

**RAJALAKSHMI ENGINEERING COLLEGE**  
**(An Autonomous Institution Affiliated to Anna University Chennai)**  
**Choice Based Credit System**  
**DEPARTMENT OF AUTOMOBILE ENGINEERING**  
**CURRICULUM AND SYLLABUS REGULATIONS – 2023**  
**B.E. AUTOMOBILE ENGINEERING**

**VISION:**

To be a department of excellence in the domain of Automotive Engineering and develop competent engineers imbued with entrepreneurial and innovative skills with a concern for the society.

**MISSION:**

- To provide accessible quality education well grounding the students in the fundamental principles of Automotive Engineering and humane values.
- To provide a conducive environment for the students to get transformed themselves into professionals who can design, develop and effectuate automotive systems for industry and societal needs.
- To explore, develop and create innovations in Automotive Engineering thereby furthering research activities resulting in products satisfying industrial and social needs.

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO'S)**

1. To provide students with sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, analyze and solve engineering problems and to prepare them for higher studies and for successful careers in automobile industry.
2. To impart students with knowledge, innovation and skills towards research, design and development of Automotive Systems and allied integrated systems of global standards for betterment of society. To impart knowledge in usage of alternate fuels and emission control in IC engines.
3. To instill the values, skills, leadership, team spirit and professional ethics for comprehensive and wholesome personality and to promote entrepreneurial interest among students so that they can compete globally in the field and to create a fervor for use of Engineering in addressing societal concerns.

**PROGRAM OUTCOMES (PO)**

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design

system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

#### **PROGRAM SPECIFIC OUTCOMES (PSO's)**

- PSO1. Will be able to design and develop power plant and chassis systems in a view to meet the dynamic needs of the society by harnessing the potential of electronic systems and modern software tools.
- PSO2. Will be able to explore possibilities of viable alternate fuels and to develop emission control technologies and safety systems
- PSO3. Will be able to work in an industry as a team member as well as an individual with professional qualities and evolve oneself for lifelong learning.

**R2023 CURRICULUM AND SYLLABUS**

| <b>Automobile Engineering</b> |            |                    |  |                 |                  |           |          |          |           |
|-------------------------------|------------|--------------------|--|-----------------|------------------|-----------|----------|----------|-----------|
| <b>Sl. No.</b>                | <b>SEM</b> | <b>Course Code</b> | <b>Course Name</b>                           | <b>Category</b> | <b>Total Hrs</b> | <b>L</b>  | <b>T</b> | <b>P</b> | <b>C</b>  |
| 1                             | I          | HS 23111           | Technical Communication I                    | HS              | 2                | 2         | 0        | 0        | 2         |
| 2                             | I          | MA23112            | Algebra and Calculus                         | BS              | 4                | 3         | 1        | 0        | 4         |
| 3                             | I          | GE23111            | Engineering Graphics                         | ES              | 6                | 2         | 0        | 4        | 4         |
| 4                             | I          | AT23111            | Production Technology - I                    | PC              | 3                | 3         | 0        | 0        | 3         |
| 5                             | I          | GE23117            | தமிழர்மரபு / Heritage of Tamils              | HS              | 1                | 1         | 0        | 0        | 1         |
| 6                             | I          | PH23131            | Physics of Materials                         | BS              | 5                | 3         | 0        | 2        | 4         |
| 7                             | I          | GE23121            | Engineering Practices – Civil and Mechanical | ES              | 2                | 0         | 0        | 2        | 1         |
| 8                             | I          | MC23112            | Environmental Science and Engineering        | MC              | 3                | 3         | 0        | 0        | 0         |
| <b>Total</b>                  |            |                    |  |                 | <b>24</b>        | <b>17</b> | <b>3</b> | <b>4</b> | <b>19</b> |

| <b>Sl. No.</b> | <b>SEM</b> | <b>Course Code</b> | <b>Course Name</b>                               | <b>Category</b> | <b>Total Hrs</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|----------------|------------|--------------------|--|-----------------|------------------|----------|----------|----------|----------|
| 1              | II         | MA23212            | Differential Equations and Complex Variables     | BS              | 4                | 3        | 1        | 0        | 4        |
| 2              | II         | GE23211            | Engineering Mechanics                            | ES              | 3                | 2        | 1        | 0        | 3        |
| 3              | II         | GE23217            | தமிழரும் தொழில்நுட்பமும் / Tamils and Technology | HS              | 1                | 1        | 0        | 0        | 1        |
| 4              | II         | CY23233            | Engineering Chemistry                            | BS              | 5                | 3        | 0        | 2        | 4        |
| 5              | II         | EE23133            | Basic Electrical And Electronics Engineering     | ES              | 5                | 3        | 0        | 2        | 4        |

|              |    |          |  |    |           |           |          |           |           |
|--------------|----|----------|--|----|-----------|-----------|----------|-----------|-----------|
| 6            | II | GE23231  | Programming Using Python                         | ES | 5         | 1         | 0        | 4         | 3         |
| 7            | II | HS 23221 | Technical Communication II                       | HS | 2         | 0         | 0        | 2         | 1         |
|              |    | HS 23222 | English for Professional Competence              |    |           |           |          |           |           |
| 8            | II | GE23122  | Engineering Practices - Electrical & Electronics | ES | 2         | 0         | 0        | 2         | 1         |
| 9            | II | MC23111  | Indian Constitution and Freedom Movement         | MC | 3         | 3         | 0        | 0         | 0         |
| <b>Total</b> |    |          |  |    | <b>30</b> | <b>16</b> | <b>2</b> | <b>12</b> | <b>21</b> |

| Sl. No.      | SEM | Course Code | Subject Name                                   | Category | Total Hrs | L         | T        | P         | C         |
|--------------|-----|-------------|--|----------|-----------|-----------|----------|-----------|-----------|
| 1            | III | MA23331     | Transforms and Statistics                      | BS       | 5         | 3         | 0        | 2         | 4         |
| 2            | III | AT23331     | Automotive Engines                             | PC       | 5         | 3         | 0        | 2         | 4         |
| 3            | III | AT23332     | Applied Thermodynamics                         | PC       | 5         | 2         | 1        | 2         | 4         |
| 4            | III | AT23333     | Strength of Materials for Automobile Engineers | PC       | 5         | 2         | 1        | 2         | 4         |
| 5            | III | AT23334     | Production Technology - II                     | PC       | 5         | 3         | 0        | 2         | 4         |
| 6            | III | AT23321     | Computer Aided Machine Drawing Laboratory      | PC       | 4         | 0         | 0        | 4         | 2         |
| <b>Total</b> |     |             |  |          | <b>29</b> | <b>13</b> | <b>2</b> | <b>14</b> | <b>22</b> |

| Sl. No. | SEM | Course Code | Subject Name                         | Category | Total Hrs | L | T | P | C |
|---------|-----|-------------|--------------------------------------|----------|-----------|---|---|---|---|
| 1       | IV  | AT23411     | Electric and Hybrid Vehicles - I     | PC       | 3         | 3 | 0 | 0 | 3 |
| 2       | IV  | AT23412     | Engineering Materials and Metallurgy | ES       | 3         | 3 | 0 | 0 | 3 |
| 3       | IV  | AT23431     | Automotive Drive Line and Chassis    | PC       | 5         | 3 | 0 | 2 | 4 |

|              |    |         |  |     |           |           |          |           |           |
|--------------|----|---------|--|-----|-----------|-----------|----------|-----------|-----------|
| 4            | IV | AT23432 | Fluid Mechanics and Machinery for Automobile Engineers | PC  | 5         | 2         | 1        | 2         | 4         |
| 5            | IV | AT23433 | Theory of Machines                                     | PC  | 5         | 2         | 1        | 2         | 4         |
| 6            | IV | CS23422 | Python Programming for Machine Learning                | ES  | 4         | 0         | 0        | 4         | 2         |
| 7            | IV | GE23327 | Soft Skills - I  | EEC | 2         | 0         | 0        | 2         | 1         |
| <b>Total</b> |    |         |  |     | <b>27</b> | <b>13</b> | <b>2</b> | <b>12</b> | <b>21</b> |

| Sl. No.      | SEM | Course Code | Subject Name  | Category | Total Hrs | L         | T        | P         | C         |
|--------------|-----|-------------|---|----------|-----------|-----------|----------|-----------|-----------|
| 1            | V   | AT23511     | Machine Design  | PC       | 3         | 2         | 1        | 0         | 3         |
| 2            | V   | GE23311     | Fundamentals of Management for Engineers                      | HS       | 3         | 3         | 0        | 0         | 3         |
| 3            | V   |             | Professional Elective – I                                     | PE       | 3         | 3         | 0        | 0         | 3         |
| 4            | V   |             | Open Elective - I   | OE       | 3         | 3         | 0        | 0         | 3         |
| 5            | V   | AT23531     | Automotive Electrical and Electronics                         | PC       | 5         | 3         | 0        | 2         | 4         |
| 6            | V   | AT23532     | Electric and Hybrid Vehicles - II                             | PC       | 5         | 3         | 0        | 2         | 4         |
| 7            | V   | AT23521     | Two and Three wheelers Laboratory                             | PC       | 2         | 0         | 0        | 2         | 1         |
| 8            | V   | AT23522     | Computer Aided Vehicle Design Data Characteristics Laboratory | PC       | 2         | 0         | 0        | 2         | 1         |
| 9            | V   | GE23427     | Soft Skills - II  | EEC      | 2         | 0         | 0        | 2         | 1         |
| <b>Total</b> |     |             |   |          | <b>28</b> | <b>17</b> | <b>1</b> | <b>10</b> | <b>23</b> |

| Sl. No.      | SEM | Course Code | Subject Name  | Category | Total Hrs | L         | T        | P         | C         |
|--------------|-----|-------------|---|----------|-----------|-----------|----------|-----------|-----------|
| 1            | VI  |             | Professional Elective – II                              | PE       | 3         | 3         | 0        | 0         | 3         |
| 2            | VI  |             | Open Elective - II                                      | OE       | 3         | 3         | 0        | 0         | 3         |
| 3            | VI  | AT23631     | Automotive System Design                                | PC       | 5         | 2         | 1        | 2         | 4         |
| 4            | VI  | AT23632     | Vehicle Dynamics  | PC       | 5         | 2         | 1        | 2         | 4         |
| 5            | VI  | AT23633     | Automotive Fuels and Lubricants                         | PC       | 5         | 3         | 0        | 2         | 4         |
| 6            | VI  | GE23627     | Problem solving techniques                              | EEC      | 2         | 0         | 0        | 2         | 1         |
| 7            | VI  | AT23621     | Design Thinking and Innovation for Automobile Engineers | EEC      | 4         | 0         | 0        | 4         | 2         |
| <b>Total</b> |     |             |   |          | <b>27</b> | <b>13</b> | <b>2</b> | <b>12</b> | <b>21</b> |

| Sl. No.      | SEM | Course Code | Subject Name                       | Category | Total Hrs | L         | T        | P         | C         |
|--------------|-----|-------------|------------------------------------|----------|-----------|-----------|----------|-----------|-----------|
| 1            | VII | AT23711     | Automotive Pollution and Control   | PC       | 3         | 3         | 0        | 0         | 3         |
| 2            | VII | AT23712     | Intelligent Vehicle System         | PC       | 3         | 3         | 0        | 0         | 3         |
| 3            | VII | AT23713     | Automotive Safety                  | PC       | 3         | 3         | 0        | 0         | 3         |
| 4            | VII |             | Professional Elective – IV         | PE       | 3         | 3         | 0        | 0         | 3         |
| 5            | VII | AT23721     | AI and ML for Automobile Engineers | PC       | 4         | 0         | 0        | 4         | 2         |
| 6            | VII | AT23722     | Vehicle Maintenance Laboratory     | PC       | 2         | 0         | 0        | 2         | 1         |
| 7            | VII | AT23723     | Computer Aided Analysis laboratory | PC       | 2         | 0         | 0        | 2         | 1         |
| 8            | VII |             | Industrial Training                | EEC      | 2         | 0         | 0        | 2         | 1         |
| <b>Total</b> |     |             |                                    |          | <b>22</b> | <b>12</b> | <b>0</b> | <b>10</b> | <b>17</b> |

| Sl. No.      | SEM  | Course Code | Subject Name               | Category | Total Hrs | L        | T        | P         | C         |
|--------------|------|-------------|----------------------------|----------|-----------|----------|----------|-----------|-----------|
| 1            | VIII |             | Professional Elective – IV | PE       | 3         | 3        | 0        | 0         | 3         |
| 2            | VIII |             | Professional Elective – V  | PE       | 3         | 3        | 0        | 0         | 3         |
| 3            | VIII |             | Project Work               | EEC      | 20        | 0        | 0        | 20        | 10        |
| <b>Total</b> |      |             |                            |          | <b>26</b> | <b>6</b> | <b>0</b> | <b>20</b> | <b>16</b> |

### Vertical subjects with Specialization

| Sl. No. | SEM      | Vertical 1/ Electric Vehicles  |             |          |           |   |   |   |   |
|---------|----------|--|-------------|----------|-----------|---|---|---|---|
|         |          | Course Name  | Course Code | Category | Total Hrs | L | T | P | C |
| 1       | V/VI     | Fuel cell Technologies   | AT23A11     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 2       | V/VI     | Automotive Power Electronics   | AT23A12     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 3       | V/VI     | Sensors and Actuators  | AT23A13     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 4       | VII/VIII | Smart charging of Electric and Hybrid Vehicles                         | AT23A14     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 5       | VII/VIII | Electric and Plug-in Hybrid Vehicle Networks_ Optimization and Control | AT23A15     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 6       | VII/VIII | Energy Systems for Electric and Hybrid Vehicles                        | AT23A16     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 7       | VII/VIII | Automotive Functional Safety   | AT23A17     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 8       | VII/VIII | Modelling of Electric and Hybrid Vehicles                              | AT23A18     | Vertical | 3         | 3 | 0 | 0 | 3 |

| Sl. No. | SEM      | Vertical 2/ Computational Design                       |             |          |           |   |   |   |   |
|---------|----------|--|-------------|----------|-----------|---|---|---|---|
|         |          | Course Name  | Course Code | Category | Total Hrs | L | T | P | C |
| 1       | V/VI     | Computer Aided Design and Manufacturing                | AT23B11     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 2       | V/VI     | Integrated Computational Materials Engineering         | AT23B12     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 3       | V/VI     | Computational Theory on Solid Mechanics                | AT23B13     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 4       | VII/VIII | Computational and Visualization Theory                 | AT23B14     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 5       | VII/VIII | Computer Integrated Manufacturing in Automotive Sector | AT23B15     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 6       | VII/VIII | Computational Aero Dynamics                            | AT23B16     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 7       | VII/VIII | CFD and Heat Transfer                                  | AT23B17     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 8       | VII/VIII | Digital Manufacturing of Automobiles                   | AT23B18     | Vertical | 3         | 3 | 0 | 0 | 3 |

| Sl. No. | SEM      | Vertical 3/ VEHICLE RESEARCH AND VALIDATION |             |          |           |   |   |   |   |
|---------|----------|---|-------------|----------|-----------|---|---|---|---|
|         |          | Course Name                                 | Course Code | Category | Total Hrs | L | T | P | C |
| 1       | V/VI     | Advanced Automotive Materials               | AT23C11     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 2       | V/VI     | Noise, Vibration and Harshness              | AT23C12     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 3       | V/VI     | Combustion Thermodynamics and Heat Transfer | AT23C13     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 4       | VII/VIII | Automotive Instrumentation                  | AT23C14     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 5       | VII/VIII | Testing and Measurement Systems             | AT23C15     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 6       | VII/VIII | Homologation                                | AT23C16     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 7       | VII/VIII | IC Engine Process Modelling                 | AT23C17     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 8       | VII/VIII | Vehicle Control Systems                     | AT23C18     | Vertical | 3         | 3 | 0 | 0 | 3 |

| Sl. No. | SEM      | Vertical 4 / SPECIAL PURPOSE VEHICLES                            |             |          |           |   |   |   |   |
|---------|----------|--|-------------|----------|-----------|---|---|---|---|
|         |          | Course Name  | Course Code | Category | Total Hrs | L | T | P | C |
| 1       | V/VI     | Hydraulics and Pneumatics  | AT23D11     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 2       | V/VI     | Agricultural Vehicles  | AT23D12     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 3       | V/VI     | Defence Vehicles   | AT23D13     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 4       | VII/VIII | Constructions Vehicles   | AT23D14     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 5       | VII/VIII | Marine Vehicles  | AT23D15     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 6       | VII/VIII | Off-road Vehicle Dynamics - Analysis, Modelling and Optimization | AT23D16     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 7       | VII/VIII | Mechatronics and Intelligent Systems for Off-road Vehicles       | AT23D17     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 8       | VII/VIII | Terramechanics and Off-Road Vehicle Engineering                  | AT23D18     | Vertical | 3         | 3 | 0 | 0 | 3 |

| Sl. No. | SEM      | Vertical 5/ PRODUCT AND PROCESS DEVELOPMENT |             |          |           |   |   |   |   |
|---------|----------|---|-------------|----------|-----------|---|---|---|---|
|         |          | Course Name                                 | Course Code | Category | Total Hrs | L | T | P | C |
| 1       | V/VI     | Automotive Product Design                   | AT23E11     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 2       | V/VI     | Ergonomics in Automotive Design             | AT23E12     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 3       | V/VI     | Additive Manufacturing                      | AT23E13     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 4       | VII/VIII | Finite Element Analysis                     | AT23E14     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 5       | VII/VIII | New Product Development Process             | AT23E15     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 6       | VII/VIII | Automotive Product Life Cycle Management    | AT23E16     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 7       | VII/VIII | Production of Automotive Components         | AT23E17     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 8       | VII/VIII | Geometric Dimensioning and Tolerances       | AT23E18     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 9       | VII/VIII | Metrology and Quality Control               | AT23E19     | Vertical | 3         | 3 | 0 | 0 | 3 |



| Sl. No. | SEM      | Vertical 6 / LOGISTICS AND SUPPLY CHAIN MANAGEMENT        |             |          |           |   |   |   |   |
|---------|----------|---|-------------|----------|-----------|---|---|---|---|
|         |          |   | Course Code | Category | Total Hrs | L | T | P | C |
| 1       | V/VI     | Automation in Manufacturing                               | AT23F11     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 2       | V/VI     | Warehousing Automation                                    | AT23F12     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 3       | V/VI     | Material Handling Equipment, Repair and Maintenance       | AT23F13     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 4       | VII/VIII | Robotics  | AT23F14     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 5       | VII/VIII | Container Logistics                                       | AT23F15     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 6       | VII/VIII | Logistics in Manufacturing, Supply Chain and Distribution | AT23F16     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 7       | VII/VIII | Data Science  | AT23F17     | Vertical | 3         | 3 | 0 | 0 | 3 |

| Sl. No. | SEM      | VERTICAL 7/DIVERSIFIED COURSES GROUP 1 |             |          |           |   |   |   |   |
|---------|----------|--|-------------|----------|-----------|---|---|---|---|
|         |          |  | Course Code | Category | Total Hrs | L | T | P | C |
| 1       | V/VI     | Engine and Vehicle Management Systems  | AT23G11     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 2       | V/VI     | Transport Management                   | AT23G12     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 3       | V/VI     | Vehicle maintenance                    | AT23G13     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 4       | VII/VIII | Two and Three Wheelers                 | AT23G14     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 5       | VII/VIII | Entrepreneurship Development           | AT23G15     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 6       | VII/VIII | Operations Research                    | AT23G16     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 7       | VII/VIII | Vehicle Body Engineering               | AT23G17     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 8       | VII/VIII | Total Productive Maintenance           | AT23G18     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 9       | VII/VIII | Control Engineering                    | AT23G19     | Vertical | 3         | 3 | 0 | 0 | 3 |

| Sl. No. | SEM      | VERTICAL 8/DIVERSIFIED COURSES GROUP 2 |             |          |           |   |   |   |   |
|---------|----------|--|-------------|----------|-----------|---|---|---|---|
|         |          |  | Course Code | Category | Total Hrs | L | T | P | C |
| 1       | V/VI     | Numerical Methods                      | AT23H11     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 2       | V/VI     | Automotive Transmission                | AT23H12     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 3       | V/VI     | Road Vehicle Aerodynamics              | AT23H13     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 4       | VII/VIII | Lean Six Sigma                         | AT23H14     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 5       | VII/VIII | Renewable Sources of Energy            | AT23H15     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 6       | VII/VIII | Automotive Air-Conditioning            | AT23H16     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 7       | VII/VIII | Solar Energy Technology                | AT23H17     | Vertical | 3         | 3 | 0 | 0 | 3 |
| 8       | VII/VIII | Total Quality Management               | AT23H18     | Vertical | 3         | 3 | 0 | 0 | 3 |

|   |          |                   |         |          |   |   |   |   |   |
|---|----------|-------------------|---------|----------|---|---|---|---|---|
| 9 | VII/VIII | Industrial Safety | AT23H19 | Vertical | 3 | 3 | 0 | 0 | 3 |
|---|----------|-------------------|---------|----------|---|---|---|---|---|

Open Elective Course

| Sl. No. | SEM | Course Code | Subject Name                             | Category | Total Hrs | L | T | P | C |
|---------|-----|-------------|--|----------|-----------|---|---|---|---|
| 1       | OE  | ATOE11      | Automotive Systems                       | OE       | 3         | 3 | 0 | 0 | 3 |
| 2       | OE  | ATOE12      | Elements of Electric and Hybrid Vehicles | OE       | 3         | 3 | 0 | 0 | 3 |

|               | SEM I     | SEM II    | SEM III   | SEM IV    | SEM V     | SEM VI    | SEM VII   | SEM VIII  | Credits    | %            |
|---------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|--------------|
| HS            | 3         | 2         |           |           | 3         |           |           |           | 8          | 5.0          |
| BS            | 8         | 8         | 4         |           |           |           |           |           | 20         | 12.5         |
| ES            | 5         | 11        |           | 5         |           |           |           |           | 21         | 13.1         |
| PC            | 3         |           | 18        | 15        | 13        | 12        | 13        |           | 74         | 46.3         |
| PE            |           |           |           |           | 3         | 3         | 3         | 6         | 15         | 9.4          |
| OE            |           |           |           |           | 3         | 3         |           |           | 6          | 3.8          |
| EEC           |           |           |           | 1         | 1         | 3         | 1         | 10        | 16         | 10.0         |
| <b>Credit</b> | <b>19</b> | <b>21</b> | <b>22</b> | <b>21</b> | <b>23</b> | <b>21</b> | <b>17</b> | <b>16</b> | <b>160</b> | <b>100.0</b> |

## I semester

| Subject Code  | Subject Name (Theory course) | Category | L | T | P | C |
|---|------------------------------|----------|---|---|---|---|
| HS 23111  | Technical Communication I    | HS       | 2 | 0 | 0 | 2 |
| Common to all branches of B.E/B. Tech programmes – First Semester |                              |          |   |   |   |   |

|   |
|---|
| <b>Objectives:</b>  |
| To facilitate students develop their comprehension skills                 |
| To enable students to improve their receptive skills                      |
| To equip learners with better vocabulary and enhance their writing skills |
| To aid students speak effectively in all kinds of communicative contexts. |
| To improve the learners' basic proficiency in workplace communication     |

|  |  |   |
|--|--|---|
| <b>UNIT-I</b>  | <b>DEVELOPING COMPREHENSION SKILLS</b>   | 6 |
| <p><b>Listening:</b> Introduction to Informational listening – Listening to Podcasts, News</p> <p><b>Reading:</b> Intentional Reading - Short Narratives and Passages.</p> <p><b>Speaking:</b> Introducing Oneself, Narrating a Story / Incident.</p> <p><b>Writing:</b> Sequential Writing – connecting ideas using transitional words (Jumbled Sentences), Process Description</p> <p><b>Grammar:</b> Verbs – Main &amp; Auxiliary: Simple Tenses – Form, Function and Meaning.</p> <p><b>Vocabulary:</b> Word formation – Prefix, Suffix, Compound Words.</p> |  |   |
| <b>UNIT-II</b>   | <b>LISTENING AND EXTENDED READING</b>    | 6 |
| <p><b>Listening:</b> Deep Listening – Listening to Talk Shows and Debates</p> <p><b>Reading:</b> In-depth Reading - Scanning Passages</p> <p><b>Speaking:</b> Describing Current Issues, Happenings, etc.,</p> <p><b>Writing:</b> Note Making, Note Taking – Paragraph Writing</p> <p><b>Grammar:</b> Continuous Tenses, Prepositions, Articles</p> <p><b>Vocabulary:</b> One Word Substitutes, Phrasal Verbs.</p>   |  |   |
| <b>UNIT-III</b>  | <b>FORMAL WRITING AND VERBAL ABILITY</b> | 6 |
| <p><b>Listening:</b> Listening to Lectures and Taking Notes</p>  |  |   |

|  |                                   |   |
|--|-----------------------------------|---|
| <p><b>Reading:</b> Interpretation of Tables, Charts and Graphs</p> <p><b>Speaking:</b> SWOT Analysis on Oneself</p> <p><b>Writing:</b> Formal Letter Writing and Email Writing</p> <p><b>Grammar:</b> Perfect Tenses, Phrases and Clauses, Discourse Markers</p> <p><b>Vocabulary :</b> Verbal Analogy / Cloze Exercise</p>  |                                   |   |
| <b>UNIT-IV</b>   | <b>ENHANCING SPEAKING ABILITY</b> | 6 |
| <p><b>Listening:</b> Listening to eminent voices of one's interest (Martin Luther King, APJ Abdul Kalam, etc..)</p> <p><b>Reading:</b> Timed Reading, Filling KWL Chart.</p> <p><b>Speaking:</b> Just a Minute, Impromptu</p> <p><b>Writing:</b> Check-list, Instructions.</p> <p><b>Grammar:</b> 'Wh' Questions / 'Yes' or 'No' Questions, Imperatives</p> <p><b>Vocabulary:</b> Synonyms, Antonyms, Different forms of the same words.</p> |                                   |   |
| <b>UNIT-V</b>  | <b>LANGUAGE FOR WORKPLACE</b>     | 6 |
| <p><b>Listening:</b> Extensive Listening (Audio books, rendering of poems, etc.)</p> <p><b>Reading:</b> Extensive reading (Jigsaw Reading, Short Stories, Novels)</p> <p><b>Speaking:</b> Short Presentations on Technical Topics</p> <p><b>Writing:</b> Recommendations, Essay Writing</p> <p><b>Grammar:</b> Impersonal Passive, Reported Speech, Concord</p> <p><b>Vocabulary :</b> Informal Vocabulary and Formal Substitutes</p>        |                                   |   |
| <b>Total Contact Hours: 30</b>   |                                   |   |

|  |
|--|
| <b>Course Outcomes:</b>  |
| <b>On completion of the course students will be able to</b>                                  |
| apply their comprehension skills and interpret different contents effortlessly               |
| read and comprehend various texts and audio visual contents                                  |
| infer data from graphs and charts and communicate it efficiently in varied contexts          |
| participate effectively in diverse speaking situations                                       |
| to present, discuss and coordinate with their peers in workplace using their language skills |

### **SUGGESTED ACTIVITIES**

- Ice breaker
- Just A Minute
- Ship wreck
- Hot seat
- Vocabulary building
- Chinese whispers
- Case study

### **SUGGESTED EVALUATION METHODS**

- Assignment topics
- Quizzes
- Class Presentation/Discussion
- Continuous Assessment Tests

### **Text Book(s):**

1. Effective Technical Communication by M. Ashraf Rizvi (Author) 2nd Edition Paperback 2017
2. Sylvan Barnet and Hugo Bedau, 'Critical Thinking Reading and Writing', Bedford/st. Martin's: Fifth Edition (June 28, 2004)
3. Meenakshi Upadhyay, Arun Sharma – Verbal Ability and Reading Comprehension.
4. Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine ChuenMeng Goh, Cambridge University Press

### **Reference Books(s) / Web links:**

1. Basic Vocabulary in Use: 60 Units of Vocabulary Practice in North American English With Answers 2nd Edition by Michael McCarthy (Author), Felicity O'Dell (Author), John D. Bunting (Contributor)
2. Reading Development and Difficulties By Kate Cain
3. The 7 Habits of Highly Effective People by Stephen Covey, Simon and Schuster, UK
4. Everybody Writes: Your Go-To Guide to Creating Ridiculously Good Content Hardcover by Ann Handley (Author)

| Course Code  | Course Title         | Category | L | T | P | C |
|--|----------------------|----------|---|---|---|---|
| MA23112  | ALGEBRA AND CALCULUS | BS       | 3 | 1 | 0 | 4 |
| <b>Common to I sem. B.E. - AERO, AUTO, MECH, MCT, R&amp;A, CIVIL and B.Tech. - BT, FT &amp; CHEM</b> |                      |          |   |   |   |   |

| <b>Objectives:</b>  |
|---|
| • To introduce the matrix techniques and to illustrate the nature of the matrix.                |
| • To address data and synthesis of the information to provide valid conclusions.                |
| • To explain techniques of calculus which are applied in the solutions of engineering problems. |
| • To analyse special types of integrals by analytical methods and numerical techniques.         |
| • To practice the techniques of Integration in finding area and volumes.                        |

|  |                                       |    |
|--|---------------------------------------|----|
| <b>UNIT-I</b>  | <b>MATRICES</b>                       | 12 |
| Matrices - Eigenvalues and eigenvectors - Diagonalization of matrices using orthogonal transformation - Cayley-Hamilton Theorem(without proof) -Quadratic forms- Reduction to canonical form using orthogonal transformation- Numerical computation of Eigen value using Power method              |                                       |    |
| <b>UNIT-II</b>   | <b>FUNCTIONS OF SEVERAL VARIABLES</b> | 12 |
| Partial differentiation–Total derivative–Change of variables–Jacobians–Partial differentiation of implicit functions– Taylor’s series for functions of two variables–Maxima and minima of functions of two variables–Lagrange’s method of undetermined multipliers.                                |                                       |    |
| <b>UNIT-III</b>  | <b>INTEGRAL CALCULUS</b>              | 12 |
| Integral Calculus: Definite Integrals as a limit of sums - Applications of integration to area, volume - Improper integrals: Beta and Gamma integrals - Numerical computation of integrals: Trapezoidal rule - Gaussian Two point quadrature   |                                       |    |
| <b>UNIT-IV</b>   | <b>MULTIPLE INTEGRALS</b>             | 12 |
| Double integrals – Change of order of integration – Area enclosed by plane curves–Triple integrals–Volume of solids– Numerical computation of double integrals: Trapezoidal rule.  |                                       |    |
| <b>UNIT-V</b>  | <b>REGRESSION</b>                     | 12 |
| Scatter diagram - Karl Pearson coefficient of correlation for raw data –Spearman rank correlation coefficient - Lines of regression - Regression equation X on Y and Y on X- Curve fitting by Principle of least squares - Fitting a straight line $y = ax+b$ and a parabola $y = ax^2 + bx + c$ . |                                       |    |
| <b>Total Contact Hours:60</b>  |                                       |    |

| <b>Course Outcomes:</b>   |
|---|
| On completion of the course students will be able to  |
| • Demonstrate the matrix techniques in solving the related problems in engineering and technology.    |
| • Analyse and interpret data, and synthesize information to provide valid conclusions.                |
| • Interpret the problems in Engineering and Technology using the principles of mathematical calculus. |
| • Apply the analytical methods and numerical techniques to solve the related engineering problems.    |
| • Evaluate multiple integrals to conduct investigations of complex problems.                          |

| <b>SUGGESTED ACTIVITIES</b>      |
|----------------------------------|
| • Problem solving sessions       |
| • Activity Based Learning        |
| • Implementation of small module |

| <b>SUGGESTED EVALUATION METHODS</b>    |
|--|
| • Problem solving in Tutorial sessions |
| • Assignment problems                  |
| • Quizzes and class test               |
| • Discussion in classroom              |

| <b>Text Book(s):</b> |   |
|----------------------|---|
| 1.                   | Grewal B.S., “ Higher Engineering Mathematics ”, Khanna Publishers, New Delhi, 43rd Edition, 2014.                  |
| 2.                   | Gupta S.C. and Kapoor V.K.”Fundamentals of Mathematical Statistics”, Sultan and Sons 10 <sup>th</sup> Edition,2000. |
| 3.                   | T Veerarajan, Engineering Mathematics –I , Mc Graw Hill Education, 2018.  |

| <b>Reference Books(s) / Web links:</b> |   |
|--|---|
| 1.                                     | Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.        |
| 2.                                     | T Veerarajan ,Fundamentals of Mathematical Statistics , yesdee publications, 2017.                        |
| 3.                                     | Erwin Kreyszig ," Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016. |

| Subject Code | Subject Name         | Category | L | T | P | C |
|--------------|----------------------|----------|---|---|---|---|
| GE23111      | ENGINEERING GRAPHICS | ES       | 2 | 0 | 4 | 4 |

### OBJECTIVES:

- To understand the importance of the drawing in engineering applications
- To develop graphic skills for communication of concepts, ideas and design of engineering products
- To expose them to existing national standards related to technical drawings.
- To improve their visualization skills so that they can apply this skill in developing new products.
- To improve their technical communication skill in the form of communicative drawings

### CONCEPTS AND CONVENTIONS (Not for Examination)

1

Importance of graphics in engineering applications–Use of drafting instruments– BIS conventions and specifications–Size, layout and folding of drawing sheets– Lettering and dimensioning. Basic Geometrical constructions.

### UNIT-I PLANE CURVES AND PROJECTION OF POINTS

5+12

Curves used in engineering practices: Conics–Construction of ellipse, parabola and hyperbola by eccentricity method – Cycloidal Curves–Construction of cycloid, epicycloid and hypocycloid – Construction of involutes of square and circle–Drawing of tangents and normal to the above curves.

Principles of Projection and Projection of points.

### UNIT-II PROJECTION OF LINES AND PLANE SURFACES

6+12

Projection of straight lines (First angle projection) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

### UNIT-III PROJECTION OF SOLIDS AND PROJECTION OF SECTIONED SOLIDS

6+12

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

Sectioning of solids in simple vertical position when the cutting plane is inclined to HP and perpendicular to VP – obtaining true shape of the section.

Practicing three-dimensional modeling of simple objects by CAD software (Not for examination)

### UNIT-IV DEVELOPMENT OF SURFACE AND ISOMETRIC PROJECTIONS

6+12

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.

Principles of isometric projection–isometric scale–Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders and cones

Model making of isometric projection of combination of solids as assignment (Not for End semester)

### UNIT-V FREE HAND SKETCHING AND PERSPECTIVE PROJECTIONS

6+12

Free Hand sketching: Freehand sketching of multiple views from pictorial views of objects - Freehand sketching of pictorial views of object from multiple views

Perspective projection of simple solids-Prisms, pyramids, cylinder and cone by visual ray method.

**Total Contact Hours: (L=30; P=60) 90 Periods**



**COURSE OUTCOMES:**

After learning the course, the students should be able

- To construct different plane curves and to comprehend the theory of projection
- To draw the basic views related to projection of lines and planes
- To draw the projection of simple solids and to draw the projection of development of surfaces of Sectioned solids in simple vertical position
- To draw the orthographic projection from pictorial objects and Isometric projections of simple solids
- To visualize Perspective view of simple solids

**CO PO PSO MAPPING**

| CO/PO | PO |   |   |   |   |   |   |   |   |    |    |    | PSO |   |   |
|-------|----|---|---|---|---|---|---|---|---|----|----|----|-----|---|---|
|       | 1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1   | 2 | 3 |
| CO 1  | 3  | 2 | 2 | 1 | - | 1 | - | 2 | 2 | 2  | -  | 2  |     |   |   |
| CO 2  | 3  | 2 | 2 | 1 | - | 1 | - | 2 | 2 | 2  | -  | 2  |     |   |   |
| CO 3  | 3  | 2 | 2 | 1 | - | 1 | - | 2 | 2 | 2  | -  | 2  |     |   |   |
| CO 4  | 3  | 2 | 2 | 1 | - | 1 | - | 2 | 2 | 2  | -  | 2  |     |   |   |
| CO 5  | 3  | 2 | 2 | 1 | - | 1 | - | 2 | 2 | 2  | -  | 2  |     |   |   |

1: Slight (Low)    2: Moderate (Medium)    3: Substantial (High)

**TEXT BOOK (S):**

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2017.

**REFERENCE BOOKS(S) / WEB LINKS:**

1. Varghese P I., "Engineering Graphics", McGraw Hill Education (I) Pvt.Ltd., 2013.
2. V.B Sikka "Civil Engineering Drawing", S.K Kataria & Sons, New Delhi.
3. Venugopal K. and PrabhuRaja V., "Engineering Graphics", New Age International(P)Limited, 2008.
4. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2017.
5. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill Publishing Company Limited, New Delhi, 2018.

| Subject Code   | Subject Name                                    | Category | L | T | P | C        |
|--|---|----------|---|---|---|----------|
| AT23111  | Production Technology – I                       | PC       | 3 | 0 | 0 | 3        |
| <b>OBJECTIVES:</b>   |   |          |   |   |   |          |
| <ol style="list-style-type: none"> <li>1. To learn about various metal casting process principle and procedure involved</li> <li>2. To rephrase the process principle and application of powder metallurgy and polymer processing</li> <li>3. To learn about the process principle of various types of welding and its applications.</li> <li>4. To understand the process principles of metal forming techniques.</li> <li>5. To understand various sheet metal operations and processing techniques.</li> </ol>  |   |          |   |   |   |          |
| <b>UNIT I</b>  | <b>METAL CASTING PROCESSES</b>                  |          |   |   |   | <b>9</b> |
| Sand Casting : Sand Mould – Type of patterns - Pattern Materials – Pattern allowances –Moulding sand Properties and testing – Cores –Types and applications – Moulding machines– Types and applications; Melting furnaces : Blast and Cupola Furnaces; Principle of special casting processes : Shell - investment – Ceramic mould – Pressure die casting - Centrifugal Casting - Defects in Sand casting. Design of patterns, moulds and cores; riser and gating design.  |   |          |   |   |   |          |
| <b>UNIT II</b>   | <b>POWDER METALLURGY AND POLYMER PROCESSING</b> |          |   |   |   | <b>9</b> |
| <p>Historical and modern developments in Powder Metallurgy. Advantages, limitations and applications of Powder Metallurgy. Basic Steps for Powder Metallurgy. Powder Compaction Methods, Powder Forming Methods and Sintering.</p> <p>Types of plastics- Working principles and typical applications of - Injection Moulding- Compression moulding- Extrusion- Thermoforming- Transfer moulding-Rotational Moulding and Film blow moulding.</p>  |   |          |   |   |   |          |
| <b>UNIT III</b>  | <b>JOINING PROCESSES</b>                        |          |   |   |   | <b>9</b> |
| Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding - Operating principle and applications of: Resistance welding - Plasma arc welding – Thermit welding – Electron beam welding –Laser Beam welding, Friction welding and Friction Stir Welding; Weld defects: types, causes and cure. Principles of brazing, soldering. |   |          |   |   |   |          |
| <b>UNIT IV</b>   | <b>METAL FORMING PROCESSES</b>                  |          |   |   |   | <b>9</b> |
| Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – forging operations. Rolling of metals– Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts. Principle of rod and wire drawing – Tube drawing – Principles  |   |          |   |   |   |          |

of Extrusion – Types – Hot and Cold extrusion. Load estimation for bulk (forging, rolling, extrusion and drawing).

|               |                              |          |
|---------------|------------------------------|----------|
| <b>UNIT V</b> | <b>SHEET METAL PROCESSES</b> | <b>9</b> |
|---------------|------------------------------|----------|

Sheet metal characteristics – shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods –special forming processes-Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning– Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Micro forming.

|                |                   |
|----------------|-------------------|
| <b>TOTAL :</b> | <b>45 PERIODS</b> |
|----------------|-------------------|

**COURSE OUTCOMES:**

1. The students will be able to comprehend various metal casting process principle and procedure
2. The students will be able to demonstrate the working principle and application of powder metallurgy and polymer processing.
3. The students will be to explain principle of various types of welding and its applications
4. The students will be able to illustrate the working principles of metal forming techniques.
5. The students will be able to demonstrate various sheet metal operations and processing techniques.

**TEXT BOOKS:**

- |   |   |
|---|---|
| 1 | P N Rao, “Manufacturing Technology: Vol. I”, 4 <sup>th</sup> Edition, McGraw hill Education, 2013.  |
| 2 | 2013S SK HajraChoudhury and A K HajraChoudhury, Nirjhar Roy, “Elements of WorkshopTechnology Volume I: Manufacturing Processes' ', Media Publishers and Promoters Pvt. Ltd.,2008. |

**REFERENCE BOOKS:**

- |    |   |
|----|---|
| 1. | Mikell P Groover, “Fundamentals of Modern Manufacturing Materials processes and systems”Fourth Edition, Wiley Publication.    |
| 2. | Roy. A. Lindberg, “Processes and Materials of Manufacture”, PHI / Pearson education, 2006                                     |
| 3. | J. T. Black, Ronald A. Kohser, “DeGarmo's Materials and Processes in Manufacturing” Twelfth Edition, John Wiley & Sons, 2017. |
| 4. | Steven R. Schmid and SeropeKalpakjian, “Manufacturing Engineering and Technology” Seventh Edition, Pearson Education, 2014.   |

GE23117

தமிழர் மரபு

L T P C

1 0 0 1

**அலகு I மொழி மற்றும் இலக்கியம்:**

3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழிக் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

**அலகு II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை:** 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

**அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:**

3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

**அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:**

3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

**அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:**

3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

TOTAL : 15 PERIODS

## TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணிணித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu)(Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

| Subject Code  | Subject Name  | Category             | L | T | P | C |           |
|---|---|----------------------|---|---|---|---|-----------|
| PH23131   | <b>PHYSICS OF MATERIALS</b><br>Common to I sem. B.E. - Aero, Auto, Civil, Mech, MCT and R&A                 | BS                   | 3 | 0 | 2 | 4 |           |
| <b>Objectives:</b>  |   |                      |   |   |   |   |           |
| •   | To enhance the fundamental knowledge of elasticity and its applications relevant to engineering streams.    |                      |   |   |   |   |           |
| •   | To become proficient in crystal growth and crystal systems.   |                      |   |   |   |   |           |
| •   | To introduce the essential of phase transformation in materials.  |                      |   |   |   |   |           |
| •   | To impart knowledge on the structure, properties, treatment, testing and applications of metals and alloys. |                      |   |   |   |   |           |
| •   | To familiarize students with thermal properties and applications.   |                      |   |   |   |   |           |
| <b>UNIT-I</b>   | <b>PROPERTIES OF MATTER</b>   |                      |   |   |   | 9 |           |
| Elasticity–Hooke’s law-stress–strain-modulus of elasticity-stress-strain diagram-Poisson’s ratio-rigidity modulus-twisting couple on a cylinder-moment of inertia - torsional pendulum method. Bending of beams -bending moment-cantilever depression-theory and experiment - Young’s modulus determination–uniform and non-uniform bending-I-shape girders. Viscosity-flow of motion-Reynolds number.  |   |                      |   |   |   |   |           |
| <b>UNIT-II</b>  | <b>THERMAL PHYSICS</b>  |                      |   |   |   | 9 |           |
| Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation –rectilinear heat flow – thermal conductivity - Forbe’s and Lee’s disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.  |   |                      |   |   |   |   |           |
| <b>UNIT-III</b>   | <b>PHASE DIAGRAMS</b>   |                      |   |   |   | 9 |           |
| Solid solutions - Hume-Rothery’s rules –Gibb’s phase rule – unary phase diagram- binary phase diagrams -isomorphous systems - tie-line and lever rule - eutectic, eutectoid, peritectic, peritectoid, monotectic and syntectic systems - formation of microstructures-homogeneous and non-homogenous cooling – nucleation (Qualitative)– iron-carbon phase diagram - eutectoid steel – hypo-eutectoid and hyper-eutectoid steel – diffusion - Fick’s laws – T-T-T diagrams. |   |                      |   |   |   |   |           |
| <b>UNIT-IV</b>  | <b>CRYSTAL PHYSICS</b>  |                      |   |   |   | 9 |           |
| Basis – lattices – unit cell-crystal systems – Bravais lattices –number of atoms, atomic radius, co-ordination number and packing fraction - SC, BCC, FCC, HCP lattices and diamond structure - polymorphism and allotropy-graphite structure - Miller indices – determination of d-space-crystal growth techniques-solution growth –melt growth- Bridgmann and Czochralski - crystal defects.  |   |                      |   |   |   |   |           |
| <b>UNIT-V</b>   | <b>ADVANCED MATERIALS &amp; TESTING</b>   |                      |   |   |   | 9 |           |
| Metallic glasses – preparation, properties and applications - Composites – types and properties - Shape memory alloys – properties and applications - Nano-materials – top down and bottom up approaches –sol-gel method-pulsed laser deposition-ball milling- properties-applications - Tensile strength – Hardness – Fatigue - Impact strength – Creep - Fracture – types of fracture.  |   |                      |   |   |   |   |           |
|   |   | <b>Contact Hours</b> | : |   |   |   | <b>45</b> |

| <b>List of Experiments</b>                                |   |  |                            |
|---|---|--|----------------------------|
| <b>1</b>  | Determination of Young's modulus of given material by non-uniform bending method.                           |  |                            |
| <b>2</b>  | Determination of moment of inertia of a disc and rigidity modulus of a given wire using Torsional pendulum. |  |                            |
| <b>3</b>  | Determination of Young's modulus of given beam by cantilever method.  |  |                            |
| <b>4</b>  | Determination of viscosity of the given liquid using Poiseuille's method.                                   |  |                            |
| <b>5</b>  | Determination of Thermal conductivity of a bad conductor – Lee's Disc method.                               |  |                            |
| <b>6</b>  | Determination of Velocity of ultrasound and compressibility of given liquid – Ultrasonic interferometer.    |  |                            |
| <b>7</b>  | Determination of the wavelength of Laser and particle size of given powder.                                 |  |                            |
| <b>8</b>  | Determination of the Hysteresis loss of ferromagnetic material by B-H curve experiment.                     |  |                            |
| <b>9</b>  | Find the thickness of a given thin wire – Air wedge method.   |  |                            |
| <b>10</b>   | Study the characteristics of solar cell parameters.   |  |                            |
|   |   |  | <b>Contact Hours</b>       |
|   |   |  | <b>: 30</b>                |
|   |   |  | <b>Total Contact Hours</b> |
|   |   |  | <b>: 75</b>                |
| <b>Course Outcomes:</b>                                   |   |  |                            |
| On completion of the course, the students will be able to |   |  |                            |
| •   | apply the elastic nature of materials and determine the elastic moduli of different materials.              |  |                            |
| •   | apply the basic knowledge of crystal structure in solids.   |  |                            |
| •   | analyse and measure the properties of alloys.   |  |                            |
| •   | analyse various material testing methods and use them in suitable applications.                             |  |                            |
| •   | understand the concepts of heat transfer in various applications.   |  |                            |
| <b>Suggested Activities</b>                               |   |  |                            |
| •   | Problem solving sessions  |  |                            |
| <b>Suggested Evaluation Methods</b>                       |   |  |                            |
| •   | Quizzes   |  |                            |
| •   | Class Presentation / Discussion   |  |                            |
| <b>Text Book(s):</b>                                      |   |  |                            |
| <b>1</b>  | Bhattacharya, D.K. & Poonam, T. " <i>Engineering Physics</i> ". Oxford University Press, 2018.              |  |                            |
| <b>2</b>  | Gaur, R.K. & Gupta, S.L. " <i>Engineering Physics</i> ". Dhanpat Rai Publishers, 2018.                      |  |                            |
| <b>3</b>  | Raghavan, V. " <i>Physical Metallurgy: Principles and Practice</i> ". PHI Learning, 2019.                   |  |                            |
| <b>Reference Books(s) / Web links:</b>                    |   |  |                            |
| <b>1</b>  | Balasubramaniam, R. " <i>Callister's Materials Science and Engineering</i> ". Wiley India Pvt. Ltd., 2017   |  |                            |
| <b>2</b>  | Resnick, R., Halliday, D., & Walker, J. " <i>Principles of Physics</i> ", Wiley India Pvt., 2018.           |  |                            |

|   |   |
|---|---|
| 3 | Raghavan, V. <i>“Materials Science and Engineering: A First course”</i> . PHI Learning, 2019.                               |
| 4 | <a href="https://nptel.ac.in/courses/113104068">https://nptel.ac.in/courses/113104068</a>                                   |
| 5 | <a href="https://archive.nptel.ac.in/courses/115/105/115105099/">https://archive.nptel.ac.in/courses/115/105/115105099/</a> |

### List of Equipment Available

(Common to B.E. Aero, Auto, Civil, Mechanical, Mechatronics Engineering and R&A)

| S. No | Name of the equipment  | Quantity Required | Quantity Available | Deficiency |
|-------|--|-------------------|--------------------|------------|
| 1     | Young’s modulus by Non - Uniform bending method<br>Travelling Microscopes, Meter scale etc., | 6                 | 13                 | -          |
| 2     | Rigidity Modulus - Torsional Pendulum Setup  | 6                 | 19                 | -          |
| 3     | Velocity of sound and compressibility of liquid –<br>Ultrasonic Interferometer               | 6                 | 14                 | -          |
| 4     | Wavelength of Laser and Characteristics -Laser source<br>And grating plate                   | 6                 | 15                 | -          |
| 5     | B-H curve Setup and CRO  | 6                 | 7                  | -          |
| 6     | Thermal conductivity of bad conductor- Lee’s Disc setup                                      | 6                 | 16                 | -          |
| 7     | LCR circuit kit  | 6                 | 7                  | -          |
| 8     | Thickness of a thin wire-Air wedge method –<br>Travelling microscope                         | 6                 | 13                 | -          |
| 9     | Solar cell parameters setup  | 6                 | 8                  | -          |
| 10    | Poiseuille’s method set up   | 6                 | 10                 | -          |



**CO - PO – PSO matrices of course**

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High) If there is no correlation, put “-”

| PO/PSO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1<br>0 | PO1<br>1 | PO1<br>2 | PSO<br>1 | PSO<br>2 | PSO<br>3 |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|----------|----------|----------|----------|----------|
| CO 1         | 3   | 3   | 2   | -   | -   | -   | -   | -   | -   | -        | -        | -        | 1        | 1        | 1        |
| CO 2         | 3   | 2   | 1   | -   | -   | -   | -   | -   | -   | -        | -        | -        | -        | 1        | -        |
| CO 3         | 3   | 3   | 2   | -   | -   | -   | -   | -   | -   | -        | -        | 1        | 1        | 1        | -        |
| CO 4         | 3   | 2   | 2   | -   | -   | -   | -   | -   | -   | -        | -        | 1        | 1        | 1        | 1        |
| CO 5         | 3   | 3   | 2   | -   | -   | -   | -   | -   | -   | -        | -        | 1        | 1        | -        | -        |
| Average      | 3   | 2.6 | 1.8 | -   | -   | -   | -   | -   | -   | -        | -        | 1        | 1        | 1        | 1        |

| Subject Code | Subject Name (Laboratory Course)             | Category | L | T | P | C |
|--------------|--|----------|---|---|---|---|
| GE23121      | ENGINEERING PRACTICES – Civil and Mechanical | ES       | 0 | 0 | 2 | 1 |

**Objectives:**

To provide exposure to the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

| List of Experiments                    |  |  |  |  |                            |          |           |
|--|--|--|--|--|----------------------------|----------|-----------|
| <b>CIVIL ENGINEERING PRACTICE</b>      |  |  |  |  |                            |          |           |
| 1.                                     | Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings. |  |  |  |                            |          |           |
| 2.                                     | Preparation of basic plumbing line sketches for wash basins, water heaters, etc.   |  |  |  |                            |          |           |
| 3.                                     | Hands-on-exercise: Basic pipe connections – Pipe connections with different joining components.                                    |  |  |  |                            |          |           |
| <b>Carpentry Works:</b>                |  |  |  |  |                            |          |           |
| 4.                                     | Study of joints in roofs, doors, windows and furniture.  |  |  |  |                            |          |           |
| 5.                                     | Hands-on-exercise: Woodwork, joints by sawing, planing and chiselling.   |  |  |  |                            |          |           |
| <b>MECHANICAL ENGINEERING PRACTICE</b> |  |  |  |  |                            |          |           |
| 6.                                     | Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.  |  |  |  |                            |          |           |
| 7.                                     | Gas welding practice.  |  |  |  |                            |          |           |
| <b>Basic Machining:</b>                |  |  |  |  |                            |          |           |
| 8.                                     | Simple Turning and Taper turning   |  |  |  |                            |          |           |
| 9.                                     | Drilling Practice  |  |  |  |                            |          |           |
| <b>Sheet Metal Work:</b>               |  |  |  |  |                            |          |           |
| 10.                                    | Forming & Bending:   |  |  |  |                            |          |           |
| 11.                                    | Model making – Trays and funnels   |  |  |  |                            |          |           |
| 12.                                    | Different type of joints.  |  |  |  |                            |          |           |
| <b>Machine Assembly Practice:</b>      |  |  |  |  |                            |          |           |
| 13.                                    | Study of centrifugal pump  |  |  |  |                            |          |           |
| 14.                                    | Study of air conditioner   |  |  |  |                            |          |           |
|  |  |  |  |  | <b>Total Contact Hours</b> | <b>:</b> | <b>30</b> |
|  |  |  |  |  |                            |          |           |

| <b>Course Outcomes:</b> |   |
|-------------------------|---|
| ●                       | Able to perform plumbing activities for residential and industrial buildings considering safety aspects while gaining clear understanding on pipeline location and functions of joints like valves, taps, couplings, unions, reducers, elbows, etc. |
| ●                       | Able to perform wood working carpentry activities like sawing, planing, cutting, etc. while having clear understanding of the joints in roofs, doors, windows and furniture.  |
| ●                       | Able to produce joints like L joint, T joint, Lap joint, Butt joint, etc. through arc welding process while acquiring in depth knowledge in the principle of operation of welding and other accessories   |
| ●                       | Able to perform operations like Turning, Step turning, Taper turning, etc. in lathe and Drilling operation in drilling machine  |
| ●                       | Able to perform sheet metal operations like Forming, Bending, etc. and fabricating models like Trays, funnels, etc.   |

**TOTAL: 30 PERIODS**

|             | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO 1</b> | 1   | 1   | 1   | -   | -   | 2   | 1   | -   | 2   | -    | -    | 2    | -    | 2    | 1    |
| <b>CO 2</b> | 1   | 1   | 1   | -   | -   | 2   | 1   | -   | 2   | -    | -    | 2    | -    | 2    | 1    |
| <b>CO 3</b> | 1   | 1   | 1   | -   | -   | 2   | 1   | -   | 2   | -    | -    | 2    | -    | 2    | 1    |
| <b>CO 4</b> | 1   | 1   | 1   | -   | -   | 2   | 1   | -   | 2   | -    | -    | 2    | -    | 2    | 1    |
| <b>CO 5</b> | 1   | 1   | 1   | -   | -   | 2   | 1   | -   | 2   | -    | -    | 2    | -    | 2    | 1    |

1: Slight (Low)    2: Moderate (Medium)    3: Substantial (High)

| Subject Code | Subject Name (Theory course)  | Category | L | T | P | C |
|--------------|---|----------|---|---|---|---|
| MC23112      | <b>ENVIRONMENTAL SCIENCE AND<br/>ENGINEERING</b><br>Common to all branches of B.E./B.Tech. courses (Except B.Tech-<br>CSBS) | MC       | 3 | 0 | 0 | 0 |

| <b>Objectives:</b> |   |
|--------------------|---|
|                    | To develop the understanding of environmental and associated issues         |
|                    | To develop an attitude of concern for the environment                       |
|                    | To promote enthusiasm in participating environmental protection initiatives |
|                    | To nurture skills to solve environmental degradation issues                 |

#### **UNIT-I**

#### **Air and Noise pollution**

9

Definition –sources of air pollution –chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, ozone depletion, particulate pollutants-Air quality standards-Air quality indices - control of particulate air pollutants-gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP)-catalytic converters. Noise pollution –sources - health effects - standards- measurement and control methods.

#### **UNIT-II**

#### **Water pollution and its management**

9

Definition-causes-effects of water pollution-point and nonpoint sources of wastewater-marine pollution - thermal pollution - Control of water pollution by physical, chemical and biological methods – wastewater treatment-primary, secondary and tertiary treatment-sources and characteristics of industrial effluents- zero liquid discharge.

#### **UNIT-III**

#### **Solid waste and Hazardous waste management**

9

Solid waste – types- municipal solid waste management: sources, characteristics, collection, and transportation- sanitary landfill, recycling, composting, incineration, energy recovery options from waste - Hazardous waste – types, characteristics, and health impact - hazardous waste management: neutralization, oxidation reduction, precipitation, solidification, stabilization, incineration and final disposal. E-waste-definition-sources-effects on human health and environment-E-waste management- steps involved - Role of E-waste management within the initiatives of the Govt. of India- Swachh Bharat Mission.

**UNIT-IV****Sustainable Development**

9

Sustainable development- concept-dimensions-sustainable development goals - value education-gender equality – food security - poverty – hunger - famine - Twelve principles of green chemistry - Green technology - definition, importance - Cleaner development mechanism - carbon credits, carbon trading, carbon sequestration, eco labeling-International conventions and protocols-Disaster management.

**UNIT-V****Environmental Management and Legislation**

9

Environmental Management systems - ISO 14000 series- Environmental audit-Environmental Impact Assessment- life cycle assessment- human health risk assessment - Environmental Laws and Policy- Objectives - Polluter pays principle, Precautionary principle - The Environment (Protection) Act 1986 - Role of Information technology in environment and human health.

**Total Contact Hours : 45**

| <b>Course Outcomes:</b>                                   |   |
|---|---|
| On completion of the course, the students will be able to |   |
| CO1   | associate air and noise quality standards with environment and human health.          |
| CO2   | illustrate the significance of water and devise control measures for water pollution. |
| CO3   | analyze solid wastes and hazardous wastes.  |
| CO4   | outline the goals of sustainable development in an integrated perspective.            |
| CO5   | comprehend the significance of environmental laws.                                    |

| <b>Text Books:</b> |  |
|--------------------|--|
| 1                  | Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016   |
| 2                  | Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018. |
| 3                  | Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi   |

| Reference Books |  |
|-----------------|--|
| 1               | R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. Edition 2010. |
| 2               | Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.                                       |
| 3               | Fowler B, Electronic Waste – 1 st Edition (Toxicology and Public Health Issues), 2017Elsevier  |

Note: Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

| PO/PSO<br>CO | PO1        | PO2        | PO3        | PO4        | PO5        | PO6        | PO7        | PO8      | PO9      | PO10     | PO11       | PO12     | PSO1 | PSO2 | PSO3 |
|--------------|------------|------------|------------|------------|------------|------------|------------|----------|----------|----------|------------|----------|------|------|------|
| MC23112.1    | 1          | 2          | 3          | 1          | -          | 2          | 2          | 2        | 1        | 1        | 1          | 2        |      |      |      |
| MC23112.2    | 1          | 2          | 3          | 1          | -          | 2          | 2          | 2        | 1        | 1        | 1          | 2        |      |      |      |
| MC23112.3    | -          | -          | 3          | 1          | -          | 2          | 3          | 2        | 1        | -        | 1          | 2        |      |      |      |
| MC23112.4    | -          | 1          | 2          | 1          | 1          | 3          | 3          | 2        | 1        | 1        | 1          | 2        |      |      |      |
| MC23112.5    | -          | 1          | 2          | -          | -          | 2          | 2          | 2        | 1        | 2        | 2          | 2        |      |      |      |
| <b>AVG.</b>  | <b>0.4</b> | <b>1.2</b> | <b>2.6</b> | <b>0.8</b> | <b>0.2</b> | <b>2.2</b> | <b>2.4</b> | <b>2</b> | <b>1</b> | <b>1</b> | <b>1.2</b> | <b>2</b> |      |      |      |

| Web links: |   |
|------------|---|
| 1          | <a href="https://onlinecourses.nptel.ac.in/noc19_ge22/">https://onlinecourses.nptel.ac.in/noc19_ge22/</a> |
| 2          | <a href="#">NPTEL</a>   |
| 3          | <a href="https://news.mit.edu/2013/ewaste-mit">https://news.mit.edu/2013/ewaste-mit</a>                   |

Suggested activities

1. Case studies presentation

Method of evaluation

1. Classroom presentations on case studies (or) Site visits, instead of CAT-I (or)CAT-II or CAT III

## II Semester

| Course Code  | Course Title  | Category  | L        | T        | P        | C        |
|--|---|-----------|----------|----------|----------|----------|
| <b>MA23212</b>   | <b>DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES</b> | <b>BS</b> | <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |
| <b>Common to II Sem. B.E. –AERO, AUTO, BME, CIVIL, EEE, ECE, MECH, MCT, R&amp;A<br/>and B. Tech. - BT, FT &amp; CHEM</b> |   |           |          |          |          |          |

| <b>Objectives:</b>   |
|--|
| <ul style="list-style-type: none"> <li>● To provide students with an introduction to the theory of ordinary differential equations through applications, methods of solution, and numerical approximations.</li> </ul>                                   |
| <ul style="list-style-type: none"> <li>● To introduce students to how to solve linear Partial Differential with different methods.</li> </ul>  |
| <ul style="list-style-type: none"> <li>● To enable the students to study the Laplace Transforms, properties of Laplace Transform, inverse Laplace Transform and some applications to solve the differential equations and integral equations.</li> </ul> |
| <ul style="list-style-type: none"> <li>● To explain the concept of a vector integration in a plane and in space.</li> </ul>  |
| <ul style="list-style-type: none"> <li>● To describe basic properties of complex variables and to have the ability to compute complex integrals.</li> </ul>  |

|   |  |           |
|---|--|-----------|
| <b>UNIT-I</b>   | <b>ORDINARY DIFFERENTIAL EQUATIONS</b> | <b>12</b> |
| Second and higher order Linear differential equations with constant coefficients - Method of variation of parameters – Legendre’s linear equations – Numerical solution of ODE - Single Step methods: Taylor’s series method, Euler’s method.   |  |           |
| <b>UNIT-II</b>  | <b>PARTIAL DIFFERENTIAL EQUATIONS</b>  | <b>12</b> |
| Formation of partial differential equations - Classification of PDE – Solutions of standard types of first order partial differential equations - Lagrange’s linear equation –Linear homogeneous partial differential equations of second and higher order with constant coefficients.  |  |           |
| <b>UNIT-III</b>   | <b>LAPLACE TRANSFORM</b>               | <b>12</b> |
| Laplace transform –Basic properties – Transforms of derivatives and integrals of functions - Transforms of unit step function and impulse functions, periodic functions. Inverse Laplace transform – Problems using Convolution theorem – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques |  |           |
| <b>UNIT-IV</b>  | <b>VECTOR CALCULUS</b>                 | <b>12</b> |
| Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.  |  |           |
| <b>UNIT-V</b>   | <b>COMPLEX VARIABLES</b>               | <b>12</b> |
| Analytic functions — Construction of analytic function - Bilinear transformation –Singularities – Cauchy’s integral theorem (without proof) - Residues – Residue theorem (without proof) - Simple problems - Contour integral over $ z =1$ .  |  |           |

| <b>Course Outcomes:</b>  |
|--|
| On completion of the course students will be able to   |
| <ul style="list-style-type: none"> <li>● Apply the methods as a potent tool in the solution of a variety of problems in the natural sciences and technology.</li> </ul>  |
| <ul style="list-style-type: none"> <li>● Develop specific methodologies, techniques and resources in Partial differential equations to conduct research and produce innovative results in the area of specialisation.</li> </ul> |
| <ul style="list-style-type: none"> <li>● Use Laplace transform and inverse transform techniques to solve the complex problems in engineering and technology.</li> </ul>  |

|  |
|--|
| <ul style="list-style-type: none"> <li>• Apply the concepts in multivariable analysis, including space curves; directional derivative; gradient; multiple integrals; line and surface integrals; vector fields; divergence, curl ; the theorems of Green and Stokes, and the divergence theorem in different fields of engineering.</li> </ul> |
| <ul style="list-style-type: none"> <li>• Demonstrate the concept of Analytic functions, conformal mapping and complex integration in solving Engineering problems.</li> </ul>  |
| <b>Total Contact Hours: 60</b>   |

#### **SUGGESTED ACTIVITIES**

- Problem solving sessions
- Activity Based Learning

#### **SUGGESTED EVALUATION METHODS**

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

| <b>Text Book(s):</b> |   |
|----------------------|---|
| 4.                   | Grewal B.S., “ Higher Engineering Mathematics ”, Khanna Publishers, New Delhi, 43rd Edition, 2014.                    |
| 5.                   | Veerarajan. T, Engineering Mathematics –II, Mc Graw Hill Education, 2018.   |
| 6.                   | Erwin Kreyszig, " Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.             |
| 7.                   | Glyn James, “Advanced Modern Engineering Mathematics”, Pearson Education, 4th Edition, New Delhi, 2011.               |
| 8.                   | Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, 5 th Edition, New Delhi, 2017. |

| <b>Reference Books(s) / Web links:</b> |   |
|--|---|
| 1.                                     | Ramana. B.V., "Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.   |
| 2.                                     | T Veerarajan, Transforms and Partial Differential Equations, Third Edition, 2018.   |
| 3.                                     | Bali, N.P. and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 4 <sup>th</sup> Edition 2006. |
| 4.                                     | Peter V.O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi, 2012.                           |



| Subject Code | Subject Name   | Category | L | T | P | C |
|--------------|--|----------|---|---|---|---|
| GE23211      | Engineering Mechanics<br>(Common to Mech, Aero, Auto, Civil and MCT) | ES       | 2 | 1 | 0 | 3 |

| Objectives: The students can be able to |   |
|---|---|
| •                                       | To understand the basics of mechanics and apply the concept of equilibrium of system of forces. |
| •                                       | To understand the concept of equilibrium and to solve problems of rigid bodies.                 |
| •                                       | To learn about the centroid and centre of gravity of objects and moment of inertia              |
| •                                       | To learn the basic concepts of friction.  |
| •                                       | To learn the concepts in kinematics and kinetics of rigid bodies in plane motion.               |

|  |  |           |
|--|--|-----------|
| <b>UNIT-I</b>  | <b>STATICS OF PARTICLES</b>              | 9         |
| Introduction – Units and Dimensions – Laws of Mechanics – Lami’s theorem, Parallelogram and triangular Law of forces – Resolution of forces – Vector operations of forces - Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.  |  |           |
| <b>UNIT-II</b>   | <b>EQUILIBRIUM OF RIGID BODIES</b>       | 9         |
| Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force - Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in and three dimensions(class room lecture only) – (Descriptive treatment only)   |  |           |
| <b>UNIT-III</b>  | <b>PROPERTIES OF SURFACES AND SOLIDS</b> | 12        |
| Centroids - First moment of area – Second moment of area and centre of mass – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, Angle section, 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, Angle 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, cylindrical and spherical solids from first principle – Relation to area moments of inertia. |  |           |
| <b>UNIT-IV</b>   | <b>DYNAMICS OF PARTICLES</b>             | 7         |
| Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton’s laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.   |  |           |
| <b>UNIT-V</b>  | <b>FRICTION AND RIGID BODY DYNAMICS</b>  | 8         |
| Friction force – Laws of sliding friction - Characteristics of dry friction – equilibrium analysis of simple systems with sliding friction – wedge friction, Ladder friction, Rolling resistance - Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.   |  |           |
| <b>Total Contact Hours</b>   |  | <b>45</b> |

|   |  |
|---|--|
| <b>Course Outcomes:</b> Upon completion of this course, the students will be able to: |  |
| CO1   | Analyze the forces in the system and to understand vectorial and scalar representation of forces and moments   |
| CO2   | Study about the rigid body in equilibrium and to analyze the problems in engineering systems using the concept of static equilibrium   |
| CO3   | Determine the properties of surfaces and solids by means of finding centroid , centre of gravity and moment of inertia.  |
| CO4   | Solve problems involving kinematics and kinetics of rigid bodies in plane motion.  |
| CO5   | Solve problems involving frictional phenomena in machines by understanding the concept of friction and the effects by the laws of friction   |
| <b>Text Books:</b>  |  |
| 1   | Beer, F.P and Johnston Jr. E.R, Cornwell and Sanghi ., “Vector Mechanics for Engineers (In SI Units): Statics and Dynamics”, 12 <sup>th</sup> Edition, McGraw-Hill Publishing company, New Delhi (2018). |
| 2   | Rajasekaran S and Sankarasubramanian G., “Engineering Mechanics Statics and Dynamics”, 3 <sup>rd</sup> Edition, Vikas Publishing House Pvt. Ltd., 2005.  |

|  |  |
|--|--|
| <b>Reference Books(s) / Web links:</b> |  |
| 1                                      | Meriam J.L. and Kraige L.G., “Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, 7 <sup>th</sup> Edition, Wiley India, 2018.    |
| 2                                      | Hibbeler, R.C and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 14 <sup>th</sup> Edition, Pearson Education 2017.              |
| 3                                      | Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics” 4 <sup>th</sup> Edition, Pearson Education 2006. |
| 4                                      | Bhavikatti S S, Engineering Mechanics, New Age International Publishers, 2016  |
| 5                                      | Vela Murali, “Engineering Mechanics”, Oxford University Press 2010   |
| 6                                      | Palanichamy M S, Nagan S, Elango P, Engineering Mechanics: Dynamics, Tata McGraw-Hill Publishing Company Limited, 2004                       |

### CO & PO Mapping

|             | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| <b>CO 1</b> | 3   | 3   | 1   | 2   | -   | -   | 1   | -   | 2   | 1    | 3    | 2    | 3    | -    | 3    |
| <b>CO 2</b> | 3   | 3   | 1   | 2   | -   | -   | 1   | -   | 2   | 1    | 3    | 2    | 3    | -    | 3    |
| <b>CO 3</b> | 3   | 3   | 1   | 2   | -   | -   | 1   | -   | 1   | 1    | 3    | 2    | 3    | -    | 3    |
| <b>CO 4</b> | 3   | 3   | 1   | 2   | -   | -   | 1   | -   | 3   | 1    | 3    | 2    | 3    | -    | 3    |
| <b>CO 5</b> | 3   | 3   | 1   | 2   | -   | -   | 1   | -   | 3   | 1    | 3    | 2    | 3    | -    | 3    |

1: Slight (Low)    2: Moderate (Medium)    3: Substantial (High)

GE23217

தமிழரும் தொழில்நுட்பமும்

L T P C

1 0 0 1

**அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம்:**

3

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பண்டங்களில் கீறல் குறியீடுகள்.

**அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:**

3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.

**அலகு III உற்பத்தித் தொழில் நுட்பம்:**

3

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

**அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:**

3

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கல்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

**அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ் :**

3

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருறை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu)(Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

## ENGINEERING CHEMISTRY

| Subject Code | Subject Name (Theory Laboratory embedded course)            | Category | L | T | P | C |
|--------------|---|----------|---|---|---|---|
| CY23233      | ENGINEERING CHEMISTRY                                       | BS       | 3 | 0 | 2 | 4 |
| Common to    | B.E. – AERONAUTICAL, AUTOMOBILE, MECHANICAL and CIVIL ENGG. |          |   |   |   |   |

### Objectives:

- To understand the types of corrosion and its prevention
- To develop an understanding of the basic concepts of phase rule and its applications
- To provide a brief outline of polymers and composites in mechanical sciences
- To interpret the different types of batteries and fuel cells
- To provide an insight on nanomaterials and lubricants

### UNIT-I CORROSION SCIENCE AND CONTROL 9

**Corrosion:** Introduction- chemical and electrochemical theory of corrosion- types of corrosion- galvanic, differential aeration (waterline and pitting) and stress corrosion (caustic embrittlement)- corrosion penetration rate (CPR).

**Corrosion control:** Cathodic protection- Metallic coatings- Electroplating- electroplating of chromium (hard and decorative)- Electroless plating-electroless plating of nickel- Chemical conversion coatings-Organic coatings-paints-constituents-functions - special paints.

### UNIT-II PHASE RULE AND THERMAL ANALYSIS 9

**Phase rule** - Introduction, definition of terms - phase, components and degree of freedom - phase diagram- one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system. Alloys - significance of alloying - heat treatment of steel.

**Thermal analysis** - Thermogravimetric analysis- Differential thermal analysis- Differential scanning calorimetry- instrumentation (block diagram) and applications.

### UNIT-III POLYMERS AND COMPOSITES 9

**Plastics** - Types-preparation, properties and uses of Teflon, polycarbonate and PMMA

**Rubbers** - Types-vulcanization-synthetic rubber-Buna N rubber, Butyl rubber.

**Composite Materials** - Introduction-Types– MMC, CMC and PMC-Fiber-Reinforced composites-preparation, properties, and applications.

## UNIT-IV FUELS AND ENERGY STORAGE DEVICES

9

**Fuels** - Introduction, calorific value- numerical problems GCV and NCV-Green fuels-Introduction, synthesis and applications of power alcohol and biodiesel-High energy fuels-Production of hydrogen by electrolysis of water and its advantages.

**Energy devices** - Electrode potential-electrochemical series - construction, working and applications of lead acid battery, Lithium-ion battery-Fuel Cell-Hydrogen-Oxygen ( $H_2-O_2$ ) fuel cell, proton exchange membrane and solid oxide fuel cells.

9

## UNIT-V NANOMATERIALS AND LUBRICANTS

**Nanomaterials** - Introduction, size-dependent properties - Synthesis of Nanomaterials-sol-gel, precipitation, hydrothermal and solvothermal methods - Carbon based nano materials - Introduction to CNT, Graphene and Fullerenes- synthesis, properties and applications of CNT.

**Lubricants:** Classification- properties of lubricants- mechanism of lubrication- additives to lubricants- solid lubricants (graphite and  $MoS_2$ ).

**Total Contact Hours:45**

### Description of the Experiments

**Total Contact Hours:30**

1. Estimation of the acid by pH metry
2. Determination of corrosion rate on mild steel by weight loss method
3. Estimation of mixture of acids by conductometry
4. Estimation of extent of corrosion of Iron pieces by potentiometry
5. Determination of flash and fire points of lubricating oil
6. Determination of cloud and pour points of lubricating oil
7. Determination of molecular weight of a polymer by viscometry method
8. Synthesis of nanomaterials by simple precipitation method
9. Determination of phase change temperature of a solid
10. Determination of strength of an acid in Pb acid battery
11. Synthesis of biodiesel
12. Determination of acid value of biofuel

**Course Outcomes:** At the end of the course the student will be able to:

CO1: explain and the fundamental concepts of corrosion, its control and surface modification methods such as electroplating and electroless plating

CO2: apply the concept of phase rule in alloying and predict its thermal properties

CO3: identify the different types of plastics and composite materials of industrial importance

CO4: categorize the types of fuels and the energy storage devices

CO5: synthesize nanomaterials for modern engineering and technology

### **SUGGESTED ACTIVITIES**

- Electroplating of desired metal on substrate.
- Synthesis of biodiesel

### **SUGGESTED EVALUATION METHODS**

- Continuous assessment tests
- Assignments
- Model lab examination
- End semester examination

### **Text Book(s):**

1. P. C. Jain and Monika Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. O.G.Palanna, "Engineering Chemistry", McGraw Hill Education (India) Pvt, Ltd, New Delhi, 2nd Edition, 2017.
3. Shikha Agarwal "Engineering Chemistry-Fundamentals and applications", Cambridge University Press, New Delhi, 2019

### **Reference Books(s)**

- Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers, 4th Edition, 2021

|  |
|--|
| <ul style="list-style-type: none"> <li>• A Text Book Engineering Chemistry, Sunita Rattan, S.K. Kataria &amp; Sons, 1<sup>st</sup> 2018</li> </ul> |
| <ul style="list-style-type: none"> <li>• A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai &amp; Co. (P) Ltd.2011</li> </ul>              |
| <ul style="list-style-type: none"> <li>• PradeepT, “A Text Book of Nanoscience and Nanotechnology”, Tata McGraw Hill, New Delhi, 2012</li> </ul>   |
| <ul style="list-style-type: none"> <li>• Laboratory Manual Engg. Chemistry, Anupma Rajput, Dhanpat Rai &amp; Co</li> </ul>                         |

|   |
|---|
| <b>Weblinks</b>   |
| <ul style="list-style-type: none"> <li>• <a href="http://libgen.rs/">http://libgen.rs/</a></li> <li>• <a href="https://nptel.ac.in/courses/104/103/104103019/">https://nptel.ac.in/courses/104/103/104103019/</a></li> <li>• <a href="https://ndl.iitkgp.ac.in/">https://ndl.iitkgp.ac.in/</a></li> <li>• <a href="https://www.youtube.com/watch?v=j5Hml6KN4TI">https://www.youtube.com/watch?v=j5Hml6KN4TI</a></li> <li>• <a href="https://www.youtube.com/watch?v=1xWBPZnEjk8">https://www.youtube.com/watch?v=1xWBPZnEjk8</a></li> </ul> |

**Lab equipment required:**

| S. No | Name of the Equipment           | Quantity Required | Remarks |
|-------|---------------------------------|-------------------|---------|
| 1.    | Conductivity meter              | 10                |         |
| 2.    | Potentiometer                   | 10                |         |
| 3     | pH meter                        | 10                |         |
| 4     | Magnetic stirrer with hot plate | 1                 |         |
| 5     | Flash and Fire point apparatus  | 2                 |         |
| 6     | Cloud and pour point apparatus  | 2                 |         |



### CO - PO – PSO matrices of course

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High) If there is no correlation, put “-“

| PO/PSO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO.1         | 2   | 2   | 1   | -   | -   | 1   | 1   | -   | -   | -    | -    | 1    |      |      |      |
| CO.2         | 3   | 1   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | 1    |      |      |      |
| CO.3         | 2   | 2   | 2   | -   | -   | -   | -   | -   | -   | -    | -    | 1    |      |      |      |
| CO.4         | 2   | 1   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | 1    |      |      |      |
| CO.5         | 3   | 2   | 2   | -   | -   | -   | -   | -   | -   | -    | -    | 1    |      |      |      |
| AVG.         | 2.4 | 1.6 | 1.4 | -   | -   | 1   | 1   | -   | -   | -    | -    | 1    |      |      |      |

#### **SUGGESTED EVALUATION METHODS**

- Experiment based viva
- Quizzes

#### **Web links for virtual lab (if any)**

<https://drive.google.com/drive/folders/1k8g7fGRJ0D18FPbjQYg4I5jS1U9qIXnJ>

| Subject Code  | Subject Name ( Lab oriented Theory Courses)  | Category | L | T | P | C                          |          |           |
|---|--|----------|---|---|---|----------------------------|----------|-----------|
| EE23133   | BASIC ELECTRICAL AND ELECTRONICS ENGINEERING   | ES       | 3 | 0 | 2 | 4                          |          |           |
| <b>Objectives:</b>  |  |          |   |   |   |                            |          |           |
| • To provide knowledge on the analysis of DC circuits.  |  |          |   |   |   |                            |          |           |
| • To provide knowledge on the analysis of AC circuits   |  |          |   |   |   |                            |          |           |
| • To expose the principles of electrical machines and electronic devices.   |  |          |   |   |   |                            |          |           |
| • To teach the concepts of different types of electrical measuring instruments and transducers.   |  |          |   |   |   |                            |          |           |
| • To experimentally analyze the electrical circuits and machines, electronic devices and transducers.   |  |          |   |   |   |                            |          |           |
| <b>UNIT-I</b>   | <b>DC CIRCUITS</b>   |          |   |   |   |                            | 9        |           |
| Electrical circuit elements (R, L and C), Voltage and current sources, Kirchoff 's laws, Analysis of simple circuits with DC excitation, Superposition, Thevenin and Norton Theorems.                               |  |          |   |   |   |                            |          |           |
| <b>UNIT-II</b>  | <b>AC CIRCUITS</b>   |          |   |   |   |                            | 9        |           |
| Representation of sinusoidal waveforms, Power and Power factor, Analysis of single-phase AC circuits consisting of R, L, C, RL, RC, RLC combinations, Series resonance, Three phase balanced circuits               |  |          |   |   |   |                            |          |           |
| <b>UNIT-III</b>   | <b>ELECTRICAL MACHINES</b>   |          |   |   |   |                            | 9        |           |
| Construction, Principles of operation of DC machines, Single phase Transformers, Synchronous machines, Single phase induction motors. (Qualitative Treatment Only).   |  |          |   |   |   |                            |          |           |
| <b>UNIT-IV</b>  | <b>ELECTRONIC DEVICES &amp; CIRCUITS</b>   |          |   |   |   |                            | 9        |           |
| Review of PN Junction diode – Forward and Reverse Bias – Bipolar Junction Transistor – Common Emitter characteristics – MOSFET - Introduction to operational Amplifier –Inverting and Non-Inverting Amplifier.      |  |          |   |   |   |                            |          |           |
| <b>UNIT-V</b>   | <b>MEASUREMENTS &amp; INSTRUMENTATION</b>  |          |   |   |   |                            | 9        |           |
| Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Piezoelectric, - Classification of instruments - PMMC and MI Ammeters and Voltmeters – Digital Storage Oscilloscope. |  |          |   |   |   |                            |          |           |
|   |  |          |   |   |   | <b>Contact Hours</b>       | <b>:</b> | <b>45</b> |
| <b>List of Experiments</b>  |  |          |   |   |   |                            |          |           |
| <b>1</b>  | Verification of Kirchoff's Laws.   |          |   |   |   |                            |          |           |
| <b>2</b>  | Load test on DC Shunt Motor (Virtual Lab)  |          |   |   |   |                            |          |           |
| <b>3</b>  | Load test on Single phase Transformer (Virtual Lab)  |          |   |   |   |                            |          |           |
| <b>4</b>  | Load test on Single phase Induction motor (Virtual Lab)  |          |   |   |   |                            |          |           |
| <b>5</b>  | Characteristics of P-N junction Diode.   |          |   |   |   |                            |          |           |
| <b>6</b>  | Characteristics of CE based NPN Transistor.  |          |   |   |   |                            |          |           |
| <b>7</b>  | Characteristics of MOSFET  |          |   |   |   |                            |          |           |
| <b>8</b>  | Characteristics of LVDT, RTD and Thermistor.   |          |   |   |   |                            |          |           |
|   |  |          |   |   |   | <b>Contact Hours</b>       | <b>:</b> | <b>30</b> |
|   |  |          |   |   |   | <b>Total Contact Hours</b> | <b>:</b> | <b>75</b> |
| <b>Course Outcomes:</b>   |  |          |   |   |   |                            |          |           |
| On completion of the course, the students will be able to   |  |          |   |   |   |                            |          |           |
| • analyse DC circuits and apply circuit theorems.   |  |          |   |   |   |                            |          |           |
| • calculate the power and power factor in AC circuits   |  |          |   |   |   |                            |          |           |
| • understand the principles of electrical machines.   |  |          |   |   |   |                            |          |           |
| • comprehend the principles of different types of electronic devices, electrical measuring instruments and transducers.   |  |          |   |   |   |                            |          |           |
| • experimentally analyze the electric circuits and machines, electronic devices, and transducers.   |  |          |   |   |   |                            |          |           |
| <b>Suggested Activities</b>   |  |          |   |   |   |                            |          |           |
| • Problem solving sessions  |  |          |   |   |   |                            |          |           |
| <b>Suggested Evaluation Methods</b>   |  |          |   |   |   |                            |          |           |
| • Quizzes   |  |          |   |   |   |                            |          |           |
| • Class Presentation / Discussion   |  |          |   |   |   |                            |          |           |
| <b>Text Book(s):</b>  |  |          |   |   |   |                            |          |           |
| <b>1</b>  | J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2010.   |          |   |   |   |                            |          |           |
| <b>2</b>  | Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Schaum Series and Systems", Schaum's Outlines, Tata McGrawHill, Indian. 5th Edition , 2017 |          |   |   |   |                            |          |           |
| <b>3</b>  | Thereja .B.L., "Fundamentals of Electrical Engineering and Electronics", S. Chand & Co. Ltd., 2008   |          |   |   |   |                            |          |           |
| <b>Reference Books(s) / Web links:</b>  |  |          |   |   |   |                            |          |           |
| <b>1</b>  | Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2015  |          |   |   |   |                            |          |           |
| <b>2</b>  | John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2007  |          |   |   |   |                            |          |           |

|   |   |
|---|---|
| 3 | Allan S Moris, “Measurement and Instrumentation Principles”, Elsevier, Third Edition, 2006  |
| 4 | Rajendra Prasad, “Fundamentals of Electrical Engineering”, Prentice Hall of India, Third Edition, 2014  |
| 5 | A.E.Fitzgerald, David E Higginbotham and Arvin Grabel, “Basic Electrical Engineering”, McGraw Hill Education(India) Private Limited, 2009       |
| 6 | D P Kothari and I.J Nagarath, “Basic Electrical and Electronics Engineering”, McGraw Hill Education(India) Private Limited, Third Reprint ,2016 |
| 7 | <a href="https://nptel.ac.in/courses/108108076">https://nptel.ac.in/courses/108108076</a>   |

### Lab Equipment Required:

| Sl. No. | Name of the Equipment   | Quantity Required<br>(For a batch of 30 students) |
|---------|---|---|
| 1.      | <b>Verification of ohms and Kirchhoff’s Laws</b><br>1. DC Regulated Power supply (0 - 30 V variable)<br>2. Bread Board<br>3. Resistors<br>4. Multimeter<br>5. Connecting wires  | 1<br>1<br>As per Circuit diagram<br>As Required   |
| 2.      | <b>Load test on DC Shunt Motor.</b><br>1. Ammeter MC (0-20A)<br>2. Voltmeter MC (0-300)V<br>3. Tachometer<br>4. Field Rheostat 500 Ω, 1.5 A<br>5. Connecting wires  | 1<br>1<br>1<br>1<br>As Required                   |
| 3.      | <b>Load Test on Induction Motor</b><br>1. Ammeter MI (0-20A)<br>2. Voltmeter MI (0-300)V<br>3. Wattmeter – 300V, 30 A<br>4. Tachometer – Digital<br>5. Connecting Wires<br>6. Single phase Induction motor                            | 1<br>1<br>1<br>1<br>As Required                   |
| 4.      | <b>Load test on Single phase Transformer</b><br>1. Ammeter (0-30) A, (0-5 ) A<br>2. Voltmeter (0-150)V, (0-300)V<br>3. Wattmeter – 300V, 5A, UPF<br>4. Autotransformer<br>5. Single phase Transformer<br>6. Connecting Wires          | 1<br>1<br>1<br>1<br>1<br>As Required              |
| 5.      | <b>Characteristics of PN and Zener Diodes</b><br>1. PN Diode (IN4007), Zener diode (6.8V, 1A)<br>2. Resistor 1 KΩ, 100Ω<br>3. Bread Board<br>4. DC Regulated Power supply (0 - 30 V variable)<br>5. Multimeter<br>6. Connecting wires | 1<br>1<br>1<br>1<br>1<br>As Required              |
| 6.      | <b>Characteristics of BJT</b><br>1. Transistor (BC107)<br>2. Resistors- 1kΩ, 470KΩ, 1MΩ<br>3. Bread Board<br>4. DC Regulated Power supply (0 - 30 V variable)<br>5. Multimeter<br>6. Connecting wires                                 | 1<br>1<br>1<br>1<br>1<br>As Required              |

|           |   |                                      |
|-----------|---|--------------------------------------|
| <b>7</b>  | <b>Characteristics of MOSFET</b><br>1. MOSFET (IRF510)<br>2. Resistors- 100k $\Omega$ , 1k $\Omega$<br>3. Bread Board<br>4. DC Regulated Power supply (0 - 30 V variable)<br>5. Multimeter<br>6. Connecting wires | 1<br>1<br>1<br>1<br>1<br>As Required |
| <b>7.</b> | <b>Measurement of displacement of LVDT, RTD and Thermistor</b><br>1. LVDT Kit<br>2. RTD<br>3. Thermistor<br>4. Multimeter   | 1<br>1<br>1<br>1<br>1                |

| COs/POs&PSOs   | PO1      | PO2      | PO3      | PO4      | PO5 | PO6      | PO7      | PO8      | PO9      | PO10     | PO11     | PO12     | PSO1 | PSO2 | PSO3 |
|----------------|----------|----------|----------|----------|-----|----------|----------|----------|----------|----------|----------|----------|------|------|------|
| <b>CO 1</b>    | 3        | 3        | 3        | 3        |     | 3        | 1        | 1        | 2        | 1        | 1        | 1        |      |      |      |
| <b>CO 2</b>    | 3        | 3        | 3        | 3        |     | 3        | 1        | 1        | 2        | 1        | 1        | 1        |      |      |      |
| <b>CO 3</b>    | 3        | 3        | 3        | 3        |     | 3        | 1        | 1        | 2        | 1        | 1        | 1        |      |      |      |
| <b>CO 4</b>    | 3        | 3        | 3        | 3        |     | 3        | 1        | 1        | 2        | 1        | 1        | 1        |      |      |      |
| <b>CO 5</b>    | 3        | 3        | 3        | 3        |     | 3        | 1        | 1        | 2        | 1        | 1        | 1        |      |      |      |
| <b>Average</b> | <b>3</b> | <b>3</b> | <b>3</b> | <b>3</b> |     | <b>3</b> | <b>1</b> | <b>1</b> | <b>2</b> | <b>1</b> | <b>1</b> | <b>1</b> |      |      |      |

| Subject Code | SubjectName(LaboratoryCourse)  | Category | L | T | P | C |
|--------------|--|----------|---|---|---|---|
| GE23231      | <b>PROGRAMMING USING PYTHON</b><br>Common to all branches of B. E. / B.Tech program<br>(Except–CSE, CSBS, CSD, IT, AI/ML, CYBER SECURITY, AI/DS) | ES       | 1 | 0 | 4 | 3 |

**Course Objectives:**

- To understand computers, programming languages and their generations and essential skills for a logical thinking for problem solving.
- To write, test, and debug simple Python programs with conditionals, and loops and functions
- To develop Python programs with defining functions and calling them
- To understand and write python programs with compound data-lists, tuples, dictionaries
- To search, sort, read and write data from /to files in Python.

**List of Experiments**

1. Study of algorithms, flowcharts and pseudocodes.
2. Introduction to Python Programming and Python IDLE/Anaconda distribution.
3. Experiments based on Variables, Data types and Operators in Python.
4. Coding Standards and Formatting Output.
5. Algorithmic Approach: Selection control structures.
6. Algorithmic Approach: Iteration control structures.
7. Experiments based on Strings and its operations.
8. Experiments based on Lists and its operations.
9. Experiments based on Tuples and its operations.
10. Experiments based on Sets and its operations.
11. Experiments based on Dictionary and its operations.
12. Functions: Built-in functions.
13. Functions: User-defined functions.
14. Functions: Recursive functions.
15. Searching techniques: Linear and Binary.
16. Sorting techniques: Bubble and Merge Sort.
17. Experiments based on files and its operations.

**Contact Hours** : **75**

**Course Outcomes:**

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

- Understand the working principle of a computer and identify the purpose of a computer programming language and ability to identify an appropriate approach to solve the problem.
- Write, test, and debug simple Python programs with conditionals and loops.
- Develop Python programs step - wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Apply searching, sorting on data and efficiently handle data using flat files.

**TextBooks:**

1. Allen B. Downey, Think Python:How to Think Like a Computer Scientist, Second edition,UpdatedforPython3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido Van Rossum and Fred L. Drake Jr, An Introduction to Python-Revised and updated for Python3.2, Network Theory Ltd., 2011.

**ReferenceBooks:**

1. JohnVGuttag, Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press,2013.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt.Ltd., 2016.
3. Timothy A.Budd, Exploring Python, Mc-Graw Hill Education(India)PrivateLtd.,2015.
4. Kenneth A. Lambert, Fundamentals of Python: First Programs, CengageLearning,2012.
5. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition,2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, Practical Programming: An Introduction to Computer Science using Python3, Second edition, Pragmatic Programmers, LLC, 2013.

Platform Needed: Python3 interpreter for Windows/Linux

**CO -PO–PSO matrices of course**

| <b>PO/PS<br/>OCO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>P<br/>O<br/>10</b> | <b>P<br/>O<br/>11</b> | <b>P<br/>O<br/>12</b> | <b>PS<br/>O1</b> | <b>PS<br/>O2</b> | <b>PS<br/>O3</b> |
|----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------------|-----------------------|-----------------------|------------------|------------------|------------------|
| <b>GE19211.1</b>     | 2          | 2          | 2          | 2          | 1          | -          | -          | -          | 1          | 1                     | 1                     | 1                     | 3                | 3                | -                |
| <b>GE19211.2</b>     | 2          | 1          | 1          | 1          | 1          | -          | -          | -          | -          | -                     | 1                     | 1                     | 3                | 2                | -                |
| <b>GE19211.3</b>     | 1          | 1          | 2          | 1          | 2          | -          | -          | -          | -          | -                     | 1                     | 1                     | 2                | 3                | 2                |
| <b>GE19211.4</b>     | 2          | 2          | 3          | 2          | 2          | -          | -          | -          | -          | -                     | 2                     | 1                     | 2                | 2                | 2                |
| <b>GE19211.5</b>     | 2          | 2          | 3          | 2          | 3          | -          | -          | -          | -          | -                     | 2                     | 1                     | 2                | 2                | 2                |
| <b>Average</b>       | <b>1.8</b> | <b>1.6</b> | <b>2.2</b> | <b>1.6</b> | <b>1.8</b> | <b>0.0</b> | <b>0.0</b> | <b>0.0</b> | <b>0.2</b> | <b>0.2</b>            | <b>1.4</b>            | <b>1</b>              | <b>2.4</b>       | <b>2.4</b>       | <b>2</b>         |

**1:Slight(Low)**

**2:Moderate(Medium)**

**3:Substantial(High)**

| Subject Code  | Subject Name (Theory course) | Category | L | T | P | C |
|---|------------------------------|----------|---|---|---|---|
| HS 23221  | Technical Communication II   | HS       | 0 | 0 | 2 | 1 |
| Common to all branches of B.E/B. Tech programmes –Second Semester |                              |          |   |   |   |   |

| Objectives:   |
|---|
| • To facilitate students to improve their vocabulary for a better communication |
| • To enable learners to understand and reproduce language                       |
| • To aid students to write technical reports in a convincing manner             |
| • To expose students to different sentence structures                           |
| • To equip learners to present their ideas in an efficient manner               |

| UNIT-I  | VOCABULARY FOR BETTER COMMUNICATION | 6 |
|---|-------------------------------------|---|
| <b>Listening:</b> Telephonic Conversations and TV News<br><b>Reading:</b> Newspapers and Magazines<br><b>Speaking:</b> Conversational Practice: Speaking in a given situation, Asking permission and requesting etc.,<br><b>Writing:</b> Job Application Letter and Resume<br><b>Grammar:</b> Reference words: pronouns and determiners<br><b>Vocabulary:</b> Guessing meanings of words in different contexts. |                                     |   |
| UNIT-II   | FUNCTIONAL LANGUAGE ASPECTS         | 6 |
| <b>Listening:</b> Motivational listening – listening to real life challenges<br><b>Reading:</b> Articles and Technical reports<br><b>Speaking:</b> Using Polite Expressions, Indirect Questions<br><b>Writing:</b> Paraphrasing a Text, Poem<br><b>Grammar:</b> Purpose Statements, Cause and Effect Expressions<br><b>Vocabulary:</b> Neologisms.  |                                     |   |
| UNIT-III  | TECHNICAL REPORTWRITING             | 6 |
| <b>Listening:</b> Empathetic Listening – Giving Solutions to Problems<br><b>Reading:</b> Inferential Reading<br><b>Speaking:</b> Dialogues – Interviewing Celebrities / Leaders / Sportspersons, etc.,<br><b>Writing:</b> Report Writing<br><b>Grammar:</b> Functional Usage of Expressions – used to, gone / been, etc.,<br><b>Vocabulary:</b> Words Often Confused  |                                     |   |
| UNIT-IV   | STRUCTURAL GRAMMAR                  | 6 |
| <b>Listening:</b> Comprehension (IELTS practice tests)<br><b>Reading:</b> Intensive Reading for specific information<br><b>Speaking:</b> Pick and Talk<br><b>Writing:</b> Proposals<br><b>Grammar:</b> Sentence Structures – Simple, Compound, Complex Sentences<br><b>Vocabulary:</b> Replacing dull words with vivid ones   |                                     |   |
| UNIT-V  | PRESENTATION SKILLS                 | 6 |
| <b>Listening:</b> Discriminative listening – sarcasm, irony, pun, etc.,<br><b>Reading:</b> Practice of chunking – breaking up reading materials<br><b>Speaking:</b> Mini presentation on some topic<br><b>Writing:</b> Minutes of the meeting<br><b>Grammar:</b> Correction of Errors<br><b>Vocabulary:</b> Advanced vocabulary – fixing appropriate words in the given context.                                |                                     |   |
| <b>Total Contact Hours: 30</b>  |                                     |   |

| Course Outcomes:  |
|---|
| On completion of the course students will be able to                                |
| • communicate effectively using appropriate vocabulary                              |
| • use the acquired language skills to comprehend various types of language contents |
| • evaluate different texts and write effective technical content                    |
| • use appropriate sentence structures to convey their thoughts in varied contexts   |
| • present their concepts and ideas in an effective manner                           |

**SUGGESTED ACTIVITIES**

- Story Lines
- One truth and two lies
- Hang Man
- Pictionary
- Word Scramble
- Case study

**SUGGESTED EVALUATION METHODS**

- Assignment topics
- Quizzes
- Class Presentation/Discussion
- Continuous Assessment Tests

**Text Book(s):**

5. Raymond Murphy, "Intermediate English Grammar," Second Edition , Cambridge University Press, 2018
6. Meenakshi Raman & Sangeeta Sharma, "Technical Communication" Third Edition, Oxford University Press, 2015
7. Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine ChuenMeng Goh, Cambridge University Press

**Reference Books(s) / Web links:**

1. Michael McCarthy (Author), Felicity O'Dell (Author), John D. Bunting (Contributor), "Basic Vocabulary in Use: 60 Units of Vocabulary Practice in North American English With Answers" 2nd Edition
2. Dale Carnegie, "The Art of Public Speaking," Insight Press
3. Jack C. Richards & Theodore S. Rodgers, " Approaches and Methods in Language Teaching, Second Edition, Cambridge University Press



| Subject Code       | Subject Name   | Category | L | T | P | C |
|--------------------|--|----------|---|---|---|---|
| HS 23222           | English for Professional Competence<br>Common to all branches of B.E/B. Tech programmes –<br>Second Semester                   | HS       | 0 | 0 | 2 | 1 |
| <b>Objectives:</b> |  |          |   |   |   |   |
| ●                  | To facilitate the learners in acquiring listening and reading competence   |          |   |   |   |   |
| ●                  | To enable the learners to communicate effectively through written and oral medium  |          |   |   |   |   |
| ●                  | To assist the learners in preparing for competitive examinations   |          |   |   |   |   |
| ●                  | To train the students in acquiring corporate skills  |          |   |   |   |   |
| ●                  | To inculcate professional standards among the students and make them realize their responsibility in addressing the challenges |          |   |   |   |   |

|   |                                      |   |
|---|--------------------------------------|---|
| <b>UNIT-I</b>   | <b>RECEPTIVE SKILLS</b>              | 6 |
| <p><b>Listening</b> – Comprehensive Listening – Watching the news – Listening to a peer giving presentation, etc. – Critical Listening – Watching a televised debate, Listening to poems – <b>Reading</b> – Extensive Reading – Short stories and One-act Plays – Intensive Reading – Articles or Editorials in Magazines, Blog posts on topics like science and technology, arts, etc.</p> |                                      |   |
| <b>UNIT-II</b>  | <b>PRODUCTIVE SKILLS</b>             | 6 |
| <p><b>Speaking</b> – Demonstrative Speaking – Process description through visual aids – Persuasive Speaking – Convincing the listener with the speaker’s view – <b>Writing</b> – Descriptive Writing - Describing a place, person, process – Subjective Writing – Autobiography, Writing based on personal opinions and interpretations</p>   |                                      |   |
| <b>UNIT-III</b>   | <b>ENGLISH FOR COMPETITIVE EXAMS</b> | 6 |
| <p>An introduction to International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Graduate Record Examination (GRE) – Civil Service, Indian Economic Service Examination, Indian Statistical Service Examination, Combined Defence Services Examination, Staff Selection- (Language Related) – Aptitude tests.</p>                              |                                      |   |
| <b>UNIT-IV</b>  | <b>CORPORATE SKILLS</b>              | 6 |
|   |                                      |   |

**Critical Thinking and Problem Solving** – Case Study, Brainstorming, Q & A Discussion – **Team work and Collaboration** – Activities like Office Debates, Perfect Square, Blind Retriever, etc. – **Professionalism and Strong Work Ethics** – Integrity, Resilience, Accountability, Adaptability, Growth Mind set

|               |                     |   |
|---------------|---------------------|---|
| <b>UNIT-V</b> | <b>PROJECT WORK</b> | 6 |
|---------------|---------------------|---|

Case Study based on the challenges faced by the employers and the employees – Devise Plan, Provide Solution

|  |                            |    |
|--|----------------------------|----|
|  | <b>Total Contact Hours</b> | 30 |
|--|----------------------------|----|

- Course Outcomes:**
- On completion of the course, students will be able to
- interpret and respond appropriately in the listening and reading contexts.
  - express themselves effectively in spoken and written communication
  - apply their acquired language skills in writing the competitive examinations
  - exhibit their professional skills in their work place
  - identify the challenges in the work place and suggest strategies solutions

- SUGGESTED ACTIVITIES**
- Online Quizzes on Vocabulary
  - Online Quizzes on grammar
  - Communication Gap Exercises
  - Presentations
  - Word Building Games
  - Case study

- SUGGESTED EVALUATION METHODS**
- Assignment topics
  - Quizzes
  - Class Presentation/Discussion
  - Continuous Assessment Tests

**Reference Books**

|          |   |
|----------|---|
| <b>1</b> | How to Read Better & Faster, Norman Lewis, Goyal Publishers |
|----------|---|

|   |   |
|---|---|
| 2 | Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine Chuen Meng Goh, Cambridge University Press |
| 3 | The Official Cambridge Guide To IELTS by Pauline Cullen, Cambridge University Press                                 |
| 4 | The 7 Habits of Highly Effective People by Stephen Covey, Simon and Schuster, UK                                    |

|  |   |
|--|---|
| <b>Reference Books(s) / Web links:</b> |   |
| 1.                                     | Board of Editors. Sure Outcomes. A Communication Skills Course for Undergraduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad, 2013. |
| 2.                                     | Hartley, Mary. "The Power of Listening," JaicoPublishing House; First Edition (2015).   |
| 3.                                     | Chambers, Harry. "Effective Communication Skills for Scientific and Technical Professionals," Persues Publishing, Cambridge, Massachusetts, 2000.         |

| Subject Code  | Subject Name  | Category | L | T | P                          | C        |           |
|---|---|----------|---|---|----------------------------|----------|-----------|
| GE23122   | ENGINEERING PRACTICES - ELECTRICAL AND ELECTRONICS  | ES       | 0 | 0 | 2                          | 1        |           |
| <b>Objectives:</b>  |   |          |   |   |                            |          |           |
| •   | To provide hands-on experience on various basic engineering practices in Electrical Engineering.  |          |   |   |                            |          |           |
| •   | To provide hands-on experience on various basic engineering practices in Electronics Engineering.   |          |   |   |                            |          |           |
| <b>List of Experiments</b>                                |   |          |   |   |                            |          |           |
| <b>A. ELECTRICAL ENGINEERING PRACTICE</b>                 |   |          |   |   |                            |          |           |
| 1   | Residential house wiring using switches, fuses, indicators, lamp and energy meter.  |          |   |   |                            |          |           |
| 2   | Fluorescent lamp wiring.  |          |   |   |                            |          |           |
| 3   | Stair case wiring.  |          |   |   |                            |          |           |
| 4   | Measurement of electrical quantities – voltage, current, power & power factor in RL circuit.  |          |   |   |                            |          |           |
| 5   | Measurement of earth resistance using Megger.   |          |   |   |                            |          |           |
| 6   | Study of Ceiling Fan and Iron Box   |          |   |   |                            |          |           |
| <b>B. ELECTRONICS ENGINEERING PRACTICE</b>                |   |          |   |   |                            |          |           |
| 1   | Study of electronic components and equipment – Resistor, colour coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO/DSO. |          |   |   |                            |          |           |
| 2   | (a) Measurement of electrical quantities using Multimeter<br>(b) Testing of electronic components.  |          |   |   |                            |          |           |
| 3   | Study of logic gates : AND, OR, EXOR and NOT.   |          |   |   |                            |          |           |
| 4   | Generation of Clock Signals.  |          |   |   |                            |          |           |
| 5   | Soldering practice – Components Devices and Circuits – Using general purpose PCB.   |          |   |   |                            |          |           |
| 6   | Measurement of ripple factor of Half-wave and Full-wave Rectifiers.   |          |   |   |                            |          |           |
|   |   |          |   |   | <b>Total Contact Hours</b> | <b>:</b> | <b>30</b> |
| <b>Course Outcomes:</b>                                   |   |          |   |   |                            |          |           |
| On completion of the course, the students will be able to |   |          |   |   |                            |          |           |
| •   | fabricate the basic electrical circuits   |          |   |   |                            |          |           |
| •   | implement the house wiring circuits   |          |   |   |                            |          |           |
| •   | fabricate the electronic circuits   |          |   |   |                            |          |           |
| •   | verify the truth table of logic gates   |          |   |   |                            |          |           |
| •   | design the Half-wave and Full-wave Rectifiers using diodes and passive components   |          |   |   |                            |          |           |
| <b>SUGGESTED EVALUATION METHODS</b>                       |   |          |   |   |                            |          |           |
| •   | Experiment based Viva   |          |   |   |                            |          |           |
| <b>REFERENCE</b>  |   |          |   |   |                            |          |           |

|   |  |
|---|--|
| 1 | Bawa H.S., “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, 2007.   |
| 2 | Jeyachandran K., Natarajan S. & Balasubramanian S., “A Primer on Engineering Practices Laboratory”, Anuradha Publications, 2007. |
| 3 | Jeyapoovan T., Saravanapandian M. &Pranitha S., “Engineering Practices Lab Manual”,Vikas Publishing House Pvt.Ltd, 2006.         |
| 4 | Rajendra Prasad A. &Sarma P.M.M.S., “Workshop Practice”, SreeSai Publication, 2002.  |

**Lab Equipment Required:**

| S. | Name of the Equipment   | Quantity Required |
|----|---|-------------------|
| 1  | Residential house wiring using switches, fuse, indicator, lamp and energy | 3 Nos             |
| 2  | Fluorescent lamp wiring.  | 3 Nos             |
| 3  | Stair case wiring   | 3 Nos             |
| 4  | Measurement of electrical quantities – voltage, current, power & power    | 2 Nos             |
| 5  | Study purpose items: Iron box, Ceiling fan.                               | 2 each            |
| 6  | Megger (250V/500V)  | 2 Nos.            |
| 7  | Soldering guns  | 10 Nos.           |
| 8  | Assorted electronic components for making circuits                        | 50 Nos.           |
| 9  | Small PCBs  | 10 Nos.           |
| 10 | Multimeters   | 10 Nos.           |
| 11 | Digital trainer kit   | 5 Nos.            |
| 12 | CRO   | 8 Nos.            |
| 13 | Transformer   | 8 Nos.            |
| 14 | Function Generator  | 8 Nos.            |

| COs/POs&PSOs | PO1 | PO2 | PO3  | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|--------------|-----|-----|------|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO 1         | 3   | 3   | 3    | 2   | -   | -   | 2   | -   | 3   | 2    | -    | 3    |      |      |      |
| CO 2         | 3   | 3   | 2    | 2   | -   | -   | 2   | -   | 3   | 2    | -    | 3    |      |      |      |
| CO 3         | 3   | 3   | 3    | 2   | -   | -   | 2   | -   | 3   | 2    | -    | 3    |      |      |      |
| CO 4         | 3   | 3   | 3    | 2   | -   | -   |     | -   | 3   | 2    | -    | 3    |      |      |      |
| CO 5         | 3   | 3   | 3    | 2   | -   | -   |     | -   | 3   | 2    | -    | 3    |      |      |      |
| Average      | 3   | 3   | 2.67 | 2   | -   | -   | 2   | -   | 3   | 2    | -    | 3    |      |      |      |

| Subject Code   | Subject Name (Theory course)             | Category | L | T | P | C |
|--|--|----------|---|---|---|---|
| MC23111  | Indian Constitution and Freedom Movement | MC       | 3 | 0 | 0 | 0 |
| Common to all branches of B.E/B. Tech Programmes – First / Second/third Semester |  |          |   |   |   |   |

| Objectives:   |
|---|
| • To apprehend the sacrifices made by the freedom fighters.               |
| • To inculcate the values enshrined in the Indian constitution.           |
| • To instil a sense of responsibility as the citizens of India.           |
| • To familiarise about the functions of the various levels of Government. |
| • To be informed about Constitutional and Non- Constitutional bodies.     |

|   |  |   |
|---|--|---|
| <b>UNIT-I</b>   | <b>INDIAN FREEDOM MOVEMENT</b>                                   | 9 |
| British Colonialism in India-Colonial administration till 1857- Revolt of 1857- Early Resistance to British Rule-Rise of Nationalism in India- <b>Indian Freedom Struggle under Mahatma Gandhi</b> -Non- Cooperation Movement-Civil Disobedience Movement- Quit India Movement-British Official response to National movement- Independence of India Act 1947-Freedom and Partition.  |  |   |
| <b>UNIT-II</b>  | <b>CONSTITUTION OF INDIA</b>                                     | 9 |
| Historical Background – Indian Constitution: Constitution’ meaning of the term, Sources and constitutional history, Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.  |  |   |
| <b>UNIT-III</b>   | <b>STRUCTURE AND FUNCTIONS OF CENTRAL GOVERNMENT</b>             | 9 |
| Union Government – Structure of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.   |  |   |
| <b>UNIT-IV</b>  | <b>STRUCTURE AND FUNCTION OF STATE GOVERNMENT AND LOCAL BODY</b> | 9 |
| State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts- Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati Raj: Introduction, Elected officials and their roles, Village level: Role of Elected and Appointed officials. |  |   |
| <b>UNIT-V</b>   | <b>CONSTITUTIONAL FUNCTIONS AND BODIES</b>                       | 9 |
| Indian Federal System – Centre – State Relations – President’s Rule – Constitutional Functionaries – Assessment of working of the Parliamentary System in India- CAG, Election Commission, UPSC, GST Council and other Constitutional bodies-. NITI Aayog, Lokpal, National Development Council and other Non –Constitutional bodies.   |  |   |
| <b>Total Contact Hours: 45</b>  |  |   |

| Course Outcomes: Upon completion of the course, students will be able to:  |
|--|
| • appreciate the sacrifices made by freedom fighters during freedom movement.                                      |
| • be responsible citizens and abide by the rules of the Indian constitution.                                       |
| • be aware of the functions of the Indian government.  |
| • be knowledgeable about the functions of the state Government and the Local bodies.                               |
| • apply the knowledge on constitutional functions and role of constitutional bodies and non-constitutional bodies. |

| SUGGESTED ACTIVITIES   |
|--|
| • Famous speeches from around the world relating to independence     |
| • Case study   |
| • Quiz on Portfolio and Cabinet                                      |
| • Discussions on International Associations like the UN, BRICS, QUAD |
| • Presentation on issues around the world                            |

**SUGGESTED EVALUATION METHODS**

- Assignment topics
- Quizzes
- Class Presentation/Discussion
- Continuous assessments (CAT)

**Text Book(s):**

8. M. Laxmikanth , “Indian Polity:, McGraw-Hill, New Delhi.
9. Durga Das Basu, “Introduction to the Constitution of India “, Lexis Nexis, New Delhi. 21<sup>st</sup>ed 2013.
10. P K Agarwal and K N Chaturvedi ,PrabhatPrakashan, New Delhi, 1<sup>st</sup>ed , 2017.

**Reference Books(s) / Web links:**

1. Sharma, Brij Kishore, “Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, “Indian Political System “, New Academic Publishing House, Jalaendhar
3. Bipan Chandra, India’s Struggle for Independence, Penguin Books, 2016.
4. Maciver and Page, “Society: An Introduction Analysis “, Mac Milan India Ltd., New Delhi.2<sup>nd</sup>ed, 2014.
5. Bipan Chandra, History of Modern India, Orient Black Swan, 2009.