I and II", 2nd Edition, I.K. International, 2016
4. Madhu, N, Sathiskumar, R and Satheesh Gobi, "Advanced Surveying: Total Station, GIS and Remote Sensing", 2nd Edition, Pearson India, 2017

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## SEMESTER III

| U25CE304 | Concrete Technology | Category: PCC |   |   |   |   |
|----------|---------------------|---------------|---|---|---|---|
|          |                     | L             | T | P | J | C |
|          |                     | 3             | 0 | 2 | 0 | 4 |

## COURSE OBJECTIVES:

- To learn the characteristics on various concrete making materials as per IS codal provisions and to understand their properties
- To explore various methods of mix design for concrete
- To understand the microstructure of concrete and its influence on physical, mechanical and durability properties

## COURSE OUTCOMES:

|       |                                                                                     |            |
|-------|-------------------------------------------------------------------------------------|------------|
| CO 1: | Explain the various requirements of cement, aggregate and water for making concrete | Understand |
| CO 2: | Choose admixtures to enhance the properties of concrete                             | Apply      |
| CO 3: | Design the concrete mix using IS methods                                            | Apply      |
| CO 4: | Determine the physical, mechanical and durability properties of concrete            | Apply      |
| CO 5: | Identify the importance and application of special concrete                         | Apply      |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 1   | -   | -   | -   | -   | -   | 3   | 3   | -    | 2    | 2    | 2    |
| CO 2       | 3   | 2   | 1   | 1   | -   | -   | 1   | 1   | -   | -    | 2    | 2    | 2    |
| CO 3       | 3   | 2   | 1   | 1   | -   | 2   | 3   | 3   | 3   | -    | 2    | 2    | 2    |
| CO 4       | 3   | 2   | 1   | 1   | -   | 2   | 2   | 3   | 2   | -    | 2    | 2    | 1    |
| CO 5       | 3   | 2   | 1   | 1   | -   | 2   | -   | 2   | -   | -    | 2    | 2    | 2    |

## SYLLABUS:

## UNIT I: CONSTITUENT MATERIALS

9 + 6

Cement: Types of cement – Chemical composition – Standard consistency test – Setting time – Fineness – Hydration process and products, Aggregates: Classification of aggregates – Physical and Mechanical properties – Tests on aggregates as per IS standards, Water: General requirements – Quality of water for mixing and curing – Permissible limits of impurities

## UNIT II: ADMIXTURES

9 + 6

Types of Admixtures – Classification and functions – Mineral Admixtures: Fly ash, GGBS, silica fume, rice husk ash – Properties and influence on concrete – Chemical Admixtures: Accelerators, retarders, water reducers, superplasticizers, high-range water reducers – Viscosity-modifying admixtures

## UNIT III: MIX PROPORTIONS

9 + 6

Factors influencing the selection of mix proportions and performance requirements – Exposure conditions and durability considerations – BIS method of mix design – Mix design concepts for high strength concrete and self-compacting concrete.

  
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**UNIT IV: PROPERTIES OF CONCRETE****9 + 6**

Fresh Concrete: Workability – Tests – Segregation and bleeding – Curing methods. Hardened Concrete: Mechanical properties – Durability parameters – Water absorption, Chemical resistance. Microstructural Aspects: Hydration products, C-S-H gel formation, Pore structure and characteristics of the Interfacial Transition Zone (ITZ).

**UNIT V: SPECIAL CONCRETE****9 + 6**

High performance concrete – Lightweight concrete – Pervious concrete: concepts, applications, and performance parameters – Fibre reinforced concrete – Geopolymer concrete: materials, reaction mechanisms and properties – Self curing concrete – Principles and applications

**LIST OF EXPERIMENTS**

1. Specific gravity of cement
2. Specific gravity of fine aggregate
3. Specific gravity of coarse aggregate
4. Water absorption of fine and coarse aggregate
5. Sieve analysis of fine aggregate and coarse aggregate
6. Workability of concrete by slump test
7. Compressive strength of concrete
8. Modulus of Elasticity

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: - Periods      Practical: 30 Periods      Project: - Periods      Total: 75 Periods

**TEXTBOOKS:**

1. Shetty M S, "Concrete Technology", 8th edition, S.Chand and Company Limited, New Delhi, 2020
2. Neville A M, "Properties of Concrete", 5th edition, Pearson India, New Delhi, 2016

**REFERENCES:**

1. Gambhir M L, "Concrete Technology", 2nd edition, Tata Mc. Graw Hill Publishers, New Delhi, 2017
2. Santhakumar A R, "Concrete Technology", 2nd edition OXFORD University Press India, New Delhi, 2018
3. IS10262-2019, "Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards", New Delhi
4. EFNARC, "Specification and Guidelines for Self-Compacting Concrete", European Federation of Producers and Applicators of Specialist Building Products for Concrete, Association House, 99 West Street, Farnham, UK, 2005
5. <https://nptel.ac.in/courses/105102012>





## SEMESTER III

| U25CE305 | Materials Testing Laboratory | Category: PCC |   |   |   |   |
|----------|------------------------------|---------------|---|---|---|---|
|          |                              | L             | T | P | J | C |
|          |                              | 0             | 0 | 4 | 0 | 2 |

## PRE-REQUISITES:

- U25CE301 - Strength of Materials

## COURSE OBJECTIVES:

- To understand and determine the fundamental engineering properties of materials such as steel, bricks, aggregates, and bitumen through experimental methods
- To develop practical knowledge of testing procedures, equipment usage, and interpretation of test data for evaluating material performance
- To correlate laboratory findings with theoretical concepts and standards for assessing the suitability of materials for various civil engineering applications

## COURSE OUTCOMES:

- CO 1: Examine the physical and mechanical properties of Engineering materials using standard laboratory test methods **Analyze**
- CO 2: Compute the behavior and characteristics of materials based on experimental observations and standard testing procedures **Analyze**
- CO 3: Experiment standard laboratory tests to assess the consistency, quality and suitability of construction materials as per relevant codes **Analyze**
- CO 4: Predict the material quality and suitability based on experimental results for Civil Engineering works **Analyze**
- CO 5: Develop professional laboratory skills, teamwork, safety and effective technical report writing **Analyze**

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 3   | 2   | 2   | 1   | -   | 3   | 3   | -   | -    | 1    | 2    | 1    |
| CO 2       | 3   | 3   | 2   | 2   | 1   | -   | 3   | 3   | -   | -    | 1    | 2    | 2    |
| CO 3       | 3   | 3   | 2   | 2   | 1   | -   | 3   | 3   | -   | -    | 1    | 1    | 2    |
| CO 4       | 3   | 3   | 2   | 2   | 1   | 1   | 1   | 3   | -   | -    | 1    | 2    | -    |
| CO 5       | 3   | 3   | 2   | 2   | -   | 1   | -   | 3   | -   | -    | 1    | 2    | -    |

## LIST OF EXPERIMENTS

1. Tensile Strength Test on Steel Specimen
2. Torsion Test on Steel Specimen
3. Impact test on Coarse aggregate
4. Crushing strength test on Coarse aggregate
5. Abrasion test on coarse aggregate
6. Compressive strength test on Bricks/blocks
7. Impact Test on metal specimen (Izod and Charpy)

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8. Hardness test on metal specimen (Rockwell and Brinell Hardness tests)
9. Penetration test on bitumen
10. Specific gravity test of bitumen
11. Ductility test of bitumen
12. Viscosity test of bitumen
13. Softening point test of bitumen

**CONTACT PERIODS:**

**Lecture:** - Periods      **Tutorial:** - Periods      **Practical:** 60 Periods      **Project:** - Periods      **Total:** 60 Periods

**REFERENCES:**

1. Gambhir ML, Neha Jamwal, "Lab Manual – Building and Construction Materials – Testing and Quality Control", McGraw Hill Education, New Delhi, 2017
2. Venkatappa Rao G, Ramachandra Rao K, Kausik Pahari, Bhavanna Rao DV, "Highway Material Testing and Quality Control", Wiley Publication, 2019
3. Syed Danish Hasan, "Civil Engineering Materials and their testing", Narosa Book Distributors, 2020
4. IS 2386 (Part IV):1963, Reaffirmed year (2021) – Specifications for testing Aggregate Impact Value and Crushing Strength
5. Virtual Labs at NITK Surathkal, "Strength of Materials Lab", <https://sm-nitk.vlabs.ac.in/>
6. Virtual Labs at NITK Surathkal, "Theory of Structures Lab", <https://ts-nitk.vlabs.ac.in>



## SEMESTER III

| U25CE306 | Surveying Laboratory | Category: PCC |   |   |   |   |
|----------|----------------------|---------------|---|---|---|---|
|          |                      | L             | T | P | J | C |
|          |                      | 0             | 0 | 4 | 0 | 2 |

## COURSE OBJECTIVES:

- To impart practical skills in the use of basic and advanced surveying instruments
- To develop the ability to collect, analyze, and interpret field data for, determining elevations, distances, angles and areas

## COURSE OUTCOMES:

- CO 1:** Perform basic surveying operations such as ranging, chaining, and offset measurements using standard field procedures **Analyze**
- CO 2:** Calculate bearings, angles, and reduced levels from field observations using conventional surveying instruments. **Analyze**
- CO 3:** Conduct theodolite and tacheometric surveys to determine distances, elevations, and horizontal angles **Analyze**
- CO 4:** Utilize total station and DGPS data for mapping, positioning, and surveying applications **Analyze**
- CO 5:** Prepare field books, contour plans, profiles, and maps for civil engineering projects with acceptable accuracy. **Analyze**

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 1   | -   | 3   | -   | 1   | 3   | -   | -    | -    | -    | -    |
| CO 2       | 3   | 2   | 1   | -   | 3   | -   | 1   | 3   | -   | -    | -    | -    | -    |
| CO 3       | 3   | 2   | 1   | -   | 3   | -   | 1   | 3   | -   | -    | -    | -    | -    |
| CO 4       | 3   | 2   | 1   | -   | 3   | -   | 1   | 3   | -   | -    | -    | -    | -    |
| CO 5       | 3   | 2   | 1   | -   | 3   | -   | 1   | 3   | -   | -    | -    | -    | -    |

## LIST OF EXPERIMENTS

- Aligning, Ranging, Chaining and marking by perpendicular offsets
- Study of Bearings and determination of Included angle by Prismatic Compass
- Determination of Reduced Level by Check and Fly leveling
- Determine Longitudinal and cross sectioning using dumpy level
- Measurement of Horizontal angle by Repetition and Reiteration Method
- Determination of tacheometric constant
- Determine the height of the building using theodolite
- Determination of elevation of an object using single plane method when base is Accessible / inaccessible.
- Determination of Area by Total Station
- Determination of Topography using Total Station
- Determination of REM by Total Station
- Location of a point using GPS

## CONTACT PERIODS:

Lecture: - Periods      Tutorial: - Periods      Practical: 60 Periods      Project: - Periods      Total: 60 Periods

**REFERENCES:**

1. Basak, N., "Surveying and Levelling", McGraw Hill Education, 2nd Edition, 2014
2. Punmia, B.C., Jain, A.K., & Jain, A.K., "Surveying (Vol. 1 & 2)", Laxmi Publications, 17th Edition, 2021
3. Kanetkar, T.P. & Kulkarni, S.V., "Surveying and Levelling", Pune Vidyarthi Griha Prakashan, 24th Edition, 2019
4. Arora, K.R., "Surveying (Vol. 1 & 2)", Standard Book House, 12th Edition, 2018



## SEMESTER III

| U25MNC02 | Essence of Indian Traditional Knowledge<br>(Common to all programmes) | Category: MNC |   |   |   |   |
|----------|-----------------------------------------------------------------------|---------------|---|---|---|---|
|          |                                                                       | L             | T | P | J | C |
|          |                                                                       | 1             | 0 | 0 | 0 | 0 |

## COURSE OBJECTIVES:

- Understand the Concept of culture in ancient, medieval and modern period.
- Know the need and importance of Indian languages and Literature.
- Understand the various religion and philosophy in various periods.

## COURSE OUTCOMES:

CO 1: Understand Philosophy of Indian culture

Understand

CO 2: Distinguish the Indian languages and literature.

Understand

CO 3: Learn the philosophy of ancient, medieval and modern Indian

Remember

CO 4: Acquire the information about the fine arts in India

Apply

CO 5: Know the contribution of scientists different eras

Understand

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PS01 | PS02 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | -   | 2   | -   | 1   | -   | -   | 3   | -   | -   | -    | -    | -    | -    |
| CO 2       | -   | 2   | -   | 1   | -   | -   | 3   | -   | -   | -    | -    | -    | -    |
| CO 3       | -   | 2   | -   | 1   | -   | -   | 3   | -   | -   | -    | -    | -    | -    |
| CO 4       | -   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 5       | -   | 2   | -   | 1   | -   | -   | 3   | -   | -   | -    | -    | -    | -    |

## SYLLABUS:

## UNIT I: INTRODUCTION TO CULTURE

5

Culture, Civilization, Culture and heritage, General characteristics of culture, Importance of culture in human literature, Indian culture, Ancient India, Medieval India, Modern India

## UNIT II: INDIAN LANGUAGES AND LITERATURE

5

Indian Languages and Literature-I: The role of Sanskrit, Significance of scriptures to current society, Indian philosophies, other Sanskrit literature, Literature of south India Indian Languages and Literature-II: Northern Indian Languages & literature, Temples and Temple types, Sculptors' specialties, Temples Individualities Festivals and hopes

## UNIT III: RELIGION AND PHILOSOPHY

5

Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (Selected Movements only)

**UNIT IV: ARTS, SCIENCE, TECHNOLOGY& ENGINEERING IN INDIA**

5

Indian painting, Handicrafts, Music, Divisions of Indian classical music, Modern Indian music, Dance and drama, Indian architecture (ancient, medieval and modern), Science and technology in India, Development of science in different periods, Sushruta and Charaka, sages of South India, herbal treatments, Surgery methods of healers, Yoga and pranayama practices, Herbal usages and medication-making methods.

**UNIT V: EDUCATION SYSTEM IN INDIA**

5

Education in ancient, Medieval and modern India, Aims of education, subjects, languages, science and scientists of Ancient India, Medieval India and Modern India

**CONTACT PERIODS:**

|                            |                            |                             |                           |                          |
|----------------------------|----------------------------|-----------------------------|---------------------------|--------------------------|
| <b>Lecture:</b> 25 Periods | <b>Tutorial:</b> - Periods | <b>Practical:</b> - Periods | <b>Project:</b> - Periods | <b>Total:</b> 25 Periods |
|----------------------------|----------------------------|-----------------------------|---------------------------|--------------------------|

**TEXTBOOKS:**

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005.
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN: 978-8187276333, 2007.

**REFERENCES:**

1. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989.
2. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN: 9788120810990, 2014.
3. S. Narain, "Examinations in Ancient India", Arya Book Depot, 1993.
4. NCERT, "Position Paper on Arts, Music, Dance and Theatre", 2000.
5. B. Kumar Mohanta & Vipin Kumar Singh, "Traditional Knowledge System and Technology in India", 2012.

## SEMESTER III

|           |                                                                    |               |   |   |   |   |
|-----------|--------------------------------------------------------------------|---------------|---|---|---|---|
| U25RMCC08 | Professional Skill Development - III<br>(Common to all programmes) | Category: MCC |   |   |   |   |
|           |                                                                    | L             | T | P | J | C |
|           |                                                                    | 15 Hours      |   |   |   | 1 |

## COURSE OUTCOMES:

- CO 1:** Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities **Apply**
- CO 2:** Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation **Apply**
- CO 3:** Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning **Apply**

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 2   | -   | 3   | 1   | -   | -   | 2   | 2    | -    | -    | -    |
| CO 2       | 2   | 3   | 3   | 2   | 2   | 2   | -   | -   | 1   | 1    | -    | -    | -    |
| CO 3       | -   | -   | 3   | -   | -   | 2   | 2   | 3   | 3   | 3    | 2    | -    | -    |

## GUIDELINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

## CONTACT PERIODS:

Lecture: - Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 0 Periods



## SEMESTER IV

| U25MA403 | Numerical Methods and Partial Differential Equations<br>(Common to CE, EE, ME, MI) | Category: BSC |   |   |   |   |
|----------|------------------------------------------------------------------------------------|---------------|---|---|---|---|
|          |                                                                                    | L             | T | P | J | C |
|          |                                                                                    | 3             | 0 | 0 | 0 | 3 |

## PRE-REQUISITES:

- U25MA101 - Calculus and Differential Equations / U25RMA101 - Multivariable Calculus and Applications

## COURSE OBJECTIVES:

- To provide knowledge of numerical methods for solving nonlinear equations, systems of linear equations, interpolation, differentiation, and integration problems
- To develop the ability to formulate and solve partial differential equations using standard analytical techniques
- To impart an understanding of Fourier series and boundary value problems arising in heat flow and wave propagation

## COURSE OUTCOMES:

- CO 1: Apply numerical methods to solve systems of linear equations and compare the efficiency of various solution techniques Apply
- CO 2: Apply interpolation techniques to estimate unknown values and analyze the accuracy of the approximations Apply
- CO 3: Implement numerical differentiation and integration methods to obtain approximate solutions and evaluate their accuracy Apply
- CO 4: Apply standard methods to solve partial differential equations and interpret the resulting solutions under given conditions Apply
- CO 5: Apply Fourier series and partial differential equation techniques to solve heat and wave equations under different boundary conditions Apply

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 2       | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 3       | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 4       | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |
| CO 5       | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | -    |

## SYLLABUS:

## UNIT I: SYSTEM OF EQUATIONS

9

Solution of nonlinear equations – Newton Raphson method, Regular false – Solution of system of linear equations – Gauss elimination method, Iterative solution of linear systems by Gauss-Seidel method

## UNIT II: INTERPOLATION

9

Interpolation with equal intervals – Newton's forward and backward difference formulae, Interpolation with unequal intervals – Lagrange Interpolation

9

**UNIT III: NUMERICAL DIFFERENTIATION AND INTEGRATION**

Approximation of derivatives using interpolation polynomials for an equal interval – Numerical Integration – Trapezoidal rule, Simpson's 1/3 rule, evaluation of double integrals by Trapezoidal rule

9

**UNIT IV: PARTIAL DIFFERENTIAL EQUATIONS**

Formation of Partial Differential Equations – Lagrange's linear equation – Solution of second-order homogeneous partial differential equations with constant coefficients

9

**UNIT V: BOUNDARY VALUE PROBLEM**

Fourier Series solutions – One-dimensional wave equation – One-dimensional heat flow equation (unsteady state) – Two-dimensional heat flow equation (Steady state, Cartesian form only)

**CONTACT PERIODS:**

|                            |                            |                             |                           |                          |
|----------------------------|----------------------------|-----------------------------|---------------------------|--------------------------|
| <b>Lecture:</b> 45 Periods | <b>Tutorial:</b> - Periods | <b>Practical:</b> - Periods | <b>Project:</b> - Periods | <b>Total:</b> 45 Periods |
|----------------------------|----------------------------|-----------------------------|---------------------------|--------------------------|

**TEXTBOOKS:**

1. Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers", Tata McGraw Hill, New Delhi, 2021
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley India Pvt Ltd, New Delhi, 2018

**REFERENCES:**

1. Curtis F Gerald and Patrick O Wheatly, "Applied Numerical Analysis", Pearson Education, New Delhi, 2017
2. Grewal, B S and Grewal J S, "Numerical Methods in Engineering and Science", , Khanna Publishers, New Delhi, 2015
3. Bali N.P., & Manish Goyal, "Engineering mathematics", 12th edition, Lakshmi Publication, 2016
4. Peter V.O`Neil, "Advanced Engineering Mathematics", Cengage, 2016





## SEMESTER IV

| U25CE401 | Fluid Mechanics and Hydraulic Engineering | Category: PCC |   |   |   |   |
|----------|-------------------------------------------|---------------|---|---|---|---|
|          |                                           | L             | T | P | J | C |
|          |                                           | 3             | 0 | 0 | 0 | 3 |

## COURSE OBJECTIVES:

- To understand fluid properties, fluid statics, and apply the principles of kinematics and dynamics for analyzing fluid flow.
- To analyze flow behavior in pipes and boundary layers, including flow losses and flow characteristics.
- To apply dimensional analysis and similitude concepts, and analyze open channel flow conditions such as critical flow and hydraulic jump.

## COURSE OUTCOMES:

|                                                                                         |         |
|-----------------------------------------------------------------------------------------|---------|
| CO 1: Identify the fluid properties and pressure forces on submerged surfaces           | Apply   |
| CO 2: Apply fluid kinematics and dynamics concepts to measure discharge in pipes        | Apply   |
| CO 3: Calculate energy losses in pipe flow and analyze boundary layer systems           | Apply   |
| CO 4: Apply the Principles of dimensional and model analysis in fluids                  | Apply   |
| CO 5: Analyze the most economical channel sections and the behavior of non-uniform flow | Analyze |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 1   | 1   | -   | 1   | -   | -   | -   | -    | 1    | 1    | -    |
| CO 2       | 3   | 2   | 1   | 1   | -   | 1   | -   | -   | -   | -    | 1    | 1    | -    |
| CO 3       | 3   | 2   | 1   | 1   | -   | 1   | -   | -   | -   | -    | 1    | 1    | -    |
| CO 4       | 3   | 2   | 1   | 1   | -   | 1   | -   | -   | -   | -    | 1    | 1    | -    |
| CO 5       | 3   | 3   | 2   | 2   | -   | 1   | -   | -   | -   | -    | 1    | 2    | -    |

## SYLLABUS:

## UNIT I: PROPERTIES OF FLUIDS AND HYDROSTATICS

9

Basic concepts of fluid mechanics – Fluid properties – Density, specific weight, specific volume, specific gravity, viscosity, surface tension, compressibility, capillarity – Types of fluids – Total pressure and centre of pressure on submerged surfaces

## UNIT II: FLUID KINEMATICS AND DYNAMICS

9

Fluid Kinematics – Classification of fluid flows – Continuity equation – Stream line, streak line, path line – Potential function and stream function. Fluid Dynamics – Euler's equation, Bernoulli's equation and its application. Flow Measurements – Discharge measurement in pipes using Venturimeter and Orifice meter – Momentum equation

## UNIT III: FLOW THROUGH PIPES AND BOUNDARY LAYERS

9

Laminar and turbulent flow – Major and minor losses of flow in pipes – Total energy line and Hydraulic gradient line – Pipes in series and in parallel. Concept of boundary layer and its growth – Types of boundary layer thickness

## UNIT IV: DIMENSIONAL ANALYSIS

9

Units and dimensions – Dimensional homogeneity – Rayleigh's method and Buckingham Pi- theorem – Dimensionless parameters – Similitude and model studies



**UNIT V: FLOW IN OPEN CHANNELS**

Types of flow in channels - Chezy's and Manning's equation – Hydraulically most efficient channel section – Energy depth relationships, specific energy, critical flow – Hydraulic jump and backwater curves

**CONTACT PERIODS:**

**Lecture:** 45 Periods      **Tutorial:** - Periods      **Practical:** - Periods      **Project:** - Periods      **Total:** 45 Periods

**TEXTBOOKS:**

1. Bansal R.K., "Fluid Mechanics and Hydraulics Machines", 5th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2025
2. Rajput, R. K., "A Text Book of Fluid Mechanics and hydraulic Machines", 3rd edition, S. Chand & Co., New Delhi, 2019

**REFERENCES:**

1. Jain A. K. "Fluid Mechanics including Hydraulic Machines", 12th edition, Khanna Publishers, 2024
2. Modi P.N and Seth " Hydraulics and Fluid Mechanics including Hydraulic Machines", 23rd edition, Standard Book House New Delhi, 2022
3. Chandramouli P.N., "Applied Hydraulic Engineering", 2nd edition Yes Dee Publishing Pvt. Ltd., 2022
4. Subramanya K., "Flow in open channels", 5th edition Tata McGraw Hill, New Delhi, 2019
5. Ramamrutham, S., "Hydraulics, Fluid Mechanics and Fluid Machines", 4th edition, DhanpatRai and Sons, Delhi, 2015

## SEMESTER IV

| U25CE402 | Highway Engineering | Category: PCC |   |   |   |   |
|----------|---------------------|---------------|---|---|---|---|
|          |                     | L             | T | P | J | C |
|          |                     | 3             | 0 | 0 | 0 | 3 |

## COURSE OBJECTIVES:

- To understand the concept of Highway planning and alignment
- To evaluate pavement design, construction and maintenance techniques
- To identify the pavement failures and its strengthening methods

## COURSE OUTCOMES:

- CO 1: Explain highway planning and alignment
- CO 2: Build geometric design of highways
- CO 3: Design flexible pavement as per IRC standards
- CO 4: Identify the materials and equipment used in highway construction
- CO 5: Solve the methods of pavement maintenance and strengthening techniques

Understand

Apply

Apply

Apply

Apply

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 2   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | 1    | -    |
| CO 2       | 3   | 2   | 1   | 1   | -   | 1   | 2   | -   | -   | -    | -    | 2    | -    |
| CO 3       | 3   | 2   | 1   | 1   | -   | 1   | 2   | -   | -   | -    | -    | 3    | -    |
| CO 4       | 3   | 2   | 1   | 1   | -   | 1   | 1   | -   | -   | -    | -    | 3    | 1    |
| CO 5       | 3   | 2   | 1   | 1   | -   | 1   | 1   | -   | -   | -    | -    | 2    | -    |

## SYLLABUS:

## UNIT I: HIGHWAY PLANNING AND ALIGNMENT

9

Introduction to Highway Engineering – Scope – Highway Development and planning in India – Highway Alignment – Engineering surveys for Highway alignment – Classification of Highways – Highway cross sectional elements – Ongoing highway projects in India

## UNIT II: GEOMETRIC DESIGN OF HIGHWAY

9

Sight Distance – Design of Horizontal Alignment – Super elevation – PIEV Theory – Extra Widening on Curves – Horizontal transition curves – Design of Vertical Alignments – Gradients & Curves

## UNIT III: DESIGN OF HIGHWAY PAVEMENTS

9

Flexible pavements – Components and functions – Factors affecting design and performance of flexible pavements – Stresses in flexible pavements – Flexible pavement design methods as per IRC recommendations – Rigid pavements – Components and functions – Factors affecting design and performance of CC Pavements – Stresses in Rigid pavements

**UNIT IV: HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE**

9

Materials used in Highway construction – Properties and testing of Highway materials – Modern materials: Glass, Fiber, Plastic, Geo-textiles, Geo-membrane – Features of Highway construction – Construction equipment's: Excavators, Graders, Compactors/Rollers, Pavers, Stabilisers

**UNIT V: PAVEMENT MAINTENANCE EVALUATION AND STRENGTHENING**

9

Types of maintenance – Defects in Flexible pavements and Rigid pavements –Types of failures, Causes and Treatment – Pavement evaluation techniques – Strengthening of pavements – Highway Project Formulation

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 45 Periods

**TEXTBOOKS:**

1. Khanna K., Justo C E G, "Highway Engineering", Khanna Publishers, Roorkee, 2023
2. Kadiyali L.R., "Principles and Practice of Highway Engineering", Khanna Technical Publications, New Delhi, 2019

**REFERENCES:**

1. Yang H. Huang., "Pavement Analysis and Design", Pearson Education Inc, Ninth Impression, South Asia, 2012
2. Ian D. Walsh., "ICE manual of highway design and management", ICE Publishers, 1st Edition, USA, 2011
3. Indian Road Congress (IRC), "Guidelines for the Design of Flexible Pavements", (Third Revision), IRC: 37-2012
4. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", SciTech Publications (India), Chennai, 2018.
5. Geometric Design of Highways - [https://onlinecourses.nptel.ac.in/noc22\\_ce94/preview](https://onlinecourses.nptel.ac.in/noc22_ce94/preview)

*h/t*  
 20/1/2025  
 THE HONORABLE  
 HEAD OF THE DEPARTMENT  
 Department of Civil Engineering  
 KPR Institute of Engineering and Technology



## SEMESTER IV

| U25CE403 | Water Supply and Wastewater Engineering | Category: PCC |   |   |   |   |
|----------|-----------------------------------------|---------------|---|---|---|---|
|          |                                         | L             | T | P | J | C |
|          |                                         | 3             | 0 | 0 | 0 | 3 |

## COURSE OBJECTIVES:

- To understand the principles of water demand estimation, water quality assessment, and the design of water treatment and distribution systems
- To study the generation, collection, and conveyance of wastewater, along with its physical, chemical, and biological characteristics
- To learn the various treatment processes for wastewater, sludge management, effluent disposal, and reuse in an environmentally sustainable manner

## COURSE OUTCOMES:

|                                                                                                        |       |
|--------------------------------------------------------------------------------------------------------|-------|
| CO 1: Estimate water demand and assess quality as per standards                                        | Apply |
| CO 2: Develop basic components of water treatment and distribution systems                             | Apply |
| CO 3: Plan and design sewerage systems for urban areas                                                 | Apply |
| CO 4: Identify unit processes in wastewater treatment and evaluate performance                         | Apply |
| CO 5: Apply the concepts of effluent reuse and sludge handling to sustainable environmental management | Apply |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 1   | 1   | -   | 1   | 2   | -   | -   | -    | -    | 1    | 2    |
| CO 2       | 3   | 2   | 1   | 1   | -   | 2   | -   | -   | -   | -    | -    | 1    | 2    |
| CO 3       | 3   | 2   | 1   | 1   | -   | 2   | -   | -   | -   | -    | -    | 1    | 2    |
| CO 4       | 3   | 2   | 1   | 1   | -   | 2   | -   | -   | -   | -    | -    | -    | 1    |
| CO 5       | 3   | 2   | 1   | 1   | -   | 2   | -   | -   | -   | -    | -    | -    | 1    |

## SYLLABUS:

## UNIT I: FUNDAMENTALS OF WATER SUPPLY ENGINEERING

8

Importance and scope of Environmental Engineering – Sources of water and water demand for different uses – Population forecasting and design periods – Types of water demands and factors affecting demand – Variations in water demand and fire demand estimation – Quality of water: physical, chemical, and biological characteristics – Water quality standards (BIS 10500, WHO) and sampling methods.

## UNIT II: WATER TREATMENT AND DISTRIBUTION SYSTEMS

9

Objectives and classification of water treatment processes – Aeration, sedimentation, coagulation, flocculation, filtration, and disinfection – Design of sedimentation and filtration units – Layout and operation of conventional water treatment plant – Water distribution system: methods of distribution, layouts, House service connection and plumbing system.

**UNIT III: WASTEWATER GENERATION AND SEWERAGE SYSTEMS**

9

Wastewater sources and classification – Quantity estimation of domestic sewage and storm water; variation factors – Types of sewerage systems – Hydraulic design of sewers: flow estimation, gradients, self-cleansing velocity – Sewer appurtenances – Layout and components of sewerage system – Characteristics of sewage – physical, chemical, biological parameters.

**UNIT IV: WASTEWATER TREATMENT PROCESSES**

10

Objectives and levels of treatment – Screening, grit removal, sedimentation tanks – Biological treatment processes: Process design parameters: detention time, F/M ratio, MLSS, SRT, Suspended-growth systems: Activated Sludge Process, secondary clarifiers – Attached-growth systems: Trickling filters, rotating biological contactors (RBC) – Introduction to anaerobic treatment

**UNIT V: WASTEWATER DISPOSAL AND SLUDGE MANAGEMENT**

9

Tertiary treatment and safe disposal – Disinfection methods and effluent discharge standards (CPCB) – Concepts of wastewater reuse and recycling, onsite sanitation – Septic tank design and sustainable sanitation practices – Case studies and emerging technologies (membrane processes, decentralized systems). Sludge characteristics, thickening, digestion – Sludge dewatering and drying methods

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 45 Periods

**TEXTBOOKS:**

1. S.K. Garg, "Water Supply Engineering (Environmental Engineering Vol. I)", 37th Edition, Khanna Publishers, New Delhi, 2022
2. S.K. Garg, "Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. II)", 28th Edition, Khanna Publishers, New Delhi, 2022

**REFERENCES:**

1. Bureau of Indian Standards (BIS) – IS 10500, "Drinking Water Specifications (with latest amendments)", New Delhi, 2012.
2. Central Pollution Control Board (CPCB), "Effluent Discharge Standards", New Delhi (latest version available on [cpcb.nic.in](http://cpcb.nic.in))
3. P.N. Khanna, "Water Supply and Sewerage Engineering", Latest Revised Edition, Khanna Publishers, New Delhi, 2022
4. Metcalf & Eddy, Inc., George Tchobanoglous, Franklin L. Burton, H. David Stensel, "Wastewater Engineering: Treatment and Resource Recovery", 5th Edition, McGraw-Hill Education, 2014
5. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, "Environmental Engineering", 7th Reprint, McGraw-Hill Education, 2013



## SEMESTER IV

| U25CE404 | Geotechnical Engineering I | Category: PCC |   |   |   |   |
|----------|----------------------------|---------------|---|---|---|---|
|          |                            | L             | T | P | J | C |
|          |                            | 3             | 0 | 2 | 0 | 4 |

## COURSE OBJECTIVES:

- To classify soil types and its properties based on Standard Engineering criteria.
- To evaluate consolidation and compaction processes influencing soil behaviour.
- To determine effective stress and shear strength for geotechnical applications.

## COURSE OUTCOMES:

|       |                                                                                                                                |         |
|-------|--------------------------------------------------------------------------------------------------------------------------------|---------|
| CO 1: | Identify the soil formation, soil structure, phase relationships, and index properties                                         | Apply   |
| CO 2: | Solve permeability and seepage behavior in soils using laboratory tests and field Methods                                      | Apply   |
| CO 3: | Identify soil compaction characteristics and consolidation behavior using standard laboratory tests and consolidation theories | Apply   |
| CO 4: | Compute the stresses in soil under various loading conditions                                                                  | Analyze |
| CO 5: | Examine slope stability for different soil conditions and suggest suitable stabilization and protection measures               | Analyze |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 1   | 1   | -   | 1   | 1   | 3   | -   | -    | 1    | 1    | -    |
| CO 2       | 3   | 2   | 1   | 1   | -   | 1   | 1   | 3   | -   | -    | 1    | 1    | -    |
| CO 3       | 3   | 2   | 1   | 1   | -   | 1   | 1   | 3   | -   | -    | 1    | 1    | -    |
| CO 4       | 3   | 2   | 1   | 1   | -   | 1   | 1   | 3   | -   | -    | 1    | 1    | -    |
| CO 5       | 3   | 3   | 2   | 2   | -   | 1   | 1   | -   | -   | -    | 1    | 1    | -    |

## SYLLABUS:

## UNIT I: SOIL AND ITS PROPERTIES

9 + 6

Origin and formation of soils – Soil structure – Phase relationship in soil – Index properties of soil – Indian standard soil classification system

## UNIT II: PERMEABILITY AND SEEPAGE

9 + 6

One dimensional flow through soil – Permeability – Darcy's Law – Field and laboratory permeability tests – Factors affecting permeability – Capillary actions in soil – Flow through stratified soils – Uplift pressure and piping – Seepage – Seepage flow – Introduction to flow nets – Quick sand phenomenon

## UNIT III: COMPACTION AND CONSOLIDATION

9 + 6

Compaction – Proctor's test – Moisture – Density relations – Field compaction methods – Factors affecting compaction – Effect of compaction on soil properties – California Bearing Ratio (CBR) test – Consolidation – Terzaghi's theory of one dimensional consolidation (no derivation) – Laboratory test – Determination of co-efficient of consolidation



**UNIT IV: STRESS DISTRIBUTION AND SHEAR STRENGTH**

9 + 6

Stresses in soils – Concept of effective and neutral stresses – Stress distribution in soil media – Boussinesq and Westergaard equation – Pressure bulb – Shear strength of soils – Total and effective shear strength parameters – Factors affecting shear strength – Shear strength tests: Direct shear test, Unconfined Compression (UCC) test, Triaxial compression tests, and Field vane shear test – Mohr coulomb's theory and its failure

**UNIT V: SLOPE STABILITY**

9 + 6

Stability of slopes – Factor of safety – Use of stability number – Friction circle method – Infinite slopes and finite slopes – Slope protection measures

**LIST OF EXPERIMENTS**

1. Specific gravity of soil solids
2. Grain size distribution – Sieve analysis and hydrometer analysis
3. Atterberg limits of soil
4. Field density Test (Sand replacement method and core cutter method)
5. Permeability determination (constant head and falling head methods)
6. Determination of moisture – density relationship using standard Proctor compaction test
7. California Bearing Ratio Test
8. Direct shear test in cohesionless soil
9. Unconfined compression test in cohesive soil

**CONTACT PERIODS:**

Lecture: 45 Periods      Tutorial: - Periods      Practical: 30 Periods      Project: - Periods      Total: 75 Periods

**TEXTBOOKS:**

1. Arora K R, "Soil Mechanics and Foundation Engineering", 7th edition, Standard Publishers, New Delhi, 2019
2. Punmia B.C, "Soil Mechanics and Foundations", 17th edition, Laxmi Publications Pvt. Ltd., 2018

**REFERENCES:**

1. Modi P N, "Soil Mechanics and Foundation Engineering", 7th edition, Standard Book house, New Delhi, 2019
2. Murthy V.N.S, "Soil Mechanics and Foundation engineering", 5th edition, CBS publishers & Distributors, 2009
3. Das, B.M., "Principles of Geotechnical Engineering", 9th Edition, Cengage Learning, 2018
4. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", 3rd Edition, New Age International Publishers, 2016.
5. [https://onlinecourses.nptel.ac.in/noc26\\_ce14/preview](https://onlinecourses.nptel.ac.in/noc26_ce14/preview)

## SEMESTER IV

| U25CE405 | Water and Wastewater Analysis Laboratory | Category: PCC |   |   |   |   |
|----------|------------------------------------------|---------------|---|---|---|---|
|          |                                          | L             | T | P | J | C |
|          |                                          | 0             | 0 | 2 | 2 | 2 |

## COURSE OBJECTIVES:

- To provide practical knowledge of sampling and testing of water and wastewater
- To get adequate knowledge on standard laboratory procedures for determining physical, chemical and biological parameters
- To develop analytical and interpretive skills for assessing water quality as per BIS and CPCB standards

## COURSE OUTCOMES:

|                                                                                         |         |
|-----------------------------------------------------------------------------------------|---------|
| CO 1: Analyze physical, chemical and biological characteristics of water and wastewater | Analyze |
| CO 2: Examine major quality parameters using standard analytical methods                | Analyze |
| CO 3: Compare measured values with BIS/CPCB standards to assess suitability             | Analyze |
| CO 4: Assume correct laboratory techniques and safety procedures                        | Analyze |
| CO 5: Inference the results and prepare technical reports for environmental assessment  | Analyze |

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 3   | 2   | 2   | 2   | 3   | 3   | 3   | 1   | -    | -    | 1    | 2    |
| CO 2       | 3   | 3   | 2   | 2   | 2   | 3   | 3   | 3   | 1   | -    | -    | 1    | 2    |
| CO 3       | 3   | 3   | 2   | 2   | -   | -   | 3   | 3   | 2   | -    | -    | 1    | 1    |
| CO 4       | 3   | 3   | 2   | 2   | -   | -   | 1   | 3   | 2   | -    | -    | 1    | 1    |
| CO 5       | 3   | 3   | 2   | 2   | 1   | 2   | 1   | 3   | 3   | -    | -    | 1    | 1    |

## LIST OF EXPERIMENTS

1. Determination of pH, Electrical Conductivity and Turbidity
2. Determination of Total Solids, Suspended Solids, and Dissolved Solids
3. Determination of Hardness of water
4. Determination of Chloride Content in water
5. Determination of Alkalinity and Acidity of water
6. Determination of Residual Chlorine in treated water
7. Determination of Optimum Dose of Coagulant
8. Determination of Dissolved Oxygen (DO)
9. Determination of Biochemical Oxygen Demand (BOD)
10. Determination of Chemical Oxygen Demand (COD)
11. Determination of Nitrate and Phosphate Concentration in wastewater
12. Determination of Sulphate Content

## CONTACT PERIODS:

Lecture: - Periods      Tutorial: - Periods      Practical: 30 Periods      Project: 30 Periods      Total: 60 Periods

**REFERENCES:**

1. S.K. Garg, "Laboratory Manual in Environmental Engineering", Khanna Publishers, New Delhi, 37th Edition, 2022
2. APHA, AWWA, WEF, "Standard Methods for the Examination of Water and Wastewater", 24th Edition, American Public Health Association, Washington D.C., 2023
3. IS 3025, "Methods of Sampling and Testing (Physical and Chemical) for Water and Wastewater", 2009

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## SEMESTER IV

| U25CE406 | Hydraulic Engineering Laboratory | Category: PCC |   |   |   |   |
|----------|----------------------------------|---------------|---|---|---|---|
|          |                                  | L             | T | P | J | C |
|          |                                  | 0             | 0 | 2 | 0 | 1 |

## COURSE OBJECTIVES:

- To measure flow in pipes and determine frictional losses
- To develop characteristic curves of pumps and turbines

## COURSE OUTCOMES:

- CO 1:** Apply fundamental fluid mechanics principles to conduct experiments and obtain key hydraulic parameters **Analyze**
- CO 2:** Make use of laboratory equipment safely and systematically to collect accurate experimental data **Analyze**
- CO 3:** Solve the relationship between theoretical concepts and experimental results using appropriate calculations and graphs **Analyze**
- CO 4:** Identify the sources of error, uncertainties, and performance variations in hydraulic experiments through critical interpretation of results **Analyze**
- CO 5:** Develop clear and structured technical reports that communicate experimental methods, findings, and conclusions effectively **Analyze**

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 3   | 2   | 2   | -   | 1   | 1   | 3   | -   | -    | -    | 3    | -    |
| CO 2       | 3   | 3   | 2   | 2   | -   | 1   | 1   | 3   | -   | -    | -    | 3    | -    |
| CO 3       | 3   | 3   | 2   | 2   | -   | 1   | 1   | 3   | -   | -    | -    | 3    | -    |
| CO 4       | 3   | 3   | 2   | 2   | -   | 1   | 1   | 3   | -   | -    | -    | 3    | -    |
| CO 5       | 3   | 3   | 2   | 2   | -   | 1   | 1   | 3   | -   | -    | -    | 3    | -    |

## LIST OF EXPERIMENTS

- Calibration of Rotameter
- Calibration of Venturi meter
- Calibration of Orifice meter
- Bernoulli's Experiment
- Determination of friction factor in pipes
- Determination of minor losses
- Characteristics of Centrifugal pump
- Characteristics of Reciprocating pump
- Characteristics of Pelton wheel turbine
- Characteristics of Francis turbine

## CONTACT PERIODS:

Lecture: - Periods

Tutorial: - Periods

Practical: 30 Periods

Project: - Periods

Total: 30 Periods

## REFERENCES:

1. Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", 22nd edition, Standard Book House New Delhi. 2018
2. Sarbjit Singh "Experiments in Fluid mechanics", 2nd edition, Prentice hall of India Pvt Ltd, Delhi, 2012
3. Virtual labs at IIT Hyderabad – "Hydraulics and Fluid Mechanics Lab", <https://eerc03-iiith.vlabs.ac.in>
4. Virtual Labs at IIT Patna – "Virtual Fluid Laboratory", <https://me.iitp.ac.in/Virtual-Fluid-Laboratory>

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**Arundh, Coimbatore - 641 607.**

## SEMESTER IV

| U25MNC03 | Indian Constitution<br>(Common to all programmes) | Category: MNC |   |   |   |   |
|----------|---------------------------------------------------|---------------|---|---|---|---|
|          |                                                   | L             | T | P | J | C |
|          |                                                   | 1             | 0 | 0 | 0 | 0 |

## COURSE OBJECTIVES:

- To understand the evolution and importance of the Constitution.
- To understand salient features of the Indian Constitution and philosophy of Fundamental Rights
- To gain the knowledge about the state government and local level administration

## COURSE OUTCOMES:

- CO 1:** Understand the historical background of the Constitution making and its importance for building a democratic India Understand
- CO 2:** Understand the value of Fundamental Rights and Duties for becoming a good citizen of India Understand
- CO 3:** Analyze the powers of the Central Government Analyze
- CO 4:** Understand the role and responsibilities of State and Local Administration Understand
- CO 5:** Apply knowledge in strengthening constitutional institutions like Election Commission and UPSC for sustaining democracy Apply

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | -   | -   | -   | -   | -   | 1   | 2   | 3   | -   | -    | -    | -    | -    |
| CO 2       | -   | -   | -   | -   | -   | 1   | 2   | 3   | -   | -    | -    | -    | -    |
| CO 3       | -   | -   | -   | -   | -   | 1   | 2   | 3   | -   | -    | -    | -    | -    |
| CO 4       | -   | -   | -   | -   | -   | 1   | 2   | 3   | -   | -    | -    | -    | -    |
| CO 5       | -   | -   | -   | -   | -   | 1   | 2   | 3   | -   | -    | -    | -    | -    |

## SYLLABUS:

UNIT I: HISTORICAL BACKGROUND OF INDIAN CONSTITUTION 5

Introduction to Indian Constitution: Constitution Meaning of the term, History of Making of the Indian Constitution, Evolution of the Indian Constitution, Drafting Committee (Composition and Working).

UNIT II: FEATURES OF INDIAN CONSTITUTION 5

Philosophy and salient features of the Indian Constitution, Citizenship, Fundamental Rights, Duties and their significance, Directive Principles of State Policy, Rights Protective Mechanisms in India; Right to Education Act 2009; Right to Information 2005.

UNIT III: UNION GOVERNMENT 5

Union Legislature (Parliament), Lok Sabha and Rajya Sabha (with Powers and Functions), Union Executive, President of India (with Powers and Functions), Prime Minister and Council of Ministers (with Powers and Functions), Cabinet and Central Secretariat, Union Judiciary (Supreme Court).

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**UNIT IV: STATE GOVERNMENT AND LOCAL ADMINISTRATION**

5

Governor, Chief Minister and Council of Ministers, State Secretariat – Roles and Responsibilities, District Administration, Head, Municipalities – Mayor and Role of Elected Representatives, Panchayati Raj, Zila Panchayat – Roles and Responsibilities, Block Level and Village Level Organizational Hierarchy

**UNIT V: CONSTITUTIONAL INSTITUTIONS**

5

Election Commission of India – Powers and Functions, Electoral Process in India, Methods of Constitutional Amendments and their Limitations, Important Constitutional and Emergency Provisions. Case Studies.

**CONTACT PERIODS:**

Lecture: 25 Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 25 Periods

**TEXTBOOKS:**

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India Pvt. Ltd., New Delhi.
2. Subash Kashyap, "Indian Constitution", National Book Trust.

**REFERENCES:**

1. M. Laxmikanth, "Indian Polity", McGraw Hill Education India, 2013.
2. M. P. Jain, "Indian Constitution Law," 7th Edition, Lexis Nexis, 2014.
3. Raj Kumar, "Ambedkar and Constitution", Commonwealth Publication Pvt. Ltd., New Delhi, 2011

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## SEMESTER IV

|           |                                                                   |               |   |   |   |   |
|-----------|-------------------------------------------------------------------|---------------|---|---|---|---|
| U25RMCC09 | Professional Skill Development - IV<br>(Common to all programmes) | Category: MCC |   |   |   |   |
|           |                                                                   | L             | T | P | J | C |
|           |                                                                   | 15 Hours      |   |   |   | 1 |

## COURSE OUTCOMES:

- CO 1:** Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities **Apply**
- CO 2:** Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation **Apply**
- CO 3:** Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning **Apply**

## CO - PO MAPPING:

| Particular | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO 1       | 3   | 2   | 2   | -   | 3   | 1   | -   | -   | 2   | 2    | -    | -    | -    |
| CO 2       | 2   | 3   | 3   | 3   | 2   | 2   | -   | -   | 1   | 1    | -    | -    | -    |
| CO 3       | -   | -   | 3   | -   | -   | 2   | 2   | 3   | 3   | 3    | 2    | -    | -    |

## GUIDELINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

## CONTACT PERIODS:

Lecture: - Periods      Tutorial: - Periods      Practical: - Periods      Project: - Periods      Total: 0 Periods

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