Department of Applied Electronics and Instrumentation Engineering

➢ **Vision of the department:**
The Vision of the department is to create Electronics & Instrumentation engineers with outstanding technical competency acceptable worldwide to impart research aptitude for societal benefit.

➢ **Mission of the Department:**
- To provide high quality Technical education and Training in response to the changing needs of industries and Society through an innovative learning process related to Electronics and Instrumentation Engineering.
- To develop employable and competent Electronics and Instrumentation engineers with high academic credentials and to inspire them to take up higher studies and research.
- To contribute towards the betterment of society by imparting practical skills and technical knowledge to the students.
- To make Engineers with high professional ethics, social and human values and responsive to community needs.

➢ **Program Educational Objectives (PEOs):**

- **PEO1:** Graduates of AEIE program will be able to incorporate their knowledge to excel in professional career and also use the fundamental knowledge to enhance the power of invention, innovation & entrepreneurship.

- **PEO2:** Graduates of AEIE program will have strong foundation in mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze engineering problems related to industry and research through lifelong learning.

- **PEO3:** Graduates of AEIE program will be able to inculcate the professional and ethical code of conduct, communication skills, and team work so as to use technology for the progress to the society.
Program Outcomes (PO)

Engineering Graduates will be able to:

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 modeling 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 (PSOs):**

**PSO 1**

Ability to explore the design, installation & operation of the basic instrumentation systems used in industrial environments

**PSO2**

Ability to use scientific & engineering fundamentals, skills & tools to formulate, solve & analyze instrumentation problems related to industry & research.
Curriculum:

<table>
<thead>
<tr>
<th></th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours /Week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M 101</td>
<td>Mathematics -I</td>
<td>L:3 T:1 P:0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>CH 101/PH 101</td>
<td>Chemistry (Gr. A) / Physics - I(Gr. B)</td>
<td>L:3 T:1 P:0</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>EE 101/EC 101</td>
<td>Basic Electrical Engineering (Gr. A) / Basic Electronics Engineering (Gr. B)</td>
<td>L:3 T:1 P:0</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>HU 101</td>
<td>Communicative English</td>
<td>L:2 T:0 P:0</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>ME 101</td>
<td>Engineering Mechanics</td>
<td>L:3 T:1 P:0</td>
<td>4</td>
</tr>
</tbody>
</table>

Total no. of Theory: 18

<table>
<thead>
<tr>
<th></th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours /Week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>HU191</td>
<td>Language Lab and Seminar Presentation</td>
<td>L:0 T:0 P:2</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>CH 191/PH 191</td>
<td>Chemistry Lab (Gr. A) / Physics - I Lab(Gr. B)</td>
<td>L:0 T:0 P:3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>EE 191/EC 191</td>
<td>Basic Electrical Engineering Lab (Gr. A) /Basic Electronics Engineering Lab(Gr. B)</td>
<td>L:0 T:0 P:3</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>ME 191/ME 192</td>
<td>Engineering Drawing &amp; Graphics(Gr A)/ Workshop Practice (Gr-B)</td>
<td>L:0 T:0 P:3</td>
<td>2</td>
</tr>
</tbody>
</table>

C. SESSIONAL

<table>
<thead>
<tr>
<th></th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours /Week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>XC181</td>
<td>Extra Curricular Activity (NSS/ NCC)</td>
<td>L:0 T:0 P:2</td>
<td>2</td>
</tr>
</tbody>
</table>

Total no. of Practical & Sessional: 13
# Curriculum

## Theory

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours /Week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M 201</td>
<td>Mathematics -II</td>
<td>3 1 0 4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>CH 201/PH 201</td>
<td>Chemistry (Gr. B) / Physics - I(Gr. A)</td>
<td>3 1 0 4</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>EE 201/EC 201</td>
<td>Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)</td>
<td>3 1 0 4</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>CS 201</td>
<td>Computer Fundamentals &amp; Principle of Computer Programming</td>
<td>3 1 0 4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>ME 201</td>
<td>Engineering Thermodynamics &amp; Fluid Mechanics</td>
<td>3 1 0 4</td>
<td>4</td>
</tr>
</tbody>
</table>

Total of Theory: 20 20

## Practical

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>CS 291</td>
<td>Computer Fundamentals &amp; Principle of Computer Programming Lab</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>CH 291/PH 291</td>
<td>Chemistry Lab (Gr. B) / Physics -I Lab(Gr. A)</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>EE 291/EC 291</td>
<td>Basic Electrical Engineering Lab (Gr. B) /Basic Electronics Engineering Lab(Gr. A)</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>ME 291/ME 292</td>
<td>Engg Drawing &amp; Graphics(Gr B)/ Workshop Practice (Gr- A)</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
</tbody>
</table>

Total of Practical: 12 08

## C.Sessional

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>MC 281</td>
<td>Soft Skill Development</td>
<td>0 0 2 2</td>
<td>0</td>
</tr>
</tbody>
</table>
# 2nd Year, 3rd SEMESTER

## A. THEORY:

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>BS M 301</td>
<td>Mathematics – III</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>BS M(CS) 301</td>
<td>Numerical Methods</td>
<td>3 0 0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>PC EI 301</td>
<td>Analog Electronic Circuits</td>
<td>3 0 0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>PC EI 302</td>
<td>Digital Electronic Circuits</td>
<td>3 0 0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>PC EI 303</td>
<td>Circuit Theory and Networks</td>
<td>3 1 0</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>PC EI 304</td>
<td>Electrical &amp; Electronic Measurement &amp; Instrumentation</td>
<td>3 1 0</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Theory: 21 21

## B. PRACTICAL:

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>BS M(CS)391</td>
<td>Numerical Methods Lab</td>
<td>0 0 3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>PC EI 391</td>
<td>Analog Electronic Circuits Lab</td>
<td>0 0 3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>PC EI 392</td>
<td>Digital Electronic Circuits Lab</td>
<td>0 0 3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>PC EI 393</td>
<td>Circuits and Networks Lab</td>
<td>0 0 3</td>
<td>3</td>
</tr>
</tbody>
</table>

Sessional:

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>MC MC381</td>
<td>Technical Skill development-I</td>
<td>2 0 0</td>
<td>2</td>
</tr>
</tbody>
</table>

Total practical: 14 8

Total 3rd Semester: 35 29
### Proposed Curriculum for Autonomy Syllabus B.Tech (EIE)

#### 2nd Year: 4th SEMESTER

**A: THEORY:**

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>BS</td>
<td>PH 401 Physics – II</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>PC</td>
<td>EI 401 Sensors and Transducers</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>PC</td>
<td>EI 402 Microprocessors and Microcontrollers</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>PC</td>
<td>EI 403 Electromagnetic Theory and Transmission Line</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>PC</td>
<td>EI 404 Signals &amp; Systems</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total Theory</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

**B: PRACTICAL & SESSIONAL:**

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>BS</td>
<td>PH 491 Physics –II Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>PC</td>
<td>EI 491 Sensors and Transducers Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>PC</td>
<td>EI 492 Microprocessor and Microcontrollers Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>PC</td>
<td>EI 493 Electrical &amp; Electronic Measurement &amp; Instrumentation Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sessional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>HU</td>
<td>HU 481 Technical report writing &amp; language practice laboratory</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total practical</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total 4th semester</td>
<td>29</td>
<td>24</td>
</tr>
</tbody>
</table>
### A. THEORY:

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HS</td>
<td>HU501</td>
<td>Environmental Science</td>
<td>2 0 0 2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>PC</td>
<td>EI 501</td>
<td>Industrial Instrumentation</td>
<td>3 0 0 3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>PC</td>
<td>EI 502</td>
<td>Analog &amp; Digital Communication Theory</td>
<td>3 0 0 3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>PC</td>
<td>EI 503</td>
<td>Control Engineering</td>
<td>3 0 0 3</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>PE</td>
<td>EI 504A/ EI 504B/ EI 504C</td>
<td>Digital Signal Processing/ RF &amp; Microwave Engineering/ Antenna Theory &amp; Propagation</td>
<td>3 0 0 3</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Theory: 14 14

### B. PRACTICAL & SESSIONAL:

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PC</td>
<td>EI 591</td>
<td>Industrial Instrumentation Lab</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>PC</td>
<td>EI 592</td>
<td>Analog &amp; Digital Communication Lab</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>PC</td>
<td>EI 593</td>
<td>Control Engineering Lab</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>PE</td>
<td>EI 594A/ EI 594B</td>
<td>Digital Signal Processing Lab / RF &amp; Microwave Engineering Lab/ Antenna &amp; Propagation Lab</td>
<td>0 0 3 3</td>
<td>3</td>
</tr>
</tbody>
</table>

Sessional:

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>MC</td>
<td>MC581</td>
<td>Technical Skill development-II</td>
<td>2 0 0 2</td>
<td>0</td>
</tr>
</tbody>
</table>

Total practical: 14 8

Total 5th Semester: 28 22
### Proposed Curriculum for Autonomy Syllabus B.Tech (EIE)

#### 3rd Year: 6th SEMESTER

**A: THEORY:**

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>PC</td>
<td>EI 601</td>
<td>Process Control-I</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>PC</td>
<td>EI 602</td>
<td>Bio Medical Instrumentation</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>PE</td>
<td>EI 603A / EI 603B / EI 603C</td>
<td>Power Electronics / Industrial Drives/ Advanced Sensors</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>PE</td>
<td>EI 604A / EI 604B</td>
<td>Optoelectronics &amp; Fibre Optic Sensors/ Soft Computing</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>OE</td>
<td>EI 605A / EI 605B / EI 605C</td>
<td>Data Structures &amp; Algorithms / Database Management System / Software Engineering(IT)</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total Theory**

15  15

**B. PRACTICAL:**

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>PC</td>
<td>EI 691</td>
<td>Process Control Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>PE</td>
<td>EI 693A / EI 693B / EI 693C</td>
<td>Power Electronics Lab / Industrial Drives Lab/ Advanced Sensors Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>OE</td>
<td>EI 695A / EI 695B / EI 695C</td>
<td>Data Structures &amp; Algorithms Lab / Database Management System Lab / Software Engineering Lab</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Sessional:**

4        | EI 681 | GD & Seminar | 0  | 0  | 3  | 3     | 3               |
5        | EI 682 | Mini Project | 0  | 0  | 3  | 3     | 3               |

**Total practical**

15  12

**Total 6th semester**

30  27
Proposed Curriculum for Autonomy Syllabus B.Tech (EIE)

4th Year: 7th SEMESTER

A.THEORY:

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>HS</td>
<td>HU702</td>
<td>Values &amp; Ethics</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>PC</td>
<td>EI 701</td>
<td>Telemetry and Remote Control</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>PC</td>
<td>EI 702</td>
<td>Process Control-II</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>PE</td>
<td>EI703A/</td>
<td>Digital Image Processing/ Non-Conventional Energy</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EI703B/</td>
<td>Sources/ Analytical Instrumentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EI703C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>OE</td>
<td>EI704A /</td>
<td>Computer Networking/ Multimedia/ Object Oriented</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EI704B /</td>
<td>Programming</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EI704C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total Theory</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

B. PRACTICAL & SESSIONAL:

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>PC</td>
<td>EI 791</td>
<td>Telemetry and Remote Control Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>OE</td>
<td>EI794A/EI794B/EI794C</td>
<td>Computer Networking Lab/ Multimedia Lab / Object Oriented Programming Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>EI 793</td>
<td>Project-1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>EI 781</td>
<td>Industrial Training Evaluation</td>
<td>4 wks during 6th -7th Sem-break</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>MC</td>
<td>MC781</td>
<td>Foreign Language</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total practical and sessional</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 7th Semester</td>
<td>28</td>
<td>22</td>
</tr>
</tbody>
</table>
### Proposed Curriculum for Autonomy Syllabus B.Tech (EIE)

**4th Year: 8th SEMESTER**

#### A. THEORY:

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HS</td>
<td>HU804</td>
<td>Industrial &amp; Financial Management</td>
<td>2 0 0 2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>PE</td>
<td>EI801A/</td>
<td>Plant Automation/ Embedded System Design/ Virtual Instrumentation</td>
<td>3 0 0 3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EI801B/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EI801C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PE</td>
<td>EI802A/</td>
<td>Mobile Communication/ VLSI &amp; Microelectronics/ Mechatronics</td>
<td>3 0 0 3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EI802B/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EI802C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Theory: 8 8

#### B. PRACTICAL & SESSIONAL:

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PC</td>
<td>EI891</td>
<td>Instrumentation &amp; Control Lab</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>EI892</td>
<td>Project-2</td>
<td>0 0 12 12</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>EI893</td>
<td>General Viva-voce</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Total sessional: 15 12

Total 8th semester: 23 20

Total Credit of the course: 198

---

### Total Credit

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Year</th>
<th>Semester</th>
<th>Total Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Theory</td>
</tr>
<tr>
<td>1</td>
<td>1st</td>
<td>1st</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>1st</td>
<td>2nd</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total (1st Year)</strong>= 54</td>
</tr>
<tr>
<td>3</td>
<td>2nd</td>
<td>3rd</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>2nd</td>
<td>4th</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>3rd</td>
<td>5th</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>3rd</td>
<td>6th</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>4th</td>
<td>7th</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>4th</td>
<td>8th</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>87/</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total (2nd-4th Year)</strong>= 144</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total (1st -4th Year)</strong>= 125</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Grand Total (AICTE Norm)</strong>= 198</td>
</tr>
</tbody>
</table>

---
### Proposed Curriculum for Autonomy Syllabus B.Tech (EIE)

#### 1st Year-4th Year Credit Calculation

<table>
<thead>
<tr>
<th>Field</th>
<th>HS</th>
<th>BS</th>
<th>ES</th>
<th>PC</th>
<th>PE</th>
<th>OE</th>
<th>Projects/Seminar etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit</td>
<td>11</td>
<td>34</td>
<td>30</td>
<td>71</td>
<td>22</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>% of Credit Coverage</td>
<td>5.55</td>
<td>17.17</td>
<td>15.15</td>
<td>35.85</td>
<td>11.11</td>
<td>5.05</td>
<td>10.10</td>
</tr>
<tr>
<td>AICTE Norms</td>
<td>5-10%</td>
<td>15-20%</td>
<td>15-20%</td>
<td>30-40%</td>
<td>10-15%</td>
<td>5-10%</td>
<td>10 to 15%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HS</th>
<th>Humanities and Social Sciences</th>
<th>PC</th>
<th>Professional -Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>Basic Sciences</td>
<td>PE</td>
<td>Professional -Electives</td>
</tr>
<tr>
<td>ES</td>
<td>Engineering Sciences</td>
<td>OE</td>
<td>Open Electives</td>
</tr>
</tbody>
</table>

Signature of the Head of the Department
Applied Electronics and Instrumentation Engineering
Autonomy Curriculum and Syllabus of B.Tech Programme
Implemented from the Academic Year 2016

First Year First Semester

Group A: ECE, EE, BME, AEIE/EIE

Group B: CSE, IT, FT, ME, CE

Curriculum:

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours /Week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>M 101</td>
<td>Mathematics -I</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>CH 101/PH 101</td>
<td>Chemistry (Gr. A) / Physics - I(Gr. B)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>EE 101/EC 101</td>
<td>Basic Electrical Engineering (Gr. A) / Basic Electronics Engineering (Gr. B)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>HU 101</td>
<td>Communicative English</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>ME 101</td>
<td>Engineering Mechanics</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Total no. of Theory 18 18

PRACTICAL

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours /Week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>HU191</td>
<td>Language Lab and Seminar Presentation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>CH 191/PH 191</td>
<td>Chemistry Lab (Gr. A) / Physics -I Lab(Gr. B)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>EE 191/EC 191</td>
<td>Basic Electrical Engineering Lab (Gr. A) /Basic Electronics Engineering Lab(Gr. B)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>ME 191/ME 192</td>
<td>Engineering Drawing &amp; Graphics(Gr A)/ Workshop Practice (Gr-B)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

C. SESSIONAL

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours /Week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>XC181</td>
<td>Extra Curricular Activity (NSS/ NCC)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Total no. of Practical & Sessional 13 08
Syllabus:

Theory

Paper Name: Mathematics –I
Paper Code: M101
Total Contact Hours:  40
Credit: 4

Prerequisite: Any introductory course on matrix algebra, calculus, geometry.

Course Objective: The purpose of this course is to provide fundamental concepts matrix algebra, Calculus of Single and Several Variables and Vector Analysis.

Course outcome:

On successful completion of the learning sessions of the course, the learner will be able to:

M 101.1: Recall the distinctive characteristics of Matrix Algebra, Calculus of Single and Several Variables and Vector Analysis.

M 101.2: Understand the theoretical concept of Matrix Algebra, Calculus of Single and Several Variables and Vector Analysis.

M 101.3: Apply the principles of Matrix Algebra, Calculus of Single and Several Variables and Vector Analysis to solve various problems.

Course contents:

MODULE I [10L]
Matrix Algebra: Elementary row and column operations on a matrix, Rank of matrix, Normal form, Inverse of a matrix using elementary operations, Consistency and solutions of systems of linear equations using elementary operations, Linear dependence and independence of vectors, Concept & Properties of different matrices (unitary, orthogonal, symmetric, skew-symmetric, hermitian, skew-hermitian), Eigen values and Eigen vectors of a square matrix (of order 2 or 3), Characteristic polynomials, Caley-Hamilton theorem and its applications, Reduction to diagonal form (upto 3rd order).

MODULE II [10L]
Calculus-I (Functions of single variable): Rolle’s theorem, Mean value theorem- Lagrange & Cauchy, Taylor’s and Maclaurin’s theorems, Expansion of simple functions by Taylor’s and Maclaurin’s Theorems, Fundamental theorem of integral calculus, Evaluation of plane areas, volume and surface area of a solid of revolution and lengths, Convergence of Improper integrals, Beta and Gamma Integrals - Elementary properties and the Inter relations.

MODULE III [12L]
Calculus-II (Functions of several variables): Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives, Total Differentiation, Derivatives of composite and implicit functions, Euler's theorem on homogeneous functions, Chain rule, Maxima and minima of functions of two variables – Lagrange’s method of Multipliers, Change of variables-Jacobians (up to three variables), Double and triple integrals.
MODULE IV [8L]


Text Books:

Reference Books:

CO-PO mapping:

<table>
<thead>
<tr>
<th></th>
<th>PO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 101.1</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>M 101.2</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>M 101.3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
Paper Name: Chemistry
Paper Code: CH 101
Total Contact Hours: 40
Credit: 4

Pre requisites: 10+2 science with chemistry

Course Objective
Understanding of the fundamental theories and applications of thermodynamics, electrochemical principles in modern electrochemical cells and to get an insight into electronic structure of crystals and nanomaterials. Learning about the Synthesis, properties and applications of polymers, fuels and alternative energy sources & their significance in petrochemical industries. Analyzing water quality for its various parameters & its significance in industries.

Course Outcome
CH101.1: Able to apply fundamental concepts of thermodynamics in different engineering applications.
CH101.2: Able to analyze & design simple and technologically advanced electrical and energy storage devices.
CH101.3: Able to synthesize nanomaterials, composites, polymers.
CH101.4: Able to apply the basic concept of Organic Chemistry and knowledge of chemical reactions to industries, and technical fields.
CH101.5: Able to apply the knowledge of different fuels and corrosion to different industries
CH101.6: Able to analyse water quality parameter for its various parameters & its significance in industries.

Course contents
Module 1 [8L]

Chemical Thermodynamics –I
1.1 Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.
Introduction to first law of thermodynamics: Different statements, mathematical form.
Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas.

1.2 Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas.
Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier and Laplace, Hess’s law of constant heat summation.

1.3 2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature (brief).
Evaluation of entropy: characteristics and expression, physical significance. Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA
and $\Delta G$ for ideal gas, standard free energy and chemical potential, Condition of spontaneity and equilibrium reaction.

**Module 2 [7L]**

2.1 Reaction Dynamics
Reactions laws: rate and order; molecularity; zero and first order kinetics, second order kinetics (same reactant concentration), Pseudounimolecular reaction, Arrhenius equation. 3L

**Mechanism and theories of reaction rates** (Content beyond the syllabus)

2.2 Solid state Chemistry
Introduction to stoichiometric defects (Schottky & Frenkel) and non–stoichiometric defects (Metal excess and metal deficiency).
Role of silicon and germanium in the field of semiconductor, n-type, p-type semiconductor, photo voltaic cell, fabrication of integrated circuits. 4L

**Module 3 [8L]**

Electrochemistry

3.1 Conductance
Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte). 1L

3.2 Electrochemical cell
Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, calomel half cell (representation, cell reaction, expression of potential, Discussion, Application). 3L

3.3 Concept of battery
Battery and Commercial electrochemical cell: Dry cell, acid storage cell, alkaline storage cell, fuel cell (construction, representation, cell reaction, expression of potential, discussion, application). 2L

3.4 Corrosion and its control
Introduction, cause and effect of corrosion, types of corrosion: dry, wet and other: Electrochemical corrosion, galvanic corrosion, passivation and protective measure. 2L

**Module 4 [12L]**

4.1 Structure and reactivity of Organic molecule
Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals. Brief study of some addition, eliminations and substitution reactions. 3L

4.2 Polymers
Concepts, classifications and industrial applications. Polymer molecular weight (number avg. weight avg.; Theory and mathematical expression only), Poly dispersity index (PDI).
Polymerization processes: addition and condensation polymerization (mechanism not required), degree of polymerization, Copolymerization, stereo-regularity of polymer, crystallinity (concept of Tm) and amorphicity (Concept of Tg) of polymer.
Preparation, structure and use of some common polymers: plastic (HDPE, LDPE, PVC, PP, PMMA, Polyester, PTFE, Bakelite), rubber (natural rubber, SBR), fibre (nylon 6, nylon 6,6), Vulcanization of rubber, Conducting polymers and bio-polymers. 7L

4.3 Nano material
Basic principles of nano science and technology, classification, preparation, properties and application of nano material. 2L

**Module 5 [5L]**

5.1 Industrial Chemistry
Fuels
Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC), Proximate analysis of coal, Calorific value.
Liquid fuel: Petroleum, classification of petroleum, Refining, Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Biodiesel.
Gaseous fuels: Natural gas, water gas, Coal gas, bio gas, CNG, LPG

5.2 Water
Introduction, source of water, water quality parameter, specification for drinking water (BIS and WHO standards), Chlorination of Water, Types of hardness- Units, Brief Softening methods.

Short overview of water treatment plants (Content beyond the syllabus)

Reference Books
1. Engineering Chemistry: Bandyopadhyay and Hazra
2. Physical Chemistry: P.C. Rakshit

CO-PO mapping:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH101.1</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CH101.2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CH101.3</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>CH101.4</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CH101.5</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>CH101.6</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
## Course Objective

The aim of courses in Physics is to provide an adequate exposure and develop insight about the basic physics principles along with the possible applications. The acquaintance of basic principles of physics would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches. It can also create awareness of the vital role played by science and engineering in the development of new technologies. It also gives necessary exposure to the practical aspects, which is an essential component for learning sciences.

### Course Outcome

At the end of the course students’ should have the

<table>
<thead>
<tr>
<th>PH 101.1 : Ability to state and recall</th>
<th>PO1</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ De-Broglie hypothesis, and Heisenberg’s Uncertainty Principle</td>
<td></td>
</tr>
<tr>
<td>➢ Amplitude and Velocity Resonance</td>
<td></td>
</tr>
<tr>
<td>➢ Malus’s Law, Brewster’s Law</td>
<td></td>
</tr>
<tr>
<td>➢ Characteristics of LASER light</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PH 101.2 : Ability to understand and explain</th>
<th>PO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Polarizer and analyzer</td>
<td></td>
</tr>
<tr>
<td>➢ basic principles and different types of LASER and Optical Fibre</td>
<td></td>
</tr>
<tr>
<td>➢ structure of solids, Miller indices</td>
<td></td>
</tr>
<tr>
<td>➢ theory of Matter Wave, equation of motion of Matter Wave</td>
<td></td>
</tr>
<tr>
<td>➢ wave function and its role in representing wave nature of matter</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PH 101.3 : Ability to apply the knowledge of</th>
<th>PO3</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ mechanical vibration in electrical circuits</td>
<td></td>
</tr>
<tr>
<td>➢ superposition principle in Newton’s ring phenomenon, diffraction phenomenon</td>
<td></td>
</tr>
<tr>
<td>➢ quantum nature of e.m. waves for production of laser</td>
<td></td>
</tr>
<tr>
<td>➢ total internal reflection in transmitting light through optical fibres</td>
<td></td>
</tr>
<tr>
<td>➢ x-ray diffraction in crystal structure</td>
<td></td>
</tr>
<tr>
<td>➢ probability interpretation in Heisenberg’s uncertainty principle</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PH 101.4 : Ability to analyze</th>
<th>PO2</th>
</tr>
</thead>
</table>

### Pre requisites

Knowledge of Physics upto 12th standard.
Course contents

Module 1 (8L):-

Oscillations
1.1 Simple harmonic motion: Concepts with examples, Superposition of SHMs in two mutually perpendicular directions: Lissajous’ figures, Engineering Applications and related Numerical problems 2L

1.2 Damped vibration: Differential equation and its solution, Logarithmic decrement, quality factor, Engineering Applications and related Numerical problems. 3L

1.3 Forced vibration: Differential equation and solution, Amplitude and Velocity resonance, Sharpness of resonance, relevant applications including LCR circuits, Numerical problems 3L

Module 2 (10L):-

Classical Optics:
2.1 Interference of light: Wave nature of light (Huygen’s principle), Conditions of sustained interference double slit as an example; qualitative idea of spatial and temporal coherence, conservation of energy and intensity distribution; Newton’s ring (qualitative descriptions of working principles and procedures-no deduction required). Engineering applications, Numerical Problems. 3L

Fresnel’s biprism (beyond the syllabus). 1L(ext)

2.2 Diffraction of light: Fresnel and Fraunhofer class, Fraunhofer diffraction for plane transmission grating (elementary treatment of intensity distribution for N-slits), single slit and double slits as examples, missing order, Rayleigh criterion, resolving power of grating and microscope (Definition and formula; no deduction required). Engineering Applications, Numerical Problems. 4L

2.3 Polarization: Definition, plane of polarization, plane of vibration, Malus law, fundamental concepts of plane, circular and elliptical polarizations (only qualitative idea) with examples, Brewster’s law, Double refraction: ordinary and extraordinary rays, Nicol’s prism, Engineering applications, Numerical problems. 3L
Module 3 (9L):
Quantum Physics:

3.1 Quantum Theory: Inadequacy of classical physics; Planck’s quantum hypothesis-Qualitative (without deductions), particle concept of electromagnetic wave (example: photoelectric and Compton effect; qualitative discussions only), wave particle duality; phase velocity and group velocity; de Broglie wave; Davisson and Germer experiment. 4L

3.2 Quantum Mechanics 1: Concept of wave function, Physical significance of wave function, Probability interpretation; wave function normalization condition and its simple numerical applications; uncertainty principle-applications, Schrödinger equation (no mathematical derivation). 4L

Module 4 (6L):
X-ray & Crystallography

4.1 X-rays – Origin of Characteristic and Continuous X-ray, Bragg’s law (No derivation), Determination of lattice constant, Applications, Numerical problems. 2L

4.2 Elementary ideas of crystal structure - lattice, basis, unit cell, Fundamental types of lattices – Bravais lattice, Simple cubic, fcc and bcc, hcp lattices, (use of models in the class during teaching is desirable) Miller indices and miller planes, Co-ordination number and Atomic packing factor, Applications, Numerical problems. 4L

Module 5 (8L):
Modern Optics-I:

5.1 Laser: Concepts of various emission and absorption process, working principle of laser, metastable state, Population Inversion, condition necessary for active laser action, optical resonator, ruby laser, He-Ne laser, semiconductor laser, Einstein A and B coefficients and equations, industrial and medical applications of laser. 5L

5.2 Fibre optics and Applications: Principle and propagation of light in optical fibres- Numerical aperture and Acceptance angle, V number, Types of optical fibres (material, refractive index, mode), Losses in optical fibre- attenuation, dispersion, bending, Numerical problems. 3L

Recommended Text Books for Physics I (PH101/201):

Oscillations:
2. Classical Mechanics-Shrivastav
3. Classical Mechanics-Takwal & Puranik (TMH)
4. Sound-N. K. Bajaj (TMH)
5. Advanced Acoustics-D. P. Roy Chowdhury (Chayan Publisher)
6. Principles of Acoustics-B.Ghosh (Sridhar Publisher)
7. A text book of sound-M. Ghosh ( S. Chand publishers)
8. Electricity Magnetism-Chattopadhyay & Rakshit (New Central Book Agency)
10. R.P. Singh (Physics of Oscillations and Waves)
11. A.B. Gupta (College Physics Vol. II)
12. Chattopadhyay and Rakshit (Vibration, Waves and Acoustics)

Classical Optics & Modern Optics-I:
15. Modern Optics-A. B. Gupta (Book & Allied Publisher)
16. Optics-Ajay Ghatak (TMH)
17. Optics-Hecht
19. Möler (Physical Optics)
20. E. Hecht (Optics)
21. E. Hecht (Schaum Series)
22. F.A. Jenkins and H.E White
23. C.R. Dasgupta (Degree Physics Vol 3)

Quantum Physics
24. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)
25. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
27. Quantum Mechanics-Binayak Datta Roy (S. Chand Publishers)
28. Quantum Mechanics-Bransden (Pearson Education Ltd.)
29. Perspective of Modern Physics-A. Beiser (TMH)
30. Eisberg & Resnick is published by Wiley India
31. A.K. Ghatak and S Lokenathan
32. E.E. Anderson (Modern Physics)
33. Haliday, Resnick & Krane : Physics Volume 2 is Published by Wiley India
34. Binayak Dutta Roy [Elements of Quantum Mechanics]

X-ray & Crystallography
35. Solid state physics-Puri & Babbar (S. Chand publishers)
36. Materials Science & Engineering-Kakani Kakani
37. Solid state physics- S. O. Pillai
38. Introduction to solid state physics-Kittel (TMH)
40. S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)

General Reference:
2. Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt. Ltd.)
3. Basic Engineering Physics-I -Sujoy Bhattacharya, Saumen Paul (TMH)
4. University Physics-Sears & Zemansky (Addison-Wesley)
5.B. Dutta Roy (Basic Physics)
6. R.K. Kar (Engineering Physics)
7. Mani and Meheta (Modern Physics)
8. Arthur Baiser (Perspective & Concept of Modern Physics)

CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH 101.1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 101.2</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 101.3</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 101.4</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 101.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Basic Electrical Engineering
Paper Code: EE101
Total Contact Hours: 41
Credit: 4

Pre requisite: Basic 12st standard Physics and Mathematics

Course Objective:
Basic electrical engineering is an introductory course in electrical engineering. Students are introduced to simple applied electrical circuits, theories and practice to impart skill set to have visualization of electrical engineering applications. It is a course suitable for students pursuing electrical engineering as well as other related engineering disciplines.

Course Outcomes:
At the end of this course, students will able

EE 101.1: To understand and analyse basic electric and magnetic circuits.
EE 101.2: To understand and analysis the AC single phase and three phase circuit
EE101.3: To understand and analysis of the basic principles of various electrical machines

Course Contents:

DC CIRCUITS (7L)
Definition of electric circuit, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, node, branch, active and passive elements, Kirchhoff’s laws, Source equivalence and conversion, Network Theorems-Superposition Theorem, Thevenin’s Theorem, Norton Theorem, Maximum Power Transfer Theorem, Star-Delta Conversions.

MAGNETIC CIRCUITS (3L)
Concept of Magnetic circuit, B-H curve, Analogous quantities in magnetic and electric circuits, Faraday’s law, iron losses, self and mutual inductance, Energy stored in magnetic field.

AC SINGLE PHASE CIRCUITS (8L)
Sinusoidal quantities, Average and RMS values, peak factor, Form factor, Phase and Phase difference, concept of phasor diagram, V-I Relationship in R,L,C circuit, Combination R,L,C in AC series , parallel and series parallel circuits with phasor diagrams, impedance and admittance, Power factor, Power in AC circuit, Resonance in RLC series and parallel circuit, Q factor, band width of resonant circuit.

THREE PHASE CIRCUITS (3L)
Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters method.

DC MACHINES (6L)
Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Torque Equation ,Speed Torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control).

SINGLE PHASE TRANSFORMER (5L)
Constructional parts, Types of transformers, Emf equation, No Load no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation.

THREE PHASE INDUCTION MOTOR (6L)
Types, Construction, production of rotating field, principle of operation, Slip and Frequency ,rotor emf and current, Equivalent circuit and phasor diagram, Torque Slip characteristics torque-speed characteristics Starting of induction motor by star delta starter and( DOL starter). Speed Control of Three phase induction motor by variation of supply frequency, supply voltage and number of poles.

GENERAL STRUCTURE OF ELECTRICAL POWER SYSTEM (3L)
Power generation to distribution through overhead lines and underground cables with single line diagram, Earthing of Electrical Equipment, Electrical Wiring Practice

Text books
1. V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.
2. Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication
3. Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH
4. C.L. Wadhwa, Basic Electrical Engineering, Pearson Education

Reference books
1. H. Cotton, Willey Press
2. J.B. Gupta, Basic Electrical Engineering, Kataria & Sons .
3. Kothari & Nagrath, Basic Electrical Engineering, TMH

CO-PO mapping:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE101.1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE101.2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE101.3</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Paper Name: Basic Electronics Engineering
Paper code: EC101
Total Contact Hours: 40
Credits: 4

Prerequisites
A basic course in Electronics and Communication Engineering Progresses from the fundamentals of electricity, direct current (DC) devices and circuits, series and parallel circuits to the study of active and passive components, Ohm's Law, Kirchoff's Law i.e. KVL, KCL, Ampere’s Law etc.

Course objectives:
Students will be able to Analyze the behaviour of semiconductor diodes in Forward and Reverse bias. To design a half wave and full wave rectifiers, Explore V-I characteristics of Bipolar Junction Transistor n CB, CE & CC configurations. To acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amps. Students will be able to explain feedback concept and different oscillators. They will also be familiar with the analysis of digital logic basics and measuring Electronic devices. Students will have knowledge about characteristics of FET.

Course Outcomes:

| EC 101.1 | Study PN junction diode, ideal diode, diode models and its circuit analysis, application of diodes and special diodes. |
| EC 101.2 | Learn how operational amplifiers are modeled and analyzed, and to design Op-Amp circuits to perform operations such as integration, differentiation on electronic signals. |
| EC 101.3 | Study the concepts of both positive and negative feedback in electronic circuits. |
| EC 101.4 | Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis. |
| EC 101.5 | Learn how the primitives of Boolean algebra are used to describe the processing of binary signals. |

Course contents

Module-I: Basics of semiconductor 6L
Conductors, Insulators, and Semiconductors- crystal structure, Fermi Dirac function, Fermi level, E-k and Energy band diagrams, valence band, conduction band, and band gap; intrinsic, and extrinsic (p-type and n-type) semiconductors, position of Fermi level in intrinsic and extrinsic semiconductor, drift and diffusion current – expression only (no derivation), mass action law, charge neutrality in semiconductor, Einstein relationship in semiconductor, Numerical problems on- Fermi level, conductivity, mass action law, drift and diffusion current.

Module-II: P-N Junction Diode and its applications 8L
p-n junction formation and depletion region, energy band diagram of p-n junction at equilibrium and barrier energy, built in potential at p-n junction, energy band diagram and current through p-n junction at forward and reverse bias, V-I characteristics and current expression of diode, temperature dependencies of V-I characteristics of diode, p-n junction breakdown – conditions, avalanche and Zener breakdown, Concept of Junction capacitance, Zener diode and characteristics.

Diode half wave and full wave rectifiers circuits and operation (I_{DC}, I_{rms}, V_{dc}, V_{rms}), ripple factor without filter, efficiency, PIV, TUF; Reduction of ac ripples using filter circuit (Qualitative analysis); Design of diode clipper and clamper circuit - explanation with example, application of Zener diode in regulator circuit. Numerical problems.

**Module-III : Bipolar junction transistor (BJT)**

Formation of PNP/NPN Transistors, energy band diagram, current conduction mechanism, CE, CB, CC configurations, transistor static characteristics in CE, CB and CC mode, junction biasing condition for active, saturation and cut-off modes, current gain $\alpha$, $\beta$ and $\gamma$, early effect.

Biasing and bias stability; biasing circuits - fixed bias; voltage divider bias; collector to base bias, D.C. load line and Quiescent point, calculation of stability factors for different biasing circuits.

BJT as an amplifier and as a switch – Graphical analysis; Numerical Problems.

**Module-IV: Field effect transistor (FET)**

Concept of field effect, channel width modulation, Classification of FETs - JFET, MOSFET, operating principle of JFET, drain and transfer characteristics of JFET (n-channel and p-channel), CS, CG, CD configurations, Relation between JFET parameters, FET as an amplifier and as a switch - graphical analysis. E-MOSFET (n-channel and p-channel), D-MOSFET (n-channel and p-channel), Numerical Problems.

**Module-V: Feedback and Operational Amplifier**

Concept of feedback with block diagram, positive and negative feedback, gain with feedback. Feedback topologies, effect of feedback on input and output impedance, distortion, concept of oscillation and Barkhausen criterion.

Operational amplifier – electrical equivalent circuit, ideal characteristics, Non ideal characteristics of op-amp – offset voltages, bias current, offset current, Slew rate, CMRR and bandwidth, Configuration of inverting and non-inverting amplifier using Op-amp, closed loop voltage gain of inverting and non-inverting amplifier, Concept of virtual ground, Applications op-amp – summing amplifier, differential amplifier, voltage follower, basic differentiator and integrator.

Problems on Characteristics of Op-amp, CMRR, slew rate, amplifier and application of Op-amp to be discussed. Any other relevant problems related to topic may be discussed or assigned.

**Module-VI: Cathode Ray Oscilloscope (CRO)**

Operating principle of CRO with block diagram, measurement of voltage, frequency and phase.

**Module-VII: Digital Electronics**

Binary numbers and conversion, Basic Boolean algebra, Logic gates (AND, OR, NOR, NOT, NAND, XOR) and realization of functions.

**Text Books:**

4. Sedra & Smith, Microelectronics Engineering
**Reference Books:**
1. John D. Ryder, Electronic Fundamentals and Applications, PHI

**CO-PO Mapping**

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 101.1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EC 101.2</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>EC 101.3</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EC 101.4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>EC 101.5</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Pre requisites:
Basic knowledge of high school English.

Course Objectives:
Designed to meet the basic survival needs of communication in the globalized workplace, including knowledge of and competency in the use of macro-skills in reading and writing proficiency, functional grammar and usage.

Course Outcomes:
At the end of this course, students will be

HU101.1: Able to comprehend and communicate in English through exposure to communication skills theory and practice.

HU101.2: Apply the basic grammatical skills of the English language through intensive practice.

HU101.3: Able to develop reading and comprehension skills.

HU101.4: Able to develop writing proficiency skills by writing Official Letters, Technical report, memo, notice, minutes, agenda, resume, curriculum vitae.

HU101.5: Able to apply/illustrate all sets of English language and communication skills in creative and effective ways in the professional sphere of their life

Course Content:
The proposed revised syllabus is as follows:

Module 1: Communication: Interface in a Globalized World [5L]

a. Definition of Communication & Scope of Communication
b. Process of Communication—Models and Types
c. Verbal—Non-Verbal Communication, Channels of Communication
d. Barriers to Communication & surmounting them

[to be delivered through case studies involving intercultural communication]

Module 2: Vocabulary and Reading [5L]

a. Word origin—Roots, Prefixes and Suffixes, Word Families, Homonyms and Homophones
b. Antonyms and Synonyms, One-word substitution
c. Reading—Purposes and Skills

d. Reading Sub-Skills—Skimming, Scanning, Intensive Reading

e. Comprehension Practice (Fiction and Non-fictional Prose/Poetry)

Texts:
(i) Isaac Asimov, *I Robot* (—Robbie OR —Little Lost Robot)
(ii) George Orwell, —Shooting an Elephant
(iii) Ruskin Bond, —The Cherry Tree OR —The Night Train at Deoli
(iv) Robert Frost, —Stopping by the Woods on a Snowy Evening.

f. Precis Writing

(Use of daily newspapers for reading practice is recommended)

Module 3: Functional Grammar and Usage [6L]

a. Articles, Prepositions, Verbs

b. Verb-Subject Agreement

c. Comparison of Adjectives

d. Tenses and their Use

e. Transformation of Sentences (Singular-Plural, Active-Passive, Direct-Indirect, Degrees of Comparison)

f. Error Correction

Module 4: Business writing [10L]

a. Business Communication in the Present-day scenario

b. Business Letters (Letters of Inquiry, Sales Letters, Complaint and Adjustment Letters, Job Application Letters)

c. Drafting of a CV and Résumé

d. Memo, Notice, Advertisement, Agenda, Minutes of Meetings

e. E-mails (format, types, jargons, conventions)

**References:**


6. IIT Kanpur, English Language & Communication Skills (ENG 112 C) syllabus.

**CO-PO Mapping:**

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>HU101.1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>HU101.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>HU101.3</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>HU101.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>HU101.5</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Paper Name: Engineering Mechanics
Paper Code: ME101
Total Contacts Hours: 45
Credit: 4

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics.

Course Objective:
1. Understand the vector and scalar representation of forces and moments.
2. Describe static equilibrium of particles and rigid bodies in two dimensions and three dimensions including the effect of Friction
3. Analyze the properties of surfaces & solids in relation to moment of inertia.
4. Illustrate the laws of motion, kinematics of motion and their interrelationship.
5. Study the concepts of engineering mechanics on deformable materials under applied loads.

Course Outcome:
Upon successful completion of the course, student should be able to:

ME 101.1. Construct free body diagram and calculate the reactions necessary to ensure static equilibrium.

ME 101.2. Study the effect of friction in static and dynamic conditions.

ME 101.3. Understand the different surface properties, property of masses and material properties.

ME 101.4. Analyze and solve different problems of kinematics and kinetics.

Course Content:
Module1: Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector).

2L

Introduction to Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami’s theorem; Free vector; Bound vector; Representation of forces in terms of i,j,k; Cross product and Dot product and their applications.

3L+1T

Two dimensional force system; Resolution of forces; Moment; Varignon’s theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces

4L+1T

Module2: Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium.

3L+1T
Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction.

3L+1T

**Module3:** Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadrilateral, composite areas consisting of above figures. 4L+1T

Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone.

3L+1T

Principle of virtual work with simple application. 1L+1T

**Module4:** Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke’s law; Poisson’s ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety. 2L+1T

**Module5:** Introduction to Dynamics: Kinematics and Kinetics; Newton’s laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs. 3L+1T

Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion). 2L+1T

**Module6:** Kinetics of particles: Newton’s second law; Equation of motion; D.Alembert’s principle and free body diagram; Principle of work and energy; Principle of conservation of energy; Power and efficiency. 3L+2T

Books Recommended

4. Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P
CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME101.1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ME101.2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>ME101.3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>ME101.4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

Practical

Paper Name: Lang. Lab. and Seminar Presentation
Paper Code: HU191
Total Contact Hours: 26
Credit: 1

Pre requisites: Basic knowledge of LSRW skills.

Course Objectives: To train the students in acquiring interpersonal communication skills by focusing on skill acquisition techniques and error feedback.

Course Outcome:
HU191.1: Able to understand advanced skills of Technical Communication in English through Language Laboratory.
HU191.2: Able to apply listening, speaking, reading and writing skills in societal and professional life.
HU191.3: Able to demonstrate the skills necessary to be a competent Interpersonal communicator.
HU191.4: Able to analyze communication behaviors.
HU191.5: Able to adapt to multifarious socio-economical and professional arenas with the help of effective communication and interpersonal skills.

Course Contents:

Module 1: Introduction to the Language Lab
a. The Need for a Language Laboratory
b. Tasks in the Lab
c. Writing a Laboratory Note Book

Module 2: Active Listening
a. What is Active Listening?
b. Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note taking
c. Contextualized Examples based on Lab Recordings

Module 3: Speaking
a. Speaking (Choice of words, Speech Syntax, Pronunciation, Intonation)
b. Language Functions/Speech Acts
c. Speaking using Picture Prompts and Audio Visual inputs
d. Conversational Role Plays (including Telephonic Conversation)

Module 4: Lab Project Work
a. Keeping a Listening Log
b. Writing a Film Review/Advertisements

References:
1. IIT Mumbai, *Preparatory Course in English* syllabus
2. IIT Mumbai, *Introduction to Linguistics* syllabus

CO-PO-Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>HU 191.1</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>HU 191.2</td>
<td></td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>HU 191.3</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>HU 191.4</td>
<td></td>
<td>3</td>
<td>2</td>
<td>3</td>
<td></td>
<td>3</td>
<td>2</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>HU 191.5</td>
<td></td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Chemistry Lab
Paper Code: CH 191
Total Contact hour: 36
Credit: 2

Pre requisites: 10+2 science with chemistry

Course Objective

Acquiring knowledge on Standard solutions and the various reactions in homogeneous and heterogeneous medium. Understanding the basic principles of pH meter and conductivity meter for different applications and analyzing water for its various parameters. Synthesis of Polymeric materials and Nanomaterials.

Course Outcome

- **CH191.1**: Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.
- **CH191.2**: Able to work as an individual also as an team member
- **CH191.3**: Able to analyse different parameters of water considering environmental issues
- **CH191.4**: Able to synthesize nano and polymer materials.
- **CH191.5**: Capable to design innovative experiments applying the fundamentals of chemistry

Course contents

List of Experiments:

1. To Determine the alkalinity in given water sample.
2. Redox titration (estimation of iron using permanganometry)
3. To determine calcium and magnesium hardness of a given water sample separately.
4. Preparation of phenol-formaldehyde resin (Bakelite).
5. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
7. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
8. pH-metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
9. Determination of dissolved oxygen present in a given water sample.
10. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution).

**Innovative experiment:**
Preparation of silver nano-particles.

**Note:** From the list of 10 (Ten) experiments a minimum of 7 (seven) experiments shall have to be performed by one student of which Sl. No. 4 (Preparation of Bakelite) has to be mandatory.

**CO-PO Mapping:**

<table>
<thead>
<tr>
<th>CH191.1</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CH191.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CH191.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>CH191.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CH191.5</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

**FOR GROUP B: CSE, IT, FT, ME, CE**

Paper Name: Physics I Lab
Paper Code: PH 191
Total Contact Hours: 40
Credit: 4

**Pre requisites:** Knowledge of Physics upto 12th standard.

**Course Outcome of Physics-I practical (PH 191)**

At the end of the course students’ should have the

<table>
<thead>
<tr>
<th>PH 191.1 : Ability to define, understand and explain</th>
<th>PO1</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Error estimation, Proportional error calculation</td>
<td></td>
</tr>
<tr>
<td>✓ superposition principle in Newton’s ring, Fresnel’s biprism, laser diffraction</td>
<td></td>
</tr>
<tr>
<td>✓ Basic circuit analysis in LCR circuits</td>
<td></td>
</tr>
</tbody>
</table>
**PH 191.2 : Ability to conduct experiments using**

- LASER, Optical fibre
- Interference by division of wave front, division of amplitude, diffraction grating, polarization of light
- Quantization of electronic energy inside an atom
- Torsional pendulum

**General idea about Measurements and Errors (One Mandatory):**

i) Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.
ii) Proportional error calculation using Carrey Foster Bridge.

**Any 7 to be performed from the following experiments**

**Experiments on Oscillations & Elasticity:**
1. Study of Torsional oscillation of Torsional pendulum & determination of time period using various load of the oscillator.
2. Experiments on Lissajous figure (using CRO).
3. Experiments on LCR circuit.
4. Determination of elastic modulii of different materials (Young’s modulus and Rigidity modulus)

**Experiments on Optics:**
7. Determination of numerical aperture and the energy losses related to optical fiber experiment
8. Measurement of specific rotation of an optically active solution by polarimeter.

**Experiments on Quantum Physics:**
11. Determination of Planck’s constant using photoelectric cell.
12. Verification of Bohr’s atomic orbital theory through Frank-Hertz experiment.

**In addition it is recommended** that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

**Probable experiments beyond the syllabus:**

1. Determination of wavelength of light by Fresnel’s bi-prism method (beyond the syllabus).
2. Study of half-wave, quarter-wave plate (beyond the syllabus)
3. Study of dispersive power of material of a prism.
5. Measurement of nodal and antinodal points along transmission wire and measurement of wave length.
6. Any other experiment related to the theory.

**CO-PO Mapping:**
FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Basic Electrical Engineering LAB
Paper Code: EE191
Total Contact Hours: 36
Credit: 2

Pre requisites:
1. Basic Physics and applied physics.
2. Basic Mathematics.
3. Basic concept of Electric Circuit

Course Objective:
1. Provide knowledge for the analysis of basic electrical circuit.
2. To introduce electrical appliances, machines with their respective characteristics.

Course Outcome:

<table>
<thead>
<tr>
<th>COs</th>
<th>CO Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE191.1</td>
<td>Identify common electrical components and their ratings.</td>
</tr>
<tr>
<td>EE191.2</td>
<td>Make Circuit connection by wires of appropriate ratings.</td>
</tr>
<tr>
<td>EE191.3</td>
<td>Understand the usage of common electrical measuring instruments</td>
</tr>
<tr>
<td>EE191.4</td>
<td>Understand the basic characteristics of transformers and electrical machines</td>
</tr>
</tbody>
</table>

Course contents

LIST OF EXPERIMENTS

1. Characteristics of Fluorescent ,Tungsten and Carbon filament lamps
2. Verification of Thevenin's and Norton's Theorem
3. Verification of Superposition Theorem
4. Calibration of Ammeter and Wattmeter
5. Study of R-L-C series circuit
6. Open circuit and short circuit test of a single phase Transformer
7. Starting, Reversing of a and speed control of D.C shunt motor
8. Test on single phase Energy Meter
9. Familiarization of PMMC and MI type Meter
10. Familiarization with house wiring practice

CO-PO mapping:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE191.1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE191.2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE191.3</td>
<td>3</td>
<td></td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE191.4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FOR GROUP B: CSE, IT, FT, ME, CE

Paper Name: Basic Electronics Engineering Lab
Paper Code: EC191
Total Contact Hours: 36
Credit: 2

Prerequisites
A basic course in electronics and Communication engineering Progresses from the fundamentals of electricity, active and passive components, basic electronics laws like Ohm's law, Ampere's law

Course objectives:
Students will become familiar with the circuit design using semiconductor diodes in Forward and Reverse bias. They will also be able to design rectifiers like half-wave, full-wave rectifiers etc. using diodes. The ability of circuit design with Bipolar Junction Transistor in CB, CE & CC configurations will be improved. The students will acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amp. Basic concepts and Circuit design with logic gates will be developed in the students. The students will be able design circuit using FET.

Course Outcomes:

<table>
<thead>
<tr>
<th>EC191.1</th>
<th>Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC191.2</td>
<td>Analyze the characteristics of Junction Diode, Zener Diode, BJT &amp; FET and different types of Rectifier Circuits.</td>
</tr>
<tr>
<td>EC191.3</td>
<td>Determination of input-offset voltage, input bias current and Slew rate, Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.</td>
</tr>
<tr>
<td>EC191.4</td>
<td>Able to know the application of Diode, BJT &amp;OPAMP.</td>
</tr>
</tbody>
</table>
Course contents:

List of Experiments:

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, millimeters etc.
2. Familiarization with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJT.
7. Study of I-V characteristics of Field Effect Transistors.
8. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
10. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.
12. Study of Characteristic curves for CB, CE and CC mode transistors.
13. Innovative Experiment

CO-PO Mapping

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 191.1</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EC 191.2</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EC 191.3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>EC 191.4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EC 191.5</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Engineering Drawing & Graphics
Paper Code: ME 191
Total Contact Hours: 36
Credit: 2

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:
1. To learn basics of drafting and use of drafting tools.
2. To know about engineering scales, dimensioning and various geometric curves.
3. To Understand projection of line, surface and solids to create the knowledge base of orthogonal and isometric view of structures and machine parts.
4. To acquire the knowledge of Computer Aided drafting using design software.

Course Outcomes: Upon successful completion of this course, the student will be able to:
ME 191.1. Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
ME 191.2. Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
ME 191.3. Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
ME 191.4. Become familiar with computer aided drafting useful to share the design model to different section of industries as well as for research & development.

Course contents:

List of Experiments:

1. Lines, Lettering, Dimensioning, Scales (Plain scale & diagonal Scale).
2. Geometrical Construction and Curves – Construction of Polygons, Parabola, Hyperbola & ellipse
3. Projection of Points, Lines and Surfaces – orthographic projection- first angle and third angle projection, projection of lines and surfaces- Hexagon
4. Projection of Solids – (Cube, Pyramid, Prism, cylinder and Cone
5. Sectional Views – for simple sold objects
6. Introduction to Computer Aided Drafting – using auto cad & / or similar software- Introduction to Cartesian and polar coordinate systems, absolute and relative coordinates; Basic editing commands: line, point, trace, rectangle, polygon, circle, arc, ellipse, polyline; editing methods; basic object selection methods – window and crossing window, erase, move, copy, offset, fillet, chamfer, trim, extend, mirror; display command; zoom, pan, redraw, regenerate; simple dimensioning and text, simple exercises.
### Course Objective:
1. To understand the basic knowledge of Workshop Practice and Safety.
2. To identify and use of different hand tools and other instruments like Hand Saw, Jack Plane, Chisels etc and operations like such as Marking, Cutting etc used in manufacturing processes.
3. To get hands on practice in various machining metal joining processes such as Welding, Brazing, Soldering, etc.

### Course Outcome:
Upon successful completion of this course, the student will be able to:

- **ME192.1** Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
- **ME192.2** Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and performing operations like such as Marking, Cutting etc used in manufacturing processes.
- **ME192.3** Gain knowledge of the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.
- **ME192.4** Get hands on practice of in Welding and various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

### Course contents

#### List of Activities:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Syllabus</th>
<th>Contact Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1</td>
<td>Pattern Making</td>
<td>6</td>
</tr>
</tbody>
</table>
Module 2  |  Sheet Metal Work  |  6  
---|---|---
Module 3  |  Fitting  |  9  
Module 4  |  Machining in Lathe  |  9  
Module 5  |  Welding  |  6  

**MODULE 1 – PATTERN MAKING.**

![Pattern Making Diagram](image)

**MODULE 3- FITTING SHOP.**

![Fitting Shop Diagram](image)

OR

**MODULE 4 – MACHINING IN LATHE & SHAPING M/C**
Sessional

Paper Name: Extra Curricular Activity (NSS/ NCC)
Paper Code: XC 181
Total Contact hours: 20
Credit: 1

Course Objectives: The objectives of the course are as follows:
- To increase student awareness about the weaker and unprivileged sections of society
- To expose students to environmental issues and ecological concerns
• To make students self aware about their participatory role in sustaining society and the environment

**Course contents**

**List of Activities:**

a) Creating awareness in social issues  
b) Participating in mass education programmes  
c) Proposal for local slum area development  
d) Waste disposal  
e) Environmental awareness  
f) Production Oriented Programmes  
g) Relief & Rehabilitation work during Natural calamities

Creating awareness in social issues:

1. Women’s development – includes health, income-generation, rights awareness.  
2. Hospital activities – Eg. writing letters for patients, guiding visitors  
3. Old age home – visiting the aging in-mates, arranging for their entertainment.  
4. Children’s Homes - visiting the young in-mates, arranging for their entertainment  
5. Linking with NGOs to work on other social issues. (Eg. Children of sex-workers)  
6. Gender issues- Developing an awareness, to link it with Women’s Cell of college

Participating in mass education programmes  
1. Adult education  
2. Children’s education

Proposal for local slum area development  
One or two slums to be identified and according to the needs, activities to be developed and proposals and reports are to be submitted.

Environmental awareness  
• Resource conservation – Awareness to be developed on water, energy, soil.  
• Preservation of heritage monuments- Marches, poster campaigns  
• Alternative energy consciousness amongst younger school-children.  
• Plantation and beautification- Plantation of trees, their preservation and upkeep, developing NSS parks.  
• Waste disposal- Proper methods of domestic waste disposal.

Production Oriented Programmes  
5. Working with people and explaining and teaching improved agricultural practices  
6. Rodent control land pest control practices;  
7. Soil-testing, soil health care and soil conservation;  
8. Assistance in repair of agriculture machinery;  
9. Work for the promotion and strengthening of cooperative societies in villages;  
10. Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;  
11. Popularization of small savings and  
12. Assistance in procuring bank loans

Relief & Rehabilitation work during Natural calamities  
g) Assisting the authorities in distribution of rations, medicine, clothes etc.;  
h) Assisting the health authorities in inoculation and immunization, supply of medicine etc.;
i) Working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
j) Assisting and working with local authorities in relief and rescue operation; Collection of clothes and other materials, and sending the same to the affected areas;
First Year Second Semester

Group A: ECE, EE, BME, AEIE/EIE

Group B: CSE, IT, FT, ME, CE

Curriculum

<p>| THEORY |
|---|---|---|---|---|</p>
<table>
<thead>
<tr>
<th>SL No</th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours/Week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M 201</td>
<td>Mathematics -II</td>
<td>3 1 0 4 4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CH 201/PH 201</td>
<td>Chemistry (Gr. B) / Physics - I(Gr. A)</td>
<td>3 1 0 4 4</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>EE 201/EC 201</td>
<td>Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)</td>
<td>3 1 0 4 4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CS 201</td>
<td>Computer Fundamentals &amp; Principle of Computer Programming</td>
<td>3 1 0 4 4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ME 201</td>
<td>Engineering Thermodynamics &amp; Fluid Mechanics</td>
<td>3 1 0 4 4</td>
<td></td>
</tr>
<tr>
<td><strong>Total of Theory</strong></td>
<td></td>
<td></td>
<td>20 20</td>
<td></td>
</tr>
</tbody>
</table>

<p>| PRACTICAL |
|---|---|---|---|---|</p>
<table>
<thead>
<tr>
<th>SL No</th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours/Week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>CS291</td>
<td>Computer Fundamentals &amp; Principle of Computer Programming Lab</td>
<td>0 0 3 3 2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CH 291/PH291</td>
<td>Chemistry Lab (Gr. B) / Physics - I Lab(Gr. A)</td>
<td>0 0 3 3 2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>EE 291/EC 291</td>
<td>Basic Electrical Engineering Lab (Gr. B) /Basic Electronics Engineering Lab(Gr. A)</td>
<td>0 0 3 3 2</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>ME 291/ME 292</td>
<td>Engg Drawing &amp; Graphics(Gr B)/Workshop Practice (Gr-A)</td>
<td>0 0 3 3 2</td>
<td></td>
</tr>
<tr>
<td><strong>Total of Practical</strong></td>
<td></td>
<td></td>
<td>12 08</td>
<td></td>
</tr>
</tbody>
</table>

<p>| C.SESSIONAL |
|---|---|---|---|---|</p>
<table>
<thead>
<tr>
<th>SL No</th>
<th>Paper Code</th>
<th>Theory</th>
<th>Contact Hours/Week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>MC 281</td>
<td>Soft Skill Development</td>
<td>0 0 2 2 0</td>
<td></td>
</tr>
</tbody>
</table>
Syllabus

Paper Name: Mathematics-II
Paper Code: M 201
Total Contact Hours: 40
Credit: 4

Prerequisite: Any introductory course on calculus.

Course Objective: The purpose of this course is to provide fundamental concepts Ordinary Differential Equations, Graph Theory and Laplace Transform.

Course outcome:

On successful completion of the learning sessions of the course, the learner will be able to:

M 201.1: Recall the distinctive characteristics of Ordinary Differential Equations, Graph Theory and Laplace Transform.

M 201.2: Understand the theoretical workings of various algorithms related to graph theory and the theorems of differential equation and Laplace transforms.

M 201.3: Apply the principles of differential equation, graph theory and Laplace transforms to solve various problems.

Course contents:

Module I
Ordinary differential equations (First order): First order and first degree Exact equations, Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli’s equation, General solution of ODE of first order and higher degree (different forms with special reference to Clairaut’s equation), Applications related to Engineering problems.

Module II

Module III
Basic Graph Theory: Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph, Walks, Paths, Circuits, Euler Graph, Cut-sets and cut-vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph. Tree, Binary tree, Spanning tree of a graph, Minimal spanning tree, properties of trees, Algorithms: Dijkstra’s Algorithm for shortest path problem, Determination of minimal spanning tree using Kruskal’s and Prim’s algorithm.

** Extra lecture hours may be taken for this module
MODULE IV: [10L]
Laplace Transform (LT): Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of tf(t), LT of f(t)/t, LT of derivatives of f(t). LT of \int f(u) \, du. Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties; Convolution Theorem (statement only) and its application to the evaluation of inverse LT. Solution of linear ODE with constant coefficients (initial value problem) using LT. Applications related to Engineering problems.

Beyond Syllabus:
Combinatorics: Fundamental Principles, Permutations, Combinations, Binomial Coefficients.

Text Books:

Reference Text Books:
6. V. K. Balakrishnan, Graph Theory, Schaum’s Outline, TMH.
7. J. Clark and D. A. Holton, A first course at Graph Theory, Allied Publishers LTD.
9. N. Deo, Graph Theory, Prentice-Hall of India.
12. Murray R. Spiegel, Laplace Transform, Schaum’s Outline Series, McGRAW-HILL.

CO-PO Mapping:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 201.1</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>M 201.2</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>M 201.3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
FOR GROUP B: ME, CE, IT, CSE, FT

Paper Name: Chemistry
Paper Code: CH 201
Total Contact Hours: 40
Credit: 4

Pre requisites: 10+2 science with chemistry

Course Objective

Understanding of the fundamental theories and applications of thermodynamics, electrochemical principles in modern electrochemical cells and to get an insight into electronic structure of crystals and nanomaterials. Learning about the Synthesis, properties and applications of polymers, fuels and alternative energy sources & their significance in petrochemical industries. Analyzing water quality for its various parameters & its significance in industries

Course Outcome

CH201.1: Able to apply fundamental concepts of thermodynamics in different engineering applications.
CH201.2: Able to analyze & design simple and technologically advanced electrical and energy storage devices.
CH201.3: Able to synthesize nanomaterials, composites, polymers.
CH201.4: Able to apply the basic concept of Organic Chemistry and knowledge of chemical reactions to industries, and technical fields.
CH201.5: Able to apply the knowledge of different fuels and corrosion to different industries.
CH201.6: Able to analyse water quality parameter for its various parameters & its significance in industries.

Course contents

Module 1 [8L]

Chemical Thermodynamics –I

1.1 Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.
Introduction to first law of thermodynamics: Different statements, mathematical form.
Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas.

1.2 Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas.
Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier and Laplace, Hess’s law of constant heat summation.

1.3 2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature (brief).
Evaluation of entropy: characteristics and expression, physical significance. Work function and free energy: Definition, characteristics, physical significance, mathematical expression of $\Delta A$ and $\Delta G$ for ideal gas, standard free energy and chemical potential, Condition of spontaneity and equilibrium reaction.

Module 2 [7L]
2.1 Reaction Dynamics
Reaction laws: rate and order; molecularity; zero and first order kinetics, second order kinetics (same reactant concentration), Pseudounimolecular reaction, Arrhenius equation.

Mechanism and theories of reaction rates (Content beyond the syllabus)

2.2 Solid state Chemistry
Introduction to stoichiometric defects (Schottky & Frenkel) and non–stoichiometric defects (Metal excess and metal deficiency).
Role of silicon and germanium in the field of semiconductor, n-type, p-type semiconductor, photo voltaic cell, fabrication of integrated circuits.

Module 3 [8L]
Electrochemistry
3.1 Conductance
Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte).

3.2 Electrochemical cell
Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, calomel half cell (representation, cell reaction, expression of potential, Discussion, Application).

3.3 Concept of battery
Battery and Commercial electrochemical cell: Dry cell, acid storage cell, alkaline storage cell, fuel cell (construction, representation, cell reaction, expression of potential, discussion, application).

3.4 Corrosion and its control
Introduction, cause and effect of corrosion, types of corrosion: dry, wet and other: Electrochemical corrosion, galvanic corrosion, passivation and protective measure.

Module 4 [12L]
4.1 Structure and reactivity of Organic molecule
Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals. Brief study of some addition, eliminations and substitution reactions.

4.2 Polymers
Concepts, classifications and industrial applications. Polymer molecular weight (number avg. weight avg.: Theory and mathematical expression only), Poly dispersity index (PDI).
Polymerization processes: addition and condensation polymerization (mechanism not required), degree of polymerization, Copolymerization, stereo-regularity of polymer, crystallinity (concept of Tm) and amorphicity (Concept of Tg) of polymer.
Preparation, structure and use of some common polymers: plastic (HDPE, LDPE, PVC, PP, PMMA, Polyester, PTFE, Bakelite), rubber (natural rubber, SBR), fibre (nylon 6, nylon 6,6), Vulcanization of rubber, Conducting polymers and bio-polymers.

4.3 Nano material
Basic principles of nano science and technology, classification, preparation, properties and application of nano material.
Module 5 [5L]

5.1 Industrial Chemistry

Fuels
Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC), Proximate analysis of coal, Calorific value.
Liquid fuel: Petroleum, classification of petroleum, Refining, Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Biodiesel.
Gaseous fuels: Natural gas, water gas, Coal gas, bio gas, CNG, LPG

5.2 Water
Introduction, source of water, water quality parameter, specification for drinking water (BIS and WHO standards), Chlorination of Water, Types of hardness- Units, Brief Softening methods.

Short overview of water treatment plants (Content beyond the syllabus)

Reference Books
1. Engineering Chemistry: Bandyopadhyay and Hazra
2. Physical Chemistry: P.C. Rakshit

CO-PO Mapping:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH201.1</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CH201.2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CH201.3</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CH201.4</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CH201.5</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CH201.6</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Physics -I
Paper Code: PH 201
Total Contact Hours: 41
Credit: 4

Pre requisites: Knowledge of Physics upto 12th standard.

Course Objective:

The aim of courses in Physics is to provide an adequate exposure and develop insight about the basic physics principles along with the possible applications. The acquaintance of basic principles of physics would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches. It can also create awareness of the vital role played by science and engineering in the development of new technologies. It also gives necessary exposure to the practical aspects, which is an essential component for learning sciences.

Course Outcome:

At the end of the course students’ should have the

<table>
<thead>
<tr>
<th>PH 201.1 : Ability to state and recall</th>
<th>PO1</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ De-Broglie hypothesis, and Heisenberg’s Uncertainty Principle</td>
<td>Or</td>
</tr>
<tr>
<td>➢ Amplitude and Velocity Resonance</td>
<td>GA1</td>
</tr>
<tr>
<td>➢ Malus’s Law, Brewster’s Law</td>
<td></td>
</tr>
<tr>
<td>➢ Characteristics of LASER light</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PH 201.2 : Ability to understand and explain</th>
<th>PO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Polarizer and analyzer</td>
<td>Or</td>
</tr>
<tr>
<td>➢ basic principles and different types of LASER and Optical Fibre</td>
<td>GA2</td>
</tr>
<tr>
<td>➢ structure of solids, Miller indices</td>
<td></td>
</tr>
<tr>
<td>➢ theory of Matter Wave, equation of motion of Matter Wave</td>
<td></td>
</tr>
<tr>
<td>➢ wave function and its role in representing wave nature of matter</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PH 201.3 : Ability to apply the knowledge of</th>
<th>PO3</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ mechanical vibration in electrical circuits</td>
<td>Or</td>
</tr>
<tr>
<td>➢ superposition principle in Newton’s ring phenomenon, diffraction phenomenon</td>
<td>GA3</td>
</tr>
<tr>
<td>➢ quantum nature of e.m. waves for production of laser</td>
<td></td>
</tr>
<tr>
<td>➢ total internal reflection in transmitting light through optical fibres</td>
<td></td>
</tr>
<tr>
<td>➢ x-ray diffraction in crystal structure</td>
<td></td>
</tr>
</tbody>
</table>
- probability interpretation in Heisenberg’s uncertainty principle

<table>
<thead>
<tr>
<th>PH 201.4 : Ability to analyze</th>
</tr>
</thead>
<tbody>
<tr>
<td>ሴ</td>
</tr>
<tr>
<td>antasy</td>
</tr>
<tr>
<td>antasy</td>
</tr>
<tr>
<td>antasy</td>
</tr>
<tr>
<td>antasy</td>
</tr>
<tr>
<td>antasy</td>
</tr>
<tr>
<td>antasy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PH 201.5 : Ability to evaluate / justify / compare</th>
</tr>
</thead>
<tbody>
<tr>
<td>岱</td>
</tr>
<tr>
<td>岱</td>
</tr>
<tr>
<td>岱</td>
</tr>
</tbody>
</table>

Course contents

**Module 1 (8L):**

**Oscillations**

1.1 **Simple harmonic motion**: Concepts with examples, Superposition of SHMs in two mutually perpendicular directions: Lissajous’ figures, Engineering Applications and related Numerical problems 2L

1.2 **Damped vibration**: Differential equation and its solution, Logarithmic decrement, quality factor, Engineering Applications and related Numerical problems. 3L

1.3 **Forced vibration**: Differential equation and solution, Amplitude and Velocity resonance, Sharpness of resonance, relevant applications including LCR circuits, Numerical problems 3L

**Module 2 (10L):**

**Classical Optics**

2.1 **Interference of light**: Wave nature of light (Huygen’s principle), Conditions of sustained interference double slit as an example; qualitative idea of spatial and temporal coherence, conservation of energy and intensity distribution; Newton’s ring (qualitative descriptions of working principles and procedures-no deduction required). Engineering applications, Numerical Problems. 3L

Fresnel’s biprism (beyond the syllabus ). 1L(ext)

2.2 **Diffraction of light**: Fresnel and Fraunhofer class, Fraunhofer diffraction for plane transmission grating (elementary treatment of intensity distribution for N-slits), single slit and double slits as examples, missing order, Rayleigh criterion, resolving power of grating and microscope (Definition and formula; no deduction required). Engineering Applications, Numerical Problems. 4L
2.3 Polarization: Definition, plane of polarization, plane of vibration, Malus law, fundamental concepts of plane, circular and elliptical polarizations (only qualitative idea) with examples, Brewster’s law, Double refraction: ordinary and extraordinary rays, Nicol’s prism, Engineering applications, Numerical problems.

Module 3 (9L):
Quantum Physics:

3.1 Quantum Theory: Inadequacy of classical physics; Planck’s quantum hypothesis-Qualitative (without deductions), particle concept of electromagnetic wave (example: photoelectric and Compton effect; qualitative discussions only), wave particle duality; phase velocity and group velocity; de Broglie wave; Davisson and Germer experiment.

3.2 Quantum Mechanics 1: Concept of wave function, Physical significance of wave function, Probability interpretation; wave function normalization condition and its simple numerical applications; uncertainty principle-applications, Schrödinger equation (no mathematical derivation).

Module 4 (6L):
X-ray & Crystallography

4.1 X-rays – Origin of Characteristic and Continuous X-ray, Bragg’s law (No derivation), Determination of lattice constant, Applications, Numerical problems.

4.2 Elementary ideas of crystal structure - lattice, basis, unit cell, Fundamental types of lattices – Bravais lattice, Simple cubic, fcc and bcc, hcp lattices, (use of models in the class during teaching is desirable) Miller indices and miller planes, Co-ordination number and Atomic packing factor, Applications, Numerical problems.

Module 5 (8L):
Modern Optics-I:


5.2 Fibre optics and Applications: Principle and propagation of light in optical fibres- Numerical aperture and Acceptance angle, V number, Types of optical fibres (material, refractive index, mode), Losses in optical fibre- attenuation, dispersion, bending, Numerical problems.

Recommended Text Books for Physics I (PH101/201):

Oscillations:
2. Classical Mechanics-Shrivastav
3. Classical Mechanics-Takwal & Puranik (TMH)
4. Sound-N. K. Bajaj (TMH)
5. Advanced Acoustics-D. P. Roy Chowdhury (Chayan Publisher)
6. Principles of Acoustics-B.Ghosh (Sridhar Publisher)
7. A text book of sound-M. Ghosh ( S. Chand publishers)
8. Electricity Magnetism-Chattopadhyay & Rakshit (New Central Book Agency)
10. R.P. Singh ( Physics of Oscillations and Waves)
11. A.B. Gupta (College Physics Vol. II)
12. Chattopadhyya and Rakshit (Vibration, Waves and Acoustics)

Classical Optics & Modern Optics-I:
15. Modern Optics-A. B. Gupta ( Book & Allied Publisher)  
16. Optics-Ajay Ghatak (TMH)  
17. Optics-Hecht  
19. Möler (Physical Optics)  
20. E. Hecht (Optics)  
21. E. Hecht (Schaum Series)  
22. F.A. Jenkins and H.E White  
23. C.R. Dasgupta ( Degree Physics Vol 3)  

**Quantum Physics**  
24. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)  
25. Quantum Mechanics-Bagde Singh (S. Chand Publishers)  
27. Quantum Mechanics-Binayak Datta Roy (S. Chand Publishers)  
28. Quantum Mechanics-Bransden (Pearson Education Ltd.)  
29. Perspective of Modern Physics-A. Beiser (TMH)  
30. Eisberg & Resnick is published by Wiley India  
31. A.K. Ghatak and S Lokenathan  
32. E.E. Anderson (Modern Physics)  
33. Haliday, Resnick & Krane : Physics Volume 2 is Published by Wiley India  
34. Binayak Dutta Roy [Elements of Quantum Mechanics]  

**X-ray & Crystallography**  
35. Solid state physics-Puri & Babbar ( S. Chand publishers)  
36. Materials Science & Engineering-Kakani Kakani  
37. Solid state physics- S. O. Pillai  
38. Introduction to solid state physics-Kittel (TMH)  
40. S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)  

**General Reference:**  
2. Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt. Ltd.)  
3. Basic Engineering Physics-I-Sujoy Bhattacharya, Saumen Paul (TMH)  
6. University Physics-Seers & Zemansky (Addison-Wesley)  
B. Dutta Roy (Basic Physics)  
6. R. K. Kar (Engineering Physics)  
7. Mani and Meheta (Modern Physics)  
8. Arthur Baiser (Perspective & Concept of Modern Physics)  

**CO-PO Mapping:**

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH 201.1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 201.2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 201.3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 201.4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 201.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
FOR GROUP B: CSE, IT, FT, ME, CE

Paper Name: Basic Electrical Engineering
Paper Code: EE 201
Total Contact Hours: 41
Credit: 4

Pre requisite: Basic 12th standard Physics and Mathematics

Course Objective:
Basic electrical engineering is an introductory course in electrical engineering. Students are introduced to simple applied electrical circuits, theories and practice to impart skill set to have visualization of electrical engineering applications. It is a course suitable for students pursuing electrical engineering as well as other related engineering disciplines.

Course Outcomes:
At the end of this course, students will be able

EE 201.1: To understand and analyse basic electric and magnetic circuits.
EE 201.2: To understand and analysis the AC single phase and three phase circuit
EE 201.3: To understand and analysis of the basic principles of various electrical machines

Course Contents:

DC CIRCUITS (7L)
Definition of electric circuit, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, node, branch, active and passive elements, Kirchhoff’s laws, Source equivalence and conversion, Network Theorems-Superposition Theorem, Thevenin’s Theorem, Norton Theorem, Maximum Power Transfer Theorem, Star-Delta Conversions.

MAGNETIC CIRCUITS (3L)
Concept of Magnetic circuit, B-H curve, Analogous quantities in magnetic and electric circuits, Faraday’s law, iron losses, self and mutual inductance, Energy stored in magnetic field.

AC SINGLE PHASE CIRCUITS (8L)
Sinusoidal quantities, Average and RMS values, peak factor, Form factor, Phase and Phase difference, concept of phasor diagram, V-I Relationship in R,L,C circuit, Combination R,L,C in AC series, parallel and series parallel circuits with phasor diagrams, impedance and admittance, Power factor, Power in AC circuit, Resonance in RLC series and parallel circuit, Q factor, band width of resonant circuit.

THREE PHASE CIRCUITS (3L)
Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagrams. Power measurement by two watt meters method.

DC MACHINES (6L)
Construction, Basic concepts of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Torque Equation, Speed Torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control).

SINGLE PHASE TRANSFORMER (5L)
Constructional parts, Types of transformers, Emf equation, No Load no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation.

THREE PHASE INDUCTION MOTOR (6L)
Types, Construction, production of rotating field, principle of operation, Slip and Frequency , rotor emf and current, Equivalent circuit and phasor diagram, Torque Slip characteristics torque-speed characteristics Starting of induction motor by star delta starter and (DOL starter). Speed Control of Three phase induction motor by variation of supply frequency, supply voltage and number of poles.

GENERAL STRUCTURE OF ELECTRICAL POWER SYSTEM (3L)
Power generation to distribution through overhead lines and underground cables with single line diagram, Earthing of Electrical Equipment, Electrical Wiring Practice

Text books
5. V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.
6. Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication
7. Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH
8. C.L. Wadhwa, Basic Electrical Engineering, Pearson Education

Reference books
5. J.B. Gupta, Basic Electrical Engineering, Kataria & Sons . 
6. Kothari & Nagrath, Basic Electrical Engineering, TMH

CO-PO mapping:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 201.1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE 201.2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE 201.3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Basic Electronics Engineering
Paper code: EC201
Total Contact Hours: 40
Credits: 4

Prerequisites
A basic course in Electronics and Communication Engineering Progresses from the fundamentals of electricity, direct current (DC) devices and circuits, series and parallel circuits to the study of active and passive components, Ohm's Law, Kirchoff's Law i.e. KVL, KCL, Ampere’s Law etc.

Course objectives:

Students will be able to Analyze the behaviour of semiconductor diodes in Forward and Reverse bias. To design a half wave and full wave rectifiers, Explore V-I characteristics of Bipolar Junction Transistor n CB, CE & CC configurations. To acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amps. Students will be able to explain feedback concept and different
oscillators. They will also be familiar with the analysis of digital logic basics and measuring Electronic devices. Students will have knowledge about characteristics of FET.

**Course Outcomes:**

| EC 201.1 | Study PN junction diode, ideal diode, diode models and its circuit analysis, application of diodes and special diodes. |
| EC 201.2 | Learn how operational amplifiers are modeled and analyzed, and to design Op-Amp circuits to perform operations such as integration, differentiation on electronic signals. |
| EC 201.3 | Study the concepts of both positive and negative feedback in electronic circuits. |
| EC 201.4 | Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis. |
| EC 201.5 | Learn how the primitives of Boolean algebra are used to describe the processing of binary signals. |

**Course contents**

**Module-I: Basics of semiconductor**

Conductors, Insulators, and Semiconductors - crystal structure, Fermi Dirac function, Fermi level, E-k and Energy band diagrams, valence band, conduction band, and band gap; intrinsic, and extrinsic (p-type and n-type) semiconductors, position of Fermi level in intrinsic and extrinsic semiconductor, drift and diffusion current – expression only (no derivation), mass action law, charge neutrality in semiconductor, Einstein relationship in semiconductor, Numerical problems on Fermi level, conductivity, mass action law, drift and diffusion current.

**Module-II: P-N Junction Diode and its applications**

p-n junction formation and depletion region, energy band diagram of p-n junction at equilibrium and barrier energy, built in potential at p-n junction, energy band diagram and current through p-n junction at forward and reverse bias, V-I characteristics and current expression of diode, temperature dependencies of V-I characteristics of diode, p-n junction breakdown – conditions, avalanche and Zener breakdown, Concept of Junction capacitance, Zener diode and characteristics.

Diode half wave and full wave rectifiers circuits and operation (I_Dc, I_rms, V_Dc, V_rms), ripple factor without filter, efficiency, PIV, TUF; Reduction of ac ripples using filter circuit (Qualitative analysis); Design of diode clipper and clamper circuit - explanation with example, application of Zener diode in regulator circuit. Numerical problems.

**Module-III: Bipolar junction transistor(BJT)**

Formation of PNP/NPN Transistors, energy band diagram, current conduction mechanism, CE, CB, CC configurations, transistor static characteristics in CE, CB and CC mode, junction biasing condition for active, saturation and cut-off modes, current gain α, β and γ, early effect.

Biasing and bias stability; biasing circuits - fixed bias; voltage divider bias; collector to base bias, D.C. load line and Quiescent point, calculation of stability factors for different biasing circuits.

BJT as an amplifier and as a switch – Graphical analysis; Numerical Problems.
Module-IV: Field effect transistor (FET)  4L
Concept of field effect, channel width modulation Classification of FETs-JFET, MOSFET, operating principle of JFET, drain and transfer characteristics of JFET (n-channel and p-channel), CS,CG,CD configurations, Relation between JFET parameters, FET as an amplifier and as a switch– graphical analysis. E-MOSFET (n-channel and p-channel), D-MOSFET (n-channel and p-channel), Numerical Problems.

Module-V: Feedback and Operational Amplifier  10L
Concept of feedback with block diagram, positive and negative feedback, gain with feedback. Feedback topologies, effect of feedback on input and output impedance, distortion, concept of oscillation and Barkhausen criterion.
Problems on Characteristics of Op-amp, CMRR, slew rate, amplifier and application of Op-amp to be discussed. Any other relevant problems related to topic may be discussed or assigned.

Module-VI: Cathode Ray Oscilloscope (CRO)  2L
Operating principle of CRO with block diagram, measurement of voltage, frequency and phase.

Module-VII: Digital Electronics  4L
Binary numbers and conversion, Basic Boolean algebra, Logic gates (AND, OR, NOR, NOT, NAND, XOR) and realization of functions.

Text Books:
4. Sedra & Smith, Microelectronics Engineering

Reference Books:
1. John D. Ryder, Electronic Fundamentals and Applications, PHI

CO-PO Mapping

<table>
<thead>
<tr>
<th>EC 201.1</th>
<th>PO1</th>
<th>P O2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EC 201.2</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EC 201.3</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Computer Fundamentals & Principle of Computer Programming

Code: CS 201
Total No. of Lectures: 40
Credits: 4

Prerequisites:
1. Number system
2. Boolean Algebra

Course Objective(s)
1. To develop the programming skills of students
2. To know the principles of designing structured programs
3. To write basic C programs using
   i) Selection statements
   ii) Repetitive statements
   iii) Functions
   iv) Pointers
   v) Arrays
   vi) Strings

Course Outcome:

CS201.1 Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming.
CS201.2 Write, Compile and Debug programs in C language and use different data types for writing the programs.
CS201.3 Design programs connecting decision structures, loops and functions.
CS201.4 Explain the difference between call by value and call by address.
CS201.5 Understand the dynamic behavior of memory by the use of pointers.

Use different data structures and create / manipulate basic data files and developing applications for real world problems.

Course content

Fundamentals of Computer: (10 L)

History of Computer, Generation of Computer, Classification of Computers 1L

Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices 2L

Binary and Allied number systems representation of signed & unsigned numbers, BCD, ASCII, Binary number Arithmetic – Addition and Subtraction (using 1’s complement and 2’s complement) 2L
Logic gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR - only truth tables, logic gate symbols and logic equations for gates only 1L

Assembly language, high level language, machine level language, compiler and assembler (basic concepts) 1L

Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX 1L

Problem solving-Algorithm & flow chart 2L

C Fundamentals: (30 L)

Variable and Data Types:
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements 3L

C Operators & Expressions:
Arithmetic operators, relational operators, logical operators, increment and decrement operators, bitwise operators, assignment operators, conditional operators, special operators - type conversion, C expressions, precedence and associativity.
Input and Output: Standard input and output, formatted output - printf, formatted input scanf, bit fields 5L

Branching and Loop Statements:
Statement and blocks, if - else, switch, goto and labels, Loops - while, for, do while, break and continue 3L

Fundamentals and Program Structures:
auto, external, static and register variables
Functions, function types, function prototypes, functions returning values, functions not returning values, scope rules, recursion, C preprocessor and macro 6L

Arrays, Strings and Pointers:
One dimensional arrays, Two-dimensional arrays, Multidimensional arrays. Passing an array to a function
Character array and string, array of strings, Passing a string to a function, String related functions
Pointers, Pointer and Array, Pointer and String, Pointer and functions, Dynamic memory allocation 6L

Files handling with C:
formatted and unformatted files, Command line arguments, fopen, fclose, fgetc, fputc, fprintf, fscanf function 4L

Structures and Unions:
Basic of structures, arrays of structures, structures and pointers, structures and functions 3L
Text book:
Kerninghan B.W. & Ritchie D.M. - The C Programming Language
Gottfried - Programming with C Schaum
Kanetkar Y. - Let us C
Balaguruswamy - Programming in C

Recommended reference Books:

Pohl and Kelly - A Book on C
Kerninghan, B.W. - The Elements of Programming Style
Schied F.S. Theory and Problems of Computers and Programming
Rajaraman V. Fundamental of Computers
M.M.Oka Computer Fundamentals, EPH
Leon Introduction to Computers, Vikas
Leon - Fundamental of Information Technology, Vikas
Ram B. Computer Fundamentals, New Age International
Ravichandran D. Programming in C, New Age International
Xavier C. Introduction to Computers, New Age International

CO-PO Mapping:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS201.1</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS201.2</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS201.3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS201.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS201.5</td>
<td>3</td>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Paper Name: Engineering Thermodynamics & Fluid Mechanics
Paper Code: ME 201
Total Contact Hours: 48
Credits: 4

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics.

Course Objective:
1. To understand the basic principles of thermodynamics, heat and work transfer.
2. To acquire the knowledge of basic concepts of Heat Engine, Entropy from Second law of thermodynamics.
3. To get the knowledge of thermodynamic properties of a pure substance and inter-relationships between key properties of a system or state possessed by the substance.
4. To understand the basic principles of fluid mechanics, and ability to analyze fluid flow problems with the application of the momentum and energy equations.
Course Outcome:
Upon successful completion of this course, the student will be able to:

ME 201.1 Know about thermodynamic equilibrium, heat & work transfer, First law and its application.
ME 201.2 Understand the basic concepts of Heat Engine, Entropy from Second law of thermodynamics.
ME 201.3 Know the thermodynamic characteristics of a pure substance and its application in power cycles (Simple Rankine cycles, Air Standard cycles)
ME 201.4 Knowledge of basic principles of fluid mechanics, and ability to analyze fluid flow problems with the application of the momentum and energy equations

Course content

Module 1:
8L+3T
Basic Concepts of Thermodynamics
  Introduction: Microscopic and Macroscopic viewpoints
  Definition of Thermodynamic systems: closed, open and isolated systems Concept of Thermodynamics state; state postulate.
  Definition of properties: intensive, extensive & specific properties. Thermodynamic equilibrium
Heat and Work
  Definition & units of thermodynamic work.
  Examples of different forms of thermodynamic works; example of electricity flow as work.
  Work done during expansion of a compressible simple system
  Definition of Heat; unit of Heat
  Similarities & Dissimilarities between Heat & Work
Ideal Equation of State, processes; Real Gas
  Definition of Ideal Gas; Ideal Gas Equations of State.
  Thermodynamic Processes for Ideal Gas; P-V plots; work done, heat transferred for isothermal, isobaric, isochoric, isentropic & polytropic processes.
  Equations of State of Real Gases: Van der Waal’s equation; Virial equation of state.
Properties of Pure Substances
  p-v, T-s & h-s diagrams of pure substance like H2O
  Introduction to steam table with respect to steam generation process; definition of saturation, wet & superheated status.
  Definition of dryness fraction of steam, degree of superheat of steam.

Module 2:
4L+3T
1st Law of Thermodynamics
  Flow Energy & Definition of Enthalpy.

Module 3:
6L+3T
2nd Law of Thermodynamics
  Definition of Sink, Source Reservoir of Heat.
  Heat Engine, heat Pump & Refrigerator; Thermal efficiency of Heat Engines & co-efficient of performance of Refrigerators
Kelvin – Planck & Clausius statements of 2nd Law of Thermodynamics Absolute or Thermodynamic scale of temperature, Clausius Integral Entropy
Entropy change calculation for ideal gas processes. Carnot Cycle & Carnot efficiency
PMM-2; definition & its impossibility

Module 4:
6L+3T

Air standard Cycles for IC engines
Otto cycle; plot on P-V, T-S planes; Thermal efficiency Diesel cycle; plot on P-V, T-S planes; Thermal efficiency

Rankine cycle of steam
Chart of steam (Mollier’s Chart)
Simple Rankine cycle plot on P-V, T-S, h-s planes Rankine cycle efficiency with & without pump work (Problems are to solved for each module)

Module 5:
9L+3T

Properties & Classification of Fluids
Ideal & Real fluids
Newton’s law of viscosity; Newtonian and Non-Newtonian fluids
Compressible and Incompressible fluids

Fluid Statics
Pressure at a point

Measurement of Fluid Pressure
Manometers: simple & differential U-tube
Inclined tube

Fluid Kinematics
Stream line
Laminar & turbulent flow
external & internal flow
Continuity equation

Dynamics of ideal fluids
Bernoulli’s equation
Total head; Velocity head; Pressure head Application of Bernoulli’s equation

Measurement of Flow rate: Basic principles
Venturimeter, Pilot tube, Orificemeter
(Problems are to be solved for each module)

Engineering Thermodynamics

Text:
1 Engineering Thermodynamics - P K Nag, 4th edn, TMH.

References:
1 "Fundamentals of Thermodynamics" 6e by Sonntag & Van Wylin published by Wiley India.
2 Engineering Thermodynamics – Russel & Adeliyi (Indian edition), OUP
3 Engineering Thermodynamics – Onkar Singh, New Age International Publishers Ltd.
4 Basic Engineering Thermodynamics – R Joel, 5th Ed., Pearson

Fluid Mechanics

Text:
1 Fluid Mechanics and Hydraulic Machines - R Bansal
References:
1. Introduction to Fluid Mechanics and Fluid Machines - S.K.Som and G.Biswas. 2nd edn, TMH

CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME201.1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>ME201.2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>ME201.3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>ME201.4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Practical

Paper Name: Computer Fundamentals & Principle of Computer Programming Lab
Paper Code: CS291
Total Contact Hours: 36
Credit: 2

Prerequisites:
3. Basic Computer Knowledge

Course Objective(s):
1. To develop an understanding of the design, implementation, and compilation of a C program
2. To gain the knowledge about pointers, a fundamental for understanding data structure issues
3. To understand the usage of user defined data type for application development

Course Outcome:

CS291.1. Understanding the working of different operating systems like DOS, Windows, Linux.

CS291.2. Write, Compile and Debug programs in C language.

CS291.3. Design programs connecting decision structures, loops.

CS291.4. Exercise user defined functions to solve real time problems.

CS291.5. Inscribe C programs using Pointers to access arrays, strings, functions, structures and files.
Experiment should include but not limited to the following:

- Some basic commands of DOS, Windows and Linux Operating System, File handling and Directory structures, file permissions, creating and editing simple C program, compilation and execution of C program.

- Writing C Programs on variable, expression, operator and type-casting.

- Writing C Programs using different structures of if-else statement and switch-case statement.

- Writing C Programs demonstrating use of loop (for loop, while loop and do-while loop) concept and use of break and continue statement.

- Writing C Programs demonstrating concept of Single & Multidimensional arrays.

- Writing C Programs demonstrating concept of Function and Recursion.

- Writing C Programs demonstrating concept of Pointers, address of operator, declaring pointers and operations on pointers.

- Writing C Programs demonstrating concept of structures, union and pointer to structure.

- Writing C Programs demonstrating concept of String and command line arguments.

- Writing C Programs demonstrating concept of dynamic memory allocation.

- Writing C Programs demonstrating concept of File Programming.

FOR GROUP B: ME, CE, IT, CSE, FT

Paper Name: Chemistry Lab
Paper Code: CH 291
Total Contact Hours: 36
Credit: 2

Pre requisites: 10+2 science with chemistry
Course Objective
Acquiring knowledge on Standard solutions and the various reactions in homogeneous and heterogenous medium. Understanding the basic principles of pH meter and conductivity meter for different applications and analyzing water for its various parameters. Synthesis of Polymeric materials and Nanomaterials.

Course Outcome

CH291.1: Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.
CH291.2: Able to work as an individual also as a team member
CH291.3: Able to analyse different parameters of water considering environmental issues
CH291.4: Able to synthesize nano and polymer materials.
CH291.5: Capable to design innovative experiments applying the fundamentals of chemistry

List of Experiments:

1. To Determine the alkalinity in given water sample.
2. Redox titration (estimation of iron using permanganometry)
3. To determine calcium and magnesium hardness of a given water sample separately.
4. Preparation of phenol-formaldehyde resin (Bakelite).
5. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
6. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
7. pH-metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
8. Determination of dissolved oxygen present in a given water sample.
9. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution).

Innovative experiment:
Preparation of silver nano-particles.

Note: From the list of 10 (Ten) experiments a minimum of 7 (seven) experiments shall have to be performed by one student of which Sl. No. 4 (Preparation of Bakelite) has to be mandatory.

CO-PO Mapping:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 291.1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CH 291.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CH 291.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>CH 291.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CH 291.5</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Physics I Lab
Paper Code: PH 291
Total Contact Hours: 40
Credit: 4

Pre requisites: Knowledge of Physics upto 12th standard.

Course Outcome of Physics-I practical (PH 191)

At the end of the course students’ should have the

<table>
<thead>
<tr>
<th>PH 291.1 : Ability to define, understand and explain</th>
<th>PO1</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Error estimation, Proportional error calculation</td>
<td></td>
</tr>
<tr>
<td>✓ superposition principle in Newton’s ring, Fresnel’s biprism, laser diffraction</td>
<td></td>
</tr>
<tr>
<td>✓ Basic circuit analysis in LCR circuits</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PH 291.2 : Ability to conduct experiments using</th>
<th>PO4</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ LASER, Optical fibre</td>
<td></td>
</tr>
<tr>
<td>➢ Interference by division of wave front, division of amplitude, diffraction grating, polarization of light</td>
<td></td>
</tr>
<tr>
<td>➢ Quantization of electronic energy inside an atom</td>
<td></td>
</tr>
<tr>
<td>➢ Torsional pendulum</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PH 291.3 : Ability to participate as an individual, and as a member or leader in groups in laboratory sessions actively</th>
<th>PO9</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PH 291.4 : Ability to analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiments</th>
<th>PO10</th>
</tr>
</thead>
</table>

General idea about Measurements and Errors (One Mandatory):

i) Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.
ii) Proportional error calculation using Carrey Foster Bridge.

Any 7 to be performed from the following experiments

Experiments on Oscillations & Elasticity:
1. Study of Torsional oscillation of Torsional pendulum & determination of time period using various load of the oscillator.
2. Experiments on Lissajous figure (using CRO).
3. Experiments on LCR circuit.
4. Determination of elastic modulii of different materials (Young’s modulus and Rigidity modulus)

Experiments on Optics:
7. Determination of numerical aperture and the energy losses related to optical fiber experiment
8. Measurement of specific rotation of an optically active solution by polarimeter.
**Experiments on Quantum Physics:**
11. Determination of Planck’s constant using photoelectric cell.
12. Verification of Bohr’s atomic orbital theory through Frank-Hertz experiment.

**In addition it is recommended** that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

**Probable experiments beyond the syllabus:**
1. Determination of wavelength of light by Fresnel’s bi-prism method (beyond the syllabus).
2. Study of half-wave, quarter-wave plate (beyond the syllabus)
3. Study of dispersive power of material of a prism.
5. Measurement of nodal and antinodal points along transmission wire and measurement of wave length.
6. Any other experiment related to the theory.

**CO-PO Mapping:**

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH 291.1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 291.2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 291.3</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 291.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FOR GROUP B: ME, CE, IT, CSE, FT**

**Paper Name:** Basic Electrical Engineering LAB
**Paper Code:** EE 291
**Total Contact Hours:** 36
**Credit:** 2

**Pre requisites:**
4. Basic Physics and applied physics.
5. Basic Mathematics.
6. Basic concept of Electric Circuit

**Course Objective:**
3. Provide knowledge for the analysis of basic electrical circuit.
4. To introduce electrical appliances, machines with their respective characteristics.
<table>
<thead>
<tr>
<th>COs</th>
<th>CO Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 291.1</td>
<td>Identify common electrical components and their ratings.</td>
</tr>
<tr>
<td>EE 291.2</td>
<td>Make Circuit connection by wires of appropriate ratings.</td>
</tr>
<tr>
<td>EE 291.3</td>
<td>Understand the usage of common electrical measuring instruments.</td>
</tr>
<tr>
<td>EE 291.4</td>
<td>Understand the basic characteristics of transformers and electrical machines</td>
</tr>
</tbody>
</table>

Course contents

LIST OF EXPERIMENTS

11. Characteristics of Fluorescent, Tungsten and Carbon filament lamps
12. Verification of Thevenin's and Norton's Theorem
13. Verification of Superposition Theorem
14. Calibration of Ammeter and Wattmeter
15. Study of R-L-C series circuit
16. Open circuit and short circuit test of a single phase Transformer
17. Starting, Reversing of a and speed control of D.C shunt motor
18. Test on single phase Energy Meter
19. Familiarization of PMMC and MI type Meter
20. Familiarization with house wiring practice

CO-PO mapping:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 291.1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EE 291.2</td>
<td>2</td>
<td></td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE 291.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE 291.4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Basic Electronics Engineering Lab
Paper Code: EC291
Total Contact Hours: 36
Credit: 2

Prerequisites
A basic course in electronics and Communication engineering Progresses from the fundamentals of electricity, active and passive components, basic electronics laws like Ohm’s law, Ampere’s law

Course objectives:
Students will become familiar with the circuit design using semiconductor diodes in Forward and Reverse bias. They will also be able to design rectifiers like half-wave, full-wave rectifiers etc. using diodes. The ability of circuit design with Bipolar Junction Transistor in CB, CE & CC configurations will be improved. The students will acquire the basic engineering technique and ability to design and analyze the circuits of Op-Amp. Basic concepts and Circuit design with logic gates will be developed in the students. The students will be able design circuit using FET.

Course Outcomes:

<table>
<thead>
<tr>
<th>EC291.1</th>
<th>Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC291.2</td>
<td>Analyze the characteristics of Junction Diode, Zener Diode, BJT &amp; FET and different types of Rectifier Circuits.</td>
</tr>
<tr>
<td>EC291.3</td>
<td>Determination of input-offset voltage, input bias current and Slew rate, Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPS.</td>
</tr>
<tr>
<td>EC291.4</td>
<td>Able to know the application of Diode, BJT &amp; OPAMP.</td>
</tr>
<tr>
<td>EC291.5</td>
<td>Familiarization and basic knowledge of Integrated Circuits</td>
</tr>
</tbody>
</table>

Course contents:

List of Experiments:

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, millimeters etc.
2. Familiarization with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs.
7. Study of I-V characteristics of Field Effect Transistors.
8. Determination of input-offset voltage, input bias current and Slew rate of OPAMPS.
9. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPS.
10. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.
12. Study of Characteristic curves for CB, CE and CC mode transistors.
13. Innovative Experiment

CO-PO Mapping

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 291.1</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
FOR GROUP B: ME, CE, IT, CSE, FT

Paper Name: Engineering Drawing & Graphics
Paper Code: ME 291
Total Contact Hours: 36
Credit: 2

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:
To learn basics of drafting and use of drafting tools.
To know about engineering scales, dimensioning and various geometric curves.
To understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
To acquire the knowledge of Computer Aided drafting using design software.

Course Outcomes: Upon successful completion of this course, the student will be able to:
ME 291.1. Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings.
ME 291.2. Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
ME 291.3. Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
ME 291.4. Become familiar with computer aided drafting useful to share the design model to different section of industries as well as for research & development.

Course contents:
List of Experiments:

1. Lines, Lettering, Dimensioning, Scales (Plain scale & diagonal Scale).
2. Geometrical Construction and Curves – Construction of Polygons, Parabola, Hyperbola & ellipse
3. Projection of Points, Lines and Surfaces – orthographic projection- first angle and third angle projection, projection of lines and surfaces- Hexagon
4. Projection of Solids – (Cube, Pyramid, Prism, cylinder and Cone
5. Sectional Views – for simple solid objects
6. Introduction to Computer Aided Drafting – using auto cad & / or similar software-Introduction to Cartesian and polar coordinate systems, absolute and relative coordinates; Basic editing commands: line, point, trace, rectangle, polygon, circle, arc, ellipse, polyline; editing
methods; basic object selection methods – window and crossing window, erase, move, copy, offset, fillet, chamfer, trim, extend, mirror; display command; zoom, pan, redraw, regenerate; simple dimensioning and text, simple exercises.

<table>
<thead>
<tr>
<th>CO Codes</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 291.1</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>ME 291.2</td>
<td>3</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>ME 291.3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>ME 291.4</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

FOR GROUP A: EE, ECE, EIE/AEIE, BME

Paper Name: Workshop Practice
Paper Code: ME 292
Total Contact Hours: 36
Credit: 2

Pre requisites: Higher Secondary with Physics, Chemistry & Mathematics

Course Objective:
1. To understand the basic knowledge of Workshop Practice and Safety.
2. To identify and use of different hand tools and other instruments like Hand Saw, Jack Plane, Chisels etc and operations like such as Marking, Cutting etc used in manufacturing processes.
3. To get hands on practice in various machining metal joining processes such as Welding, Brazing, Soldering, etc.

Course Outcome:
Upon successful completion of this course, the student will be able to:

ME 291.1 Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
ME 291.2 Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and performing operations like such as Marking, Cutting etc used in manufacturing processes.
ME 291.3 Gain knowledge of the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.
ME 291.4 Get hands on practice of in Welding and various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

Course contents
List of Activities:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Syllabus</th>
<th>Contact Hrs</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Module 1</th>
<th>Pattern Making</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 2</td>
<td>Sheet Metal Work</td>
<td>6</td>
</tr>
<tr>
<td>Module 3</td>
<td>Fitting</td>
<td>9</td>
</tr>
<tr>
<td>Module 4</td>
<td>Machining in Lathe</td>
<td>9</td>
</tr>
<tr>
<td>Module 5</td>
<td>Welding</td>
<td>6</td>
</tr>
</tbody>
</table>

**MODULE 1 – PATTERN MAKING.**

![Pattern Making Diagram](image)

**Fig. 4. Job for making a pattern**

**MODULE 3 – FITTING SHOP.**

![Fitting Shop Diagram](image)

OR
MODULE 4 – MACHINING IN LATHE & SHAPING M/C

Fig 3: Job for practice on a shaping and/or milling machine.

MODULE 5 – WELDING

CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO Codes</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 292.1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>ME 292.2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ME 292.3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ME 292.4</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
Course Objectives:

The objectives of this course are as follows:
- To expose the students to different aspects of corporate life and workplace behavior
- To introduce workplace behavioral norms, etiquettes and standards
- To equip students to face interviews, presentations and other professional interactions

<table>
<thead>
<tr>
<th>MODULE</th>
<th>CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Communication Training</td>
</tr>
<tr>
<td>Two</td>
<td>Communication Training (Accent Neutralization)</td>
</tr>
<tr>
<td>Three</td>
<td>Business Etiquette</td>
</tr>
<tr>
<td>Four</td>
<td>CV / Resume Writing</td>
</tr>
<tr>
<td>Five</td>
<td>Corporate Life and Protocols</td>
</tr>
<tr>
<td>Six</td>
<td>Group Discussion</td>
</tr>
<tr>
<td>Seven</td>
<td>Leadership Skill</td>
</tr>
<tr>
<td>Eight</td>
<td>Team Work</td>
</tr>
<tr>
<td>Nine</td>
<td>Public Speaking and Interview Basics</td>
</tr>
<tr>
<td>Ten</td>
<td>Business Telephone Etiquette</td>
</tr>
<tr>
<td>Eleven</td>
<td>Reading skill</td>
</tr>
</tbody>
</table>
Rearrange

MODULE ONE – COMMUNICATION TRAINING (2L)

1. Organisational Communication and Structure.
2. Vocabulary related to Corporate Operation.
3. Modes of Communication (Telephone, Conference Call, Team Huddle, Public Relation etc.
4. Communication with Clients, Customers, Suppliers etc.
5. Verbal and Non-Verbal Communication, Proxemics and Para Language.
6. Vocabulary Building (Synonym / Antonym / One word Substitution etc.)

MODULE TWO - COMMUNICATION TRAINING (ACCENT NEUTRALISATION) (2L)

7. Mother Tongue Influence
8. Vowel Sounds and Consonantal Sounds
9. Pronunciation and Neutral Accent.
10. Intonation.
11. Rate of Speech, Pausing, Pitch Variation and Tone.

MODULE THREE – BUSINESS ETIQUETTE (2L)

13. Corporate Dressing and Mannerism.
14. Table Etiquette (Corporate Acculturation, Office parties, Client/Customer invitations etc.)
15. Multi Cultural Etiquette.
17. E-mail Etiquette.

MODULE FOUR – JOB APPLICATION AND CV / VIDEO RESUME (2L)

18. Format (Chronological, Skill Oriented, Functional etc.)
19. Style and Appearance.
20. Writing Tips and Video Content Presentation tips.
21. Types of Cover Letter or Job Application Letter.

MODULE FIVE - INTRODUCTION TO CORPORATE LIFE AND PROTOCOLS (2L)

22. Introduction of Companies (Domain Specific)
23. Opportunities and Growth Plan.
25. Service Level Agreement and Corporate Jargon.

**MODULE SIX – GROUP DISCUSSION (2L)**

27. Introduction, Definition and Purpose.
28. Types of Group Discussion.
31. Practice Session and Video Viewing Task.

**MODULE SEVEN – LEADERSHIP SKILL (2L)**

32. Leadership Theories.
33. Traits and Skills of the Leader.
34. Roles, Duties and Responsibilities.
35. Case Study of Leaders.
36. Interpersonal relationship with Team.

**MODULE EIGHT – TEAM WORK (2L)**

37. Concept of Team Culture.
38. Stages of Team Development (Forming, Storming, Norming, Performing, Adjourning)
40. Conflict Management, Flexibility, Negotiation Skill.
41. Team Building (Assess, Plan, Execute and Evaluate)

**MODULE NINE – PUBLIC SPEAKING AND INTERVIEW BASICS (2L)**

42. Extempore.
43. JAM.
44. Interview Skill
45. Interview over Telephone, Video Conference Interview etc.

**MODULE TEN – BUSINESS TELEPHONE ETIQUETTE (2L)**

46. Five Phases of a Business Call.
47. Pitch, inflection, Courtesy and Tone.
48. Understanding, Rate of Speech, Enunciation.
49. Hold Procedure.
50. Cold and Hot Transfer protocols.
51. Dealing with Different Types of Customers (Irate, Talkative, Turnaround etc.)
MODULE ELEVEN- READING SKILL

52. Vocabulary from context, speed reading, skimming, inferring, comprehension test etc.

<table>
<thead>
<tr>
<th>ASSESSMENT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Viva</td>
<td>10</td>
</tr>
<tr>
<td>2. Personal Skill Enhancement Log</td>
<td>25</td>
</tr>
<tr>
<td>3. Movie Making: Video Resume</td>
<td>25</td>
</tr>
<tr>
<td>4. Term End Project</td>
<td>40</td>
</tr>
</tbody>
</table>

LIST OF REFERENCE:


2. Soft Skills: Know yourself and know the World, Dr. K.Alex, S Chand, 2009.


### A. THEORY:

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L  T  P  Total</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>BS M 301</td>
<td>Mathematics – III</td>
<td>3 1 0 4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>BS M(CS) 301</td>
<td>Numerical Methods</td>
<td>3 0 0 3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>PC EI 301</td>
<td>Analog Electronic Circuits</td>
<td>3 0 0 3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>PC EI 302</td>
<td>Digital Electronic Circuits</td>
<td>3 0 0 3</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>PC EI 303</td>
<td>Circuit Theory and Networks</td>
<td>3 1 0 4</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>PC EI 304</td>
<td>Electrical &amp; Electronic Measurement &amp; Instrumentation</td>
<td>3 1 0 4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total Theory</td>
<td></td>
<td>21</td>
</tr>
</tbody>
</table>

### B. PRACTICAL:

<table>
<thead>
<tr>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L  T  P  Total</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>BS M(CS)391</td>
<td>Numerical Methods Lab</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>PC EI 391</td>
<td>Analog Electronic Circuits Lab</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>PC EI 392</td>
<td>Digital Electronic Circuits Lab</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>PC EI 393</td>
<td>Circuits and Networks Lab</td>
<td>0 0 3 3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sessional:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>MC MC381</td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total practical</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total 3rd Semester</td>
<td>35</td>
<td>29</td>
</tr>
</tbody>
</table>
Syllabus:

Paper Name: Mathematics-III
Paper Code: M 301
Contact: L-T-P: 3L-0T-0P
Total Lectures: 44L
Credits: 4

Prerequisite: Any introductory course on Calculus and Combinatorics.

Course Objective: The purpose of this course is to provide fundamental concepts of Fourier Series & Fourier Transform, Calculus of Complex Variables, Probability Distribution, Correlation & Regression, Ordinary Differential Equation, Partial Differential Equations.

Course outcome:

On successful completion of the learning sessions of the course, the learner will be able to:


M 301.2: Understand the theoretical workings of mathematical approaches like Fourier Series & Fourier Transform, Calculus of Complex Variables, Probability Distribution, Correlation & Regression, Ordinary Differential Equations, and Partial Differential Equations to evaluate the various measures in related field.

M 301.3: Apply various principles of Fourier Series & Fourier Transform, Calculus of Complex Variables, Probability Distribution, Correlation & Regression, Ordinary Differential Equations, Partial Differential Equations to solve various problems.

MODULE I:

Fourier Series and Fourier Transform:


Fourier Transform:


Discussions on application of the topic related to EIE
MODULE II:


Discussions on application of the topic related to EIE

MODULE III:

Calculus of Complex Variable


Complex Integration.


Zeros and Singularities of an Analytic Function & Residue Theorem.

Zero of an Analytic function, order of zero, Singularities of an analytic function. Isolated and non-isolated singularity, essential singularities. Poles: simple pole, pole of order m. Examples on determination of singularities and their nature. Residue, Cauchy’s Residue theorem (statement only), problems on finding the residue of a given function, Introduction Conformal transformation, Bilinear transformation, simple problems.

Discussions on application of the topic related to EIE

MODULE IV:

Basic concepts of Partial differential equation (PDE):

Origin of PDE, its order and degree, concept of solution in PDE. Introduction to different methods of solution: Separation of variables, Laplace & Fourier transforms methods.

Topic: Solution of Initial Value & Boundary Value PDE’s by Separation of variables, Laplace & Fourier transform methods.

PDE I: One dimensional Wave equation.
PDE II: One dimensional Heat equation.
PDE III: Two dimensional Laplace equations.

**Introduction to series solution of Ordinary differential equation (ODE):** Validity of the series solution of an ordinary differential equation. General method to solve $P_0 y''+P_1 y'+P_2 y=0$ and related problems to Power series method. Brief review on series solution of Bessel & Legendre differential equation. Concepts of generating functions.

**Discussions on application of the topic related to EIE**: 12L

**Text Books:**
1. Rathor, Choudhari.: Descrete Structure And Graph Theory.
10. West D.B.: Introduction to Graph Theory - Prentice Hall
11. Deo N: Graph Theory with Applications to Engineering and Computer Science - Prentice Hall.
14. Jana- Undergraduate Mathematics
15. Lakshminarayan- Engineering Math 1.2.3
16. Gupta- Mathematical Physics (Vikas)
17. Singh- Modern Algebra
18. Rao B: Differential Equations with Applications & Programs, Universities Press
19. Murray: Introductory Courses in Differential Equations, Universities Press
22. Chowdhury: Elements of Complex Analysis, New Age International
23. Bhat: Modern Probability Theory, New Age International
26. Dhami: Differential Calculus, New Age International
CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 301.1</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>M 301.2</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>M 301.3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

Name of the Paper: Numerical Methods
Paper Code: M(CS)301
Contact (periods/week): L-T-P: 3L -0T-0P
Credit point: 3
Number of lectures: 33L

Prerequisite: Concept of Calculus and Algebra.

Course Objective:

The purpose of this course is to provide basic understanding of the derivation and the use of the numerical methods along with the knowledge of finite precision arithmetic.

Course outcome:

On successful completion of the learning sessions of the course, the learner will be able to:

M(CS)301.1: Recall the distinctive characteristics of various numerical techniques and the associated error measures.

M(CS)301.2: Understand the theoretical workings of various numerical techniques and to solve the engineering problems.

M(CS)301.3: Apply the principles of various numerical techniques to solve various problems.

MODULE I: NUMERICAL METHOD I

Approximation in numerical computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic. (2L)

Interpolation: Newton forward/backward interpolation, Stirling & Bessel’s Interpolation formula, Lagrange’s Interpolation, Divided difference and Newton’s divided difference Interpolation. (7L)

Numerical integration: Newton Cotes formula, Trapezoidal rule, Simpson’s 1/3 rule, Weddle’s Rule, Romberg Integration, Expression for corresponding error terms. (5L)

Numerical solution of a system of linear equations: Gauss elimination method, Tridiagonal matrix algorithm, LU Factorization method, Gauss-Seidel iterative method, Successive over Relaxation (SOR)
MODULE II: NUMERICAL METHOD II

Solution of polynomial and transcendental equations: Bisection method, Regula-Falsi, Secant Method, Newton-Raphson method.


Text Books:
2. C. Xavier: C Language and Numerical Methods, New age International Publisher.
3. Dutta & Jana: Introductory Numerical Analysis. PHI Learning
5. Jain, Iyengar & Jain: Numerical Methods (Problems and Solution), New age International Publisher.

References:
1. Balagurusamy: Numerical Methods, Scitech. TMH
2. Baburam: Numerical Methods, Pearson Education.
6. Numerical Analysis, Shastri, PHI
10. Programmed Statistics (Questions – Answers), G.S. Rao, New Age International
11. Numerical Analysis & Algorithms, Pradeep Niyogi, TMH
13. Numerical Methods, Arumugam, Scitech Publication
15. Numerical Methods in Computer Application, Wayse, EPH

CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>M(CS) 301.1</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M(CS) 301.2</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M(CS) 301.3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Course Objective:

1. Provide a strong foundation on Linear Circuits.
2. Familiarize students with applications of various IC’s.
3. Having a broad coverage in the field that is relevant for engineers to design Linear circuits using Op-amps.
4. Familiarize the conversion of data from Analog to Digital and Digital to Analog.

Course Outcome:

EI 301.1: Define significance of Op Amps and their importance.
EI 301.2: Circuit building using Analog IC’s.
EI 301.3: In-depth knowledge of applying the concepts in real time applications.
EI 301.4: Ability to use OP Amp as Summer, Subtractor, Multiplier and Divider.
EI 301.5: Able to use OP Amp to generate sine waveform, Square wave form, Triangular wave forms.
EI 301.6: Able to use OP Amp to as analog to digital and digital to analog converter.
EI 301.7: Design and explain the Analog to Digital conversion operation and vice versa.

Module I:

Small signal amplifiers: Introduction to Analog Integrated Circuits, BJT Modeling- hybrid model of transistors; Emitter follower circuits, High frequency model of transistors. FET Small signal analysis - Source follower

Module II:

Transistor Amplifiers: RC coupled amplifier, functions of all components, equivalent circuit, derivation of voltage gain, current gain, input impedance and output impedance, frequency response characteristics, lower and upper half frequencies, bandwidth, and concept of wide band amplifier.

Feedback Amplifiers & Oscillators: Feedback concept, Voltage series-shunt, current series-shunt feedback Configurations, Berkhausen criterion, Colpitts, Hartley’s, Phase shift, Wien bridge and crystal oscillators

Module III:

Operational Amplifier: Introduction to Integrated Circuits, Differential Amplifier, Constant current source (current mirror etc.), level shifter, CMRR, Open & Closed loop circuits, importance of feedback
Applications of Operational Amplifiers: analog adder, subtractor, integrator, differentiator, comparator, Schmitt Trigger. Instrumentation Amplifier, Log & Anti-log amplifiers, Analog multiplier, Precision Rectifier, voltage to current and current to voltage converter, free running Multivibrator, zero crossing detector

Multivibrator – Monostable, Bistable, Astable multivibrators; Monostable and astable operation using 555 timer.

Module IV:

Large signal Amplifiers: Introduction to power amplifiers (Class A, B, AB)

Power Supply:
Analysis for DC voltage and ripple voltage with C, L-C and C-L-C filters in Rectifier Circuit - Regulated dc power supplies - Line regulation, output resistance and temperature coefficient, Series and Shunt Voltage Regulation – percentage regulation, Fixed output voltage IC regulator 78xx and 79xx series, Adjustable output voltage regulator, LM 337 series power supply ICs, Concept of Switched Mode Power Supply

Text Books:
5. “Operational Amplifiers and Linear Integrated Circuits” by Robert F. Coughlin, Frederick F. Driscoll

Reference Books:
1. Rashid-Microelectronic Circuits- Analysis and Design- Thomson(Cenege Learning)
2. Linear Integrated Circuits – D. Roy Choudhury & Shail B. Jain
3. Analog Integrated Circuits – J. B. Gupta

CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI301.1</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EI301.2</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EI301.3</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EI301.4</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
Name of the Paper: Digital Electronic Circuits
Paper Code: EI 302
Contact (periods/week): L-T-P: 3L
Credit point: 3
Number of lectures: 35

Course Objective:

1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
2. To introduce number systems and codes
3. To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
4. To introduce the methods for simplifying Boolean expressions
5. Give students the basic tools for the analysis and design of combinational circuits and sequential circuits
6. To introduce the concept of memories, programmable logic devices and digital ICs.
7. To acquire the knowledge of Digital-to-Analog Conversion, Analog-to-Digital Conversion.

Course Outcome:

EI 302.1: On completion of this course, the students have a thorough understanding of the fundamental concepts and techniques used in digital electronics.

EI 302.2: To understand and examine the structure of various number systems and its application in digital design.

EI 302.3: The ability to understand, analyse and design various combinational and sequential circuits.

EI 302.4: Ability to identify basic requirements for a design application and propose a cost effective solution.

EI 302.5: The ability to identify and prevent various hazards and timing problems in a digital design.

EI 302.6: To develop skill to build, and troubleshoot digital circuits.

EI 302.7: Have knowledge on Programmable Logic devices and its usage.

Module 1:

Introduction:

Digital system, Comparison between Analog and Digital system, Logic level, Element of Digital Logic, Functions of Digital logic.

Data and number systems:

Number system: Binary, Octal and Hexadecimal representation and their conversions;
Number Representation: Signed binary number representation with 1’s and 2’s complement methods, Fixed point - Floating point
Binary Codes: BCD- Gray code- Excess 3 code- Alpha Numeric codes – Error detecting and correcting codes- properties
Binary Arithmetic: Addition, subtraction, Multiplication, Division, Addition and subtraction by 1’s and 2’s complement, BCD addition and subtraction
RAM-Static RAM and Dynamic RAM, ROM, EPROM, EEROM

**Boolean algebra:**
Theorems and operations, Boolean expressions and truth tables, Representation in SOP and POS forms Boolean functions; Minterm and Maxterm expansions Minimization of logic expressions by algebraic method, K-map method and Quine- McCluskey method
Various Logic gates- their truth tables and circuits; Design of circuits with universal gates. Exclusive-OR and Exclusive NOR and equivalence operations

**Module II:**
Design procedure–Adder: and Subtractor circuit: half and full adder and subtractor, BCD adder and subtractor, controlled inverter,
Convertors: BCD to excess-3 and vice versa, Binary to BCD, Gray to binary and viceversa.
Applications and circuits of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and Checker.

**Module III:**
Sequential Logic:
Various types of Registers and their design and application
Synchronous and Asynchronous counters, Irregular counter- counter design

**Sequential Circuits Design:** State diagrams and tables, transition table, excitation table, Examples using flip-flops. Analysis of simple synchronous sequential circuits, construction of state diagram, State Machine-Mealy and Moore machine

**Module IV:**
Memory Systems:
Programmable logic device: programmable read only memory, programmable logic arrays and programmable array logic, Design using PLA, PAL,PROM

**Logic families:**
TTL, ECL, MOS and CMOS, their operation and specifications: Logic levels, propagation delay time, power dissipation fan-out and fan-in, noise margin.
Implementation of Logic gate using TTL,MOS

**Different types of A/D and D/A :**
Conversion techniques: analog-to- digital (successive approximation, Dual slope, flash) and digital-to-analog converters (weighted R, R-2R ladder and current steering logic). Characteristics of ADC and DAC (resolution, quantization, significant bits, conversion/settling time)

**Text Books:**
1. A.Anand Kumar, Fundamentals of Digital Circuits- PHI
2 Morries Mano- Digital Logic Design- PHI
3. R.P.Jain—Modern Digital Electronics

Reference Books:
1. Digital Fundamental, Floyd-PHI
2. Digital, Principle and Application, Leach Malvino,Mcgraw Hill

CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI302.1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EI302.2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>EI302.3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>EI302.4</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>EI302.5</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Pre-Requisite: Concept of Basic electrical

Course Objective:

1. To prepare the students to have a basic knowledge in the analysis of Electric Networks
2. To solve the electrical network using mesh and nodal analysis by applying network theorems
3. To analyze the transient response of series and parallel circuits and to solve problems in time domain using Laplace Transform.
4. To understand the concept of resonance in series and parallel circuits.
5. To design various types of filters.
6. To relate various two port parameters and transform them.

Course Outcome:

On completion of this Subject/Course the student shall be able to:

EI 303.1: Solve complex circuit problem by applying knowledge of circuit theorems.
EI 303.3: Find out resonance of different circuit.
EI 303.4: Analyze two port networks using A,B,C,D and Z,Y Parameter Model.
EI 303.5: Design different types of filters.

Module I:
Introduction: Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems. Independent & Dependent sources, Source Transformation, Star-Delta conversation

Network equations: Kirchoff’s Voltage Law & Current Law, Formulation of network equations, Loop variable analysis, Supermesh Analysis, Node variable analysis, Supernode Analysis

Network theorem: Superposition, Thevenin’s, Norton’s,Maximum power transfer, Compensation & Reciprocity theorem. Millman’s theorem and its application. Solution of Problems with DC & AC sources.

Module II:
Laplace transforms: Concept of complex frequency, properties of Laplace Transform, Initial Value Theorem and Final Value Theorem, Concept of Convolution theorem and its application, Transformation of step, ramp, impulse, exponential, damped and undamped sine & cosine functions. Laplace Transform of Gate function & its application. Laplace transform of Periodic function. Inverse Laplace Transform, application of Laplace Transform in circuit analysis.

Module III:


Module IV:

Graph of Network: Concept of Tree, Branch, Tree link, junctions, Incident matrix, Tie-set matrix and loop currents, Cut-set matrix and node pair potentials, duality of networks, solution of problems. [4]

Coupled circuits: Magnetic coupling, Polarity of coils, Polarity of induced voltage, Concept of Self and Mutual inductance, Coefficient of coupling, Modeling of coupled circuits, Solution of problems. [4]

Filter Circuits: Analysis of Low pass, High pass, Band pass, Band reject, All pass filters (first and second order only) using operational amplifier. Solution of Problems [2]

Text Book:
1. Network Analysis, M.E.Van Valkenburg (Prentice H all)
3. Network and Systems, D.Roychowdhury,(New Age International)

References:
1. Network and Systems, Ashfaq Husain,(Khanna Book Publisher)
3. Circuits and Networks: Analysis and Synthesis Paperback , A. Sudhakar, Shyammohan S. Palli (TMH)

CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI303.1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI303.2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI303.3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI303.4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI303.5</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Name of the Paper: Electrical & Electronic Measurement &Instrumentation
Paper Code: EI304
Contact (periods/week): L-T-P: 3-1-0
Credit point: 4
Number of Lectures: 45

Course objective:

1. To understand students how different types of electrical and electronics meters work and their construction and applications.
2. To provide an extensive knowledge about standards and units of measurements.
3. To provide knowledge for the calibration and standardization of various instruments.
4. To provide students with opportunities to develop basic skills in the design of measuring equipments.
5. To familiarize the students with the available software for virtual instrumentation.

**Course Outcome:**

On completion of this Subject/Course the student shall be able to:

EI 304.1: Use instruments measuring instruments according to the need of specific application.

EI 304.2: Calibrate and standardize the instruments.

EI 304.3: Design measuring instruments on requirement basis.

EI 304.5: To measure different parameters from the simulated instrumentation systems using virtual instrumentation.

**Module I:**

**Introduction to Electrical & Electronic Measurement &Instrumentation**

Static and dynamic characteristics of measuring instruments: Definitions of accuracy, precision, hysteresis, nonlinearity, sensitivity, speed of response, fidelity, static and dynamic error, Statistical analysis of errors

Reliability, MTTF, Bath tub curve

**Introduction to electrical voltmeters and ammeters:** PMMC, MI, Electrodynamometer and Electrostatic instrument: Construction, Torque equation, Damping, range extension

**Module II:**

**Measurement of Resistance:** Wheatstone bridge & Kelvin’s Double bridge (DC Bridge), Loss of charge method, Meggar

**Measurement of Capacitance:** De Sauty’s bridge & Schering bridge (AC Bridge)

**Measurement of Inductance:** Anderson bridge & Maxwell’s inductance capacitance bridge (AC Bridge)

(*each bridge should cover: Bridge balance equation, Magnitude and phase balance of AC bridges, Phasor Diagram)

Localization of cable fault: Murray and Varley loop methods

Basic concept of Potentiometer, Wattmeter and Energy meter:

**Module III:**

PLL including VCO: Block diagram, circuit diagram, operation, modes Charge amplifier, Programmable gain amplifier
True RMS voltmeter, Digital Voltmeter, Average responding AC voltmeter and Peak responding AC voltmeters, Digital frequency meter including V to F, F to V

Q meter

**Module IV:**

Oscilloscopes and its applications: Oscilloscope Time Base, Triggering, Oscilloscope Controls, Oscilloscope Probes, Digital Storage Oscilloscope, Types of display devices. No of the lectures to be allotted for this section are

Distortion Analyzer and Spectrum Analyzer

Interference Signals and their eliminations

Introduction to Virtual Instrumentation

**Text Books:**
3. Helfrick A.D. & Cooper W.D. : Modern Electronic Instrumentation & Measuring Instruments; Wheeler
4. Bell, David : Electronic Instrumentation & Measurement, Reston Publishers
5. D.C. Patranabis, Principles of Electronic Instrumentation, PHI

**References:**
2. H.S. Kalsi, Electronic Instrumentation, Tata McGraw Hill

**CO-PO Mapping:**

<table>
<thead>
<tr>
<th>CO</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI 304.1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI 304.2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI 304.3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI 304.4</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Name of the Paper: Numerical Methods Lab
Paper Code: M(CS)391
Contact (periods/week): L-T-P: 0L -0T-3P
Credit point: 2
Number of lectures: 33L

**Prerequisite:** Any introductory course on C/ Matlab.

**Course Objective:** The purpose of this course is to provide basic programming skills for solving the problems in numerical methods.

**Course outcome:**

On successful completion of the learning sessions of the course, the learner will be able to:

M(CS) 391.1: Apply the programming skills to solve the problems using multiple numerical approaches.

M(CS) 391.2: Analyze if the results are reasonable, and then interpret and clearly communicate the results.

**List of Experiments:**

1. Assignments on Newton forward /backward, Lagrange’s interpolation, Sterling & Bessel’s Interpolation formula, Newton’s divided difference Interpolation.

2. Assignments on numerical integration using Trapezoidal rule, Simpson’s 1/3 rule, Weddle’s rule and Romberg Integration.


4. Assignments on numerical solution of Algebraic Equation by Bisection method, Regula-Falsi method, Secant Method, Newton-Raphson method


Analog Electronics Lab
Code : EI 391
Contacts: 3P
Credits: 2

Course Objective:

1. Understand the scope of modern electronics.
2. Describe models of basic components.
3. Design and construct simple electronic circuits to perform a specific function, e.g., designing amplifiers, ADC converters etc.
4. Understand capabilities and limitations and make decisions regarding their best utilization in a specific situation.

Course Outcome:

EI 391.1: Verify the working of diodes, transistors and their applications.
EI 391.2: Build a common emitter/base/collector amplifier and measure its voltage gain.
EI 391.3: Explore the operation and advantages of operational amplifiers.
EI 391.4: To design different types of filters and apply the same to oscillators and amplifiers.
EI Exploring the circuitry which converts an analog signal to

List of Experiments:

1. Study of ripple and regulation characteristics of full wave rectifier with and without capacitor filter
2. Construction of a R-C coupled amplifier & study of its input impedance, output impedance and frequency response
3. Study of timer circuit using NE555 & configuration for monostable & astable multivibrator
4. Study a linear voltage regulator using regulator IC chip
5. Construction of analog adder and subtractor using opamp
6. Construction of integrator and differentiator using opamp
7. Construction of precision rectifier using opamp
8. Construction of a simple function generator using opamp
9. Construction of a Schmitt trigger circuit using opamp
10. Design and testing of Wien bridge oscillator
11. Study and analysis of Instrumentation Amplifier
12. Extramural Experiment
Digital Electronic Circuits Lab
Code : EI 392
Contacts : 3P
Credits : 2

Course Objective:

1. To reinforce learning through hands-on experience with design, construction, and implementation of digital circuits.
2. To train students with all the equipment which will help in improving the basic knowledge

Course Outcome:

EI 391.1: Have an ability to operate laboratory equipment.
EI 391.2: Have an ability to the designed digital circuits
EI 391.3: Have an ability to construct, analyse, and troubleshoot the digital circuits.
EI 391.4: Have ability to measure and record the experimental data, analyse the results and prepare a formal laboratory report

List of Experiments:

1. Realization of basic gates using Universal logic gates
2. Code conversion circuits- BCD to Excess-3 & vice-versa
3. 4-bit parity generator & comparator circuits
4. Construction of simple Decoder & Multiplexer circuits using logic gates
5. Design of combinational circuit for BCD to decimal conversion to drive 7segment display using multiplexer
6. Construction of simple arithmetic circuits-Adder, Subtractor
7. Realization of RS-JK & D flip-flops using Universal logic gates
8. Realization of Universal Register using JK flip-flops & logic gates
9. Realization of Universal Register using multiplexer & flip-flops
10. Realization of Asynchronous and Synchronous Up/Down counter
11. Design of Sequential Counter with irregular sequences
12. Realization of Ring counter
13. Extramural Experiment
Circuits and Networks Lab
Code : EI 393
Contacts : 3P
Credits : 2

Course Objective:
1. To acquaint students with the simulation software such as MATLAB to carry out design experiments as it is a key analysis software of engineering design
2. To generate different signals and transform those to s-domain using MATLAB
3. To verify various network theorem and other network aspects using SIMULINK.
4. To provide basic laboratory experience with analyzing the frequency response of different filters using simulation software.

Course Outcome: On completion of this Subject/Course the student shall be able to:

EI 393.1: Use the techniques and skills of modern engineering tools necessary for engineering practice.
EI 393.2: Identify, formulate and solve engineering problems with simulation.
EI 393.3: Find transient response of series/parallel R-L-C circuit using simulation software.
EI 393.4: Find frequency response of different filters using simulation software.

List of Experiments:
1. Introduction to MATLAB
2. Generation of Periodic, Exponential, Sinusoidal, Damped sinusoidal, Step, Impulse, Ramp signals using MATLAB in both discrete and analog form.
3. Verification of Network Theorems using simulation software.
4. Determination of Laplace transform and inverse Laplace transformation using MATLAB.
5. Transient response in R-L and R-C Network: Simulation/hardware.
7. Determination of Impedance (Z) and Admittance(Y) parameters of two port network.
10. Evaluation of convolution integral for periodic & non-periodic signal using MATLAB.
11. Extramural Experiment.
Technical Skill Development  
Paper Code: MC 381  
Contact (periods/week): L-T-P: 2-0-0  
Credit point: 0

**Course Objective:**

1. Developing Knowledge about basic signal concept.
2. Understanding the LTI system modelling using MATLAB
3. The knowledge about the application and use of mathematical transforms.
4. Development of the mathematical skills to solve problems involving convolution using MATLAB

**Course outcome:**

MC 381.1: Student will be able to Explain commonly used signals through mathematically

MC 381.2: Student will be able to determine the response of LSI system using convolution.

MC 381.3: Student will use the tool to analyse continuous-time and discrete-time Fourier series.

MC 381.4: Student will be able to develop the continuous-time and discrete-time signals and systems.

**Module I:**

Skill development for signal simulation and analysis using MATLAB [14]

**Text Book:**

1. Linear System and Signals, 2nd Edition by B.P.Lathi, Oxford University Press
2. Signals and systems with MATLAB computing and simulink modeling- Steven T. Karris, Orchard Publications
### Mapping of CO- PO-PSO

<table>
<thead>
<tr>
<th>COs for the course</th>
<th>Statement</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC381. 1</td>
<td>Analyze the properties of different Continuous Time signals</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MC381. 2</td>
<td>Demonstrate the properties of different Continuous systems</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MC381. 3</td>
<td>Determine Continuous Time signals &amp; systems in Time domain</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>MC381. 4</td>
<td>Investigate Continuous Time systems in the Frequency domain using Fourier Analysis tools</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Autonomy curriculum of 2\textsuperscript{nd} Year, 4\textsuperscript{th} semester

Applied Electronics & Instrumentation Engineering

2\textsuperscript{nd} Year: 4\textsuperscript{th} SEMESTER

A: THEORY:

<table>
<thead>
<tr>
<th></th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BS</td>
<td>PH401</td>
<td>Physics – II</td>
<td>L:3, T:0, P:0, Total:3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>PC</td>
<td>EI 401</td>
<td>Sensors and Transducers</td>
<td>L:3, T:1, P:0, Total:4</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>PC</td>
<td>EI 402</td>
<td>Microprocessors and Microcontrollers</td>
<td>L:3, T:1, P:0, Total:4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>PC</td>
<td>EI403</td>
<td>Electromagnetic Theory and Transmission Line</td>
<td>L:3, T:0, P:0, Total:3</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Theory: 14

B. PRACTICAL & SESSIONAL:

<table>
<thead>
<tr>
<th></th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BS</td>
<td>PH 491</td>
<td></td>
<td>L:3, T:0, P:0, Total:3</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>PC</td>
<td>EI 491</td>
<td>Sensors and Transducers Lab</td>
<td>L:0, T:0, P:3, Total:3</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>PC</td>
<td>EI 492</td>
<td>Microprocessor and Microcontrollers Lab</td>
<td>L:0, T:0, P:3, Total:3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>PC</td>
<td>EI 493</td>
<td>Electrical &amp; Electronic Measurement &amp; Instrumentation Lab</td>
<td>L:0, T:0, P:3, Total:3</td>
<td>2</td>
</tr>
</tbody>
</table>

Sessional:

<table>
<thead>
<tr>
<th></th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>HU</td>
<td>HU 481</td>
<td>Technical report writing &amp; language practice</td>
<td>L:0, T:0, P:2, Total:2</td>
<td>1</td>
</tr>
</tbody>
</table>

Total practical: 14  
Total 4th semester: 28
**Paper Name:** Physics –II  
**Paper Code:** PH 401  
**Total Contact Hours:** 33  
**Credit:** 3

**Pre requisites:** Knowledge of Physics up B. Tech. 1st year Physics-I course

**Course Objective:**

The Physics-II course will provide

- exposure to the physics of materials that are applied in electrical engineering
- an insight into the science & technology of next generation and related technicalities through quantum mechanics
- advanced materials for electrical engineering
- concept of fundamental particles and associated applications in semiconductors

**Course Outcome**

**Course Outcome of Physics-II Course (Theoretical: PH 401)**

At the end of the course students’ would be able to

<table>
<thead>
<tr>
<th>PH401.1: state</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>➢ Basic postulates of Quantum Mechanics</td>
</tr>
<tr>
<td>➢ Macro state and micro state for thermodynamic system.</td>
</tr>
<tr>
<td>➢ Thermodynamic probability and phase space</td>
</tr>
<tr>
<td>➢ Properties of Nano material.</td>
</tr>
<tr>
<td>➢ Polarization</td>
</tr>
<tr>
<td>➢ Bloch Theorem</td>
</tr>
<tr>
<td>➢ Assumptions of Kronig-Penny Model</td>
</tr>
</tbody>
</table>
PH401.2: explain

- Energy levels and energy states.
- Distribution functions of Classical and quantum statistics.
- Concept of quantum well, quantum wire and quantum dots.
- Quantum confinement.
- Different types of polarizability.
- Dielectric loss.
- Ferroelectric and Piezoelectric materials.
- Ferromagnetic Hysteresis Loop
- E-k diagram and Brillouin zone and crystal momentum
- Nuclear Binding Energy

PH401.3: apply the knowledge of

- Schrödinger equation in problems of junction diode, tunnel diode, 1-D potential box, 3-D potential box.
- Nano-range and various types of nano materials.
- Fermi Dirac statistics to metals and semiconductors.
- Local electric field and Lorentz field in Clausius-Mossotti equation.
- M, B , H and χ in realizing Curie law for different magnetic materials
- Weiss molecular field theory in realizing Curie- Weiss law for Ferromagnetic materials
- Soft and hard ferromagnets in different storage devices and other applications.
- Free electron theory in deriving Weidemann and Franz law,
- Kronig-Penny Model to classify different solid materials (metal, semiconductor, and insulator) based on characteristics of allowed and forbidden energy band.

- Hall Effect to interpret its application in various real life situations.

- Liquid drop model in Nuclear Fission and Fusion

**PH401.4: Analyze**

- Behavior of dielectric under alternating field.

- Hysteresis curve to describe properties of hard and soft ferromagnets.

- Outcome of negative effective mass value to realize existence of both electron and holes in certain solids.

**PH401.5: to evaluate**

- Under certain conditions quantum statistics collapses to classical statistics

- Diamagnetic, Paramagnetic and Ferromagnetic materials.

- Sommerfeld’s energy quantization theorem to overcome the limitations of classical free electron theory (Drude’s Theory)

---

**Course contents**

**Module 1: Electric and Magnetic properties of materials (8L)**

**Module 1.01: Insulating materials:**

Dielectric Material: Concept of Polarization, the relation between \( D, E \) and \( P \), Polarizability, Electronic (derivation of polarizability), Ionic, Orientation & Space charge polarization (no derivation), behavior of Dielectric under alternating field (qualitative discussion only), Local electric field at an atom: Lorentz field, Lorentz relation; Dielectric constant and polarizability – Clausius-Mossotti equation (with derivation) ; Dielectric losses. ferroelectric and piezoelectrics (Qualitative study).

4L

**Module 1.02: Magnetic materials and storage devices:**
Magnetic Field & Magnetization M, relation between $B$, $H$, $M$. Bohr magneton, susceptibility, Diamagnetism- & Paramagnetism - Curie law (qualitative discussion), Ferromagnetism– Curie Temperature, Weiss molecular field theory (qualitative) & Curie-Weiss law, concept of $\theta_p$, Hysteresis, Hard ferromagnets, Comparison and applications of permanent magnets (storage devices) and Soft ferromagnets (Permalloys, Ferrites etc.) 4L

Module 2: Quantum Mechanics-II (7L)

Formulation of quantum mechanics and Basic postulates- superposition principle, orthogonality of wave function, expectation value; operator correspondence, Commutator. Measurements in Quantum Mechanics-Eigen value, Eigen function, Schrödinger’s equation as energy eigenvalue equation.

Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well: Discussion on degenerate levels), 1D finite barrier problem and concept of quantum tunnelling (solve only $E<V_0$). 3L

Module 3: Statistical Mechanics (6L)

Module 3.01: Basics of Statistical Mechanics:
Concept of energy levels and energy states, Microstates, macrostates and thermodynamic probability, MB, BE, FD, statistics (Qualitative discussions)- physical significance, conception of bosons, fermions, classical limits of quantum statistics, Fermi distribution at zero & non-zero temperature, Concept of Fermi level. 4L

Module 3.02: Applications of Statistical Mechanics:
Qualitative study: Fermi level in metals, total energy at absolute zero and total number of particles. Fermi level for intrinsic and extrinsic semiconductors (pictorial representations on temperature dependence and doping concentration viz. p type, n-type). 2L

Module 4: Elements of solid state physics (6L)

Module 4.01: Free electron theory (qualitative) - Electronic conduction in solids :Drude’s theory, Boltzmann equation, Wiedemann Frantz Law, Idea of quantization of energy-Sommerfeld theory. 3L

Module 4.01: Band theory of solids: Bloch Theorem-statement only, Kronig-Penny model (qualitative treatment)- Energy-band ($E$-$k$) diagram, allowed and forbidden energy bands, Brillouin Zone (qualitative study), Concept of effective mass – electrons and holes, crystal momentum, Hall effect-applications. 3L

Module 5: Physics of Nanomaterials (3L)

Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Quantum size effect and Quantum confinement. Carbon allotropes. Application of nanomaterials(CNT, grapheme, electronic, environment, medical). 3L

Module 6: Nuclear energy as future energy (3L)

Nuclear Binding Energy, Liquid drop model, Concept of Nuclear Fission, Nuclear Fusion & Energy output, Nuclear Reactor. 3L

Reference Books

4. Waves and oscillations, Dr.P.K Mittal & Prof Jai DEV ,AnandHarAnand publications
5. Fundamental of Statistical Mechanics: B Laud
6. Introduction to statistical mechanics : .Pathria
7. Fundamental of Statistical and Thermal Physics: .F. Reif
8. Electricity and Magnetism (In Si Units): Berkeley Physics Course - Vol.2, Edward M Purcell
9. Introduction to Electrodynamics- Griffiths David J.
11. Etching of Crystals-Theory, Experiment and Application, K Sangwal
12. Nanostructure and Nanomaterials, B.K. Parhasarathy
13. Introduction to Nanotechnology, B.K. Parhasarathy
14. Essentials of Nanotechnology, RishabhAnand
15. Nanomaterials Handbook(Advanced Materials and Technologies)-YuryGogotsi (Editor)
16. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)
17. 1. Nuclear Physics,Irvin Keplan
18. Nuclear Physics, J.Pearson, University of Manchester, 2008
19. Nuclear and Particle Physics, Jenny Thomas -University College London ,2000

**CO-PO Mapping:**

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH 401.1</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>PH 401.2</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>PH 401.3</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>PH 401.4</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 401.5</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>PH 401</td>
<td>2.6</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
Sensors and Transducers

Paper Code: EI 401

Contact (periods/week): L-T-P: 3L -1T-0P

Credit point: 4

Total number of lectures: 40

Course Objective:

1. To deals with various types of Sensors & Transducers and their working principle.
2. To deal with Resistive, Capacitive and Inductive transducers.
3. To deals with some of the miscellaneous transducers.
4. To know the overview of different advance sensors.

Course Outcome:

EI 401.1: Students should be able to illustrate the fundamental principles of various types of sensors.

EI 401.2: Students should be able to compare the different types of transducers available.

EI 401.3: Students should be familiar with criteria to recommend appropriate sensors to perform engineering tasks and scientific researches.

EI 401.4: Students will be able to understand the design of different Sensors.

EI 401.5: Student will be able to investigate the basics of modern sensors

Module I:

Introduction & Characteristics of Transducers

Introduction to sensors and transducers, Measurement system, Principles of sensing & transduction, Classification of sensors, Static characteristics, Dynamic characteristics: Zero, first order and second order measurement system, Response to impulse, step, ramp and sinusoidal inputs, sensitivity calculation, error estimation.

Resistive Sensing Element

Potentiometer: Loading effect, Strain gauge: theory, types, temperature compensation, applications: force, velocity and torque measurements.

Inductive Sensing Element

Self-inductive transducer, Mutual inductive transducers, Variable Reluctance type, Linear Variable Differential Transformer (LVDT): construction, Characteristic Curve, application: LVDT Accelerometer,
LVDT displacement sensors  

Module II:

Capacitive Sensing Element

Capacitive transducer: Variable Area Type, Variable distance type, Variable Permittivity type, calculation of sensitivities, applications.

Piezoelectric & Piezoresistive Sensing Element

Piezoelectric effects, charge and voltage coefficients, crystal model, materials, natural and synthetic types – their comparison, force and stress sensing, piezoelectric accelerometer, piezoresistive sensor.


Module III:

Optical Sensors

Light Dependent Resistor, Optocoupler, Photodiode, Phototransistor, Photomultiplier tube, solar cell.

Magnetic Sensors

Sensors based on Villari effect for assessment of force, torque, rpm meters, Hall effect and Hall drive, performance characteristics

Radioactive sensors

Gieger counter, proportional counter, Scintillation detection, Ionization chamber

Module IV:

Miscellaneous Sensors

IC temperature Sensor, Electrochemical Gas sensors, Fibre optic sensors- Thick film technology-MEMS sensors- Nano sensors- Sensors for intelligent systems- Introduction to Smart sensors and Sensor network.

TEXT BOOKS-

REFERENCES -


CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI 401.1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EI 401.2</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>EI 401.3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>EI 401.4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Microprocessors and Microcontrollers
Paper Code: EI 402
Contact (periods/week): L-T-P: 3L -1T-0P
Credit point: 4
Total number of lectures: 42

Course Objective:

1. To understand the architectures of 8085 & 8086 microprocessors and 8051 microcontroller.
2. To familiarize with the assembly level programming technique.
3. To understand interfacing of 8 bit microprocessor /microcontroller with memory and peripheral chips involving in system design.
4. To be able to design a microprocessor /microcontroller based system.

Course Outcome:

On completion of this course, students will be capable of

EI 402.1: Understanding the history and need of 8085/8086 microprocessors and 8051 microcontroller with their internal architecture and various addressing modes.

EI 402.2: Analyzing various instructions and programs.
EI 402.3: Applying the knowledge for communicating various real time applications through interfacing techniques

EI 402.4: Designing various systems based on microprocessors and microcontroller.

Module I:

Introduction to microprocessors:

Introduction to microprocessors, Evolution of microprocessors, The 8085 Internal architecture, Pin Diagram Instruction set and Assembly Language Programming. Addressing Modes.

Module II

Microprocessor Related Operations:

The 8085 microprocessor: Timing diagrams, Stack and subroutine related operation, Counter and Time delay generation, Interrupt systems, DMA operation, Introduction to Serial Communication

Module III

Peripherals interfacing techniques with 8085:


Module IV

Intel 8086/8088 Microprocessor:

Architecture, Register organization, Clock Generator, Resetting the microprocessor, Wait State Inserting, Bus Buffering, Pin details, Assembly Language Programming and Addressing Modes, Interrupts

Module V

Introduction to single chip microcontrollers:
Intel MCS-51 family features, 8051/8031 architecture, pin configuration, I/O ports and Memory organization. Instruction set and basic assembly language programming. Timer/Counter and Serial Communication, Interrupts

Assembly language programming using 8051:

Moving data, external data moves, code memory read only data moves, PUSH, POP, data exchanges

Logical instructions, Byte level, bit level instructions, ROTATE, SWAP instructions, Arithmetic instructions, Flags, incrementing, decrementing, addition, subtraction, multiplication, division, decimal arithmetic

Jump and Call instructions, Jump and Call ranges, subroutines and return instructions

MCS-51 applications: Square wave and pulse wave generation

12L

TEXT BOOKS-

1. Douglas V. Hall – Microprocessors & Interfacing, Tata McGraw-Hill


REFERENCES-

1. B.Ram, Fundamental of Microprocessor and Microcontrollers, Dhanpat Rai Publications.


3. Walter A. Tribel – The 8088 and 8086 Microprocessors, Pearson Education

4. Barry B. Brey – The Intel Microprocessors, PHI/Pearson Ed. Asia


7. Myke Predko, Programming and Customizing the PIC Microcontroller (Tab Electronics).
### CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI 402.1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI 402.2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI 402.3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EI 402.4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Electromagnetic Theory and Transmission Line

**Paper Code:** EI-403  
**Contact (periods/week):** L-T-P: 3-0-0  
**Credit point:** 3  
**Total number of lectures:** 35

#### Course Objectives:

1. To acquire the knowledge of Electromagnetic field theory that make the student to get a theoretical foundation to be able in the future to design emission, propagation and reception of electromagnetic wave systems

2. To identify, formulate and solve the problems related to fields and electromagnetic waves propagation in a multidimensional frame

3. Understand the basic concepts of electric and magnetic fields

4. To provide the students with a solid foundation in engineering fundamentals required to solve problems and also to pursue higher studies

5. Understand the concept of conductors, dielectrics, inductance and Capacitance, Gain knowledge on the nature of magnetic materials. Understand the concept of static and time varying fields.
**Course Outcomes:**

EI403.1: Student will be able to understand and interpret the physical meanings of gradient, divergence and curl, vector calculus and orthogonal coordinates.

EI403.2: Student will be able to understand steady fields and different associated laws, its applications and physical significances of Maxwell’s equations for static field.

EI403.3: Student will be able to understand the time varying fields and correlate the Poynting vector and Poynting theorem.

EI403.4: Student will be able to understand the thorough treatment of the theory of electro dynamics, mainly from a classical field theoretical point of view, and includes such things as electrostatics and magnetostatics, boundary conditions.

EI403.5: Student will be able to understand the wave equations, application of E.M. theory in transmission line, wave guide concept.

EI403.6: Student will be able to understand electromagnetic theory and explains universal concepts in three-dimension real world, i.e., electro-magnetic wave propagation in free-space, dielectrics, conductors.

**Module I**

Introduction to the Electromagnetic Theory,

Vector calculus – orthogonal Coordinate Systems, Curvilinear co-ordinate system (basics). Transformations of coordinate systems; Del operator; Gradient, Divergence, Curl – their physical interpretations; Divergence Theorem, Stoke’s Theorem, Laplacian operator

**Module II**

Coulomb’s law, electric field intensity, charge distribution.; Gauss’ law, flux density and electric field intensity.. Current Densities, Conductors, Poisson’s & Laplace’s equations, Uniqueness theorem, Biot-Savart law, Ampere’s law, Relation between J & H, Vector magnetic Potential. Maxwell’s equations for static field. Study of different Applications on static fields using MATLAB Programming

**Module III**

Faraday’s law & Lenz’s law, Displacement Current, J C – J D Relation, Maxwell’s equations for time varying field, Time harmonic fields, Maxwell’s equations for time harmonic field, Wave Equation, Boundary Conditions between media interface; Uniform Plane wave; Wave Propagation in Lossy Dielectric, Loss-less Dielectric, Free space, good conductor, skin effect and skin depth. Poynting Theorem, Power flow, Poynting vector. Wave polarizations
Module IV

Transmission Lines: Concept of Lump parameters and Distributed parameters, Line Parameters, Transmission line equations and solutions, Physical significance of the solutions. Propagation constant, Characteristic Impedance; Wavelength; Velocity of Propagation, group velocity, phase velocity; Distortion-less Line, Reflection and Transmission coefficients; Standing Waves, VSWR, Input Impedance, Smith chart, Load Matching Techniques.

Module V

Transmission line at microwave frequency; brief of rectangular waveguide, circular waveguide, resonators, concept of cavity, Basics of Antenna

Text Books:


References:

1. S.P.Seth, Elements of Electromagnetic Fields
2. Syed Hasan Saeed And Faiza naf Khan, Electromagnetic Field Theory
3. , G.S.N. Raju, Electromagnetics Field Theory & Transmission Lines, Pearson

CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO1 0</th>
<th>PO1 1</th>
<th>PO1 2</th>
<th>PSO 1</th>
<th>PSO 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI 403.1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI 403.2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EI 403.3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
**Paper Name:** Physics –II Lab  
**Paper Code:** PH 491  
**Total Contact Hours:** 33  
**Credit:** 2  

**Pre requisites:** Knowledge of Physics up B. Tech. 1st year Physics-I course  

**Course Objective:**  
The Physics-II course will provide  

- exposure to the physics of materials that are applied in electrical engineering  
- an insight into the science & technology of next generation and related technicalities through quantum mechanics  
- advanced materials for electrical engineering  
- concept of fundamental particles and associated applications in semiconductors  

**Course Outcome of Physics-II Course (Theoretical: PH 491)**  

At the end of the course students’ would be able to  

PH 491.1: demonstrate  

- Dipolar magnetic behavior  
- Action of capacitors  
- Fermi levels and band gap in a semiconductor  
- Function of Light emitting diode  
- Magnetic and semiconductor storage devices
✓ Motion of electron under cross fields

PH 491.2: conduct experiments using
  ➢ Insulators, Semiconductors (extrinsic and intrinsic), Light emitting diodes
  ➢ Cathode ray oscilloscope
  ➢ Various types of magnetic materials

PH 491.3: Function effectively as an individual, and as a member or leader in laboratory sessions

PH 491.4: communicate effectively, write reports and make effective presentation using available technology
  ➢ on presentation of laboratory experiment reports
  ➢ on presentation of innovative experiments

CO-PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH 491.1</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>PH 491.2</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>PH 491.3</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>PH (491.4)</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>PH 491</td>
<td>1.5</td>
<td>2</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Course contents

*At least 7 experiments to be performed during the semester

Experiments on Module 1: Electric and Magnetic properties of materials (8L)
1. Study of dipolar magnetic field behavior.
2. Study of hysteresis curve of a ferromagnetic material using CRO.
3. Use of paramagnetic resonance and determination of Lande-g factor using ESR setup.
5. Determination of dielectric constant of given sample (frequency dependent)/Measurement of losses in a dielectric using LCR circuits.

Experiments on Module 2: Quantum Mechanics-II (6L)
6. Determination of Stefan’s radiation constant.
7. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells & measurement of maximum workable power.
8. Measurement of specific charge of electron using CRT.

Experiments on Module 4: Solid state physics (9L)

10. Determination of Hall co-efficient of a semiconductor and measurement of Magnetoresistance of a given semiconductor
**In addition to regular 7 experiments it is recommended** that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

**Probable experiments beyond the syllabus:**
1. Determination of thermal conductivity of a bad conductor by Lees and Chorlton’s method.
2. Determination of thermal conductivity of a good conductor by Searle’s method.
3. Study of I-V characteristics of a LED.
4. Study of I-V characteristics of a LDR
5. Study of transducer property: Determination of the thermo-electric power at a certain temperature of the given thermocouple.

**Sensors and Transducers Lab**

**Code:** EI 491

**Contacts:** 3P

**Credits:** 2

**Course Objective:**

1. To identify suitable instruments to meet the requirements of industrial applications
2. To learn about Resistive, Capacitive and Inductive transducers
3. It knows practically about the transducer used for the measurement of speed and pressure.
4. It deals with characteristics of transducers.

**Course Outcome:**

EI 491.1: To enable the students practically to know about transducers and about the types of transducers and various transducers used for the measurement of various physical quantities.

EI 491.2: Students should be able to analyse the measurement results by using each of the transducers.

EI 491.3: Students should possess a reasonable level of competence in the design, construction, and execution of a sensor based project.

EI 491.4: Students should be able to design a mini project as per their understanding and competence.

**LIST OF EXPERIMENTS-**

1. Displacement measurement by using a capacitive transducer.
2. Pressure and displacement measurement by using LVDT.
3. Study of a load cell with tensile and compressive load.
4. Torque measurement Strain gauge transducer.
5. Speed measurement using magnetic proximity sensor.
6. Speed measurement using a Stroboscope.
7. Study of the characteristics of a LDR.
8. Pressure measurement using Piezo-electric transducer
9. Study of the Characteristics of Hall-effect transducer
10. Extramural experiment

REFERENCES-


Microprocessor and Microcontrollers Lab

Code :EI 492

Contacts : 3P

Credits : 2

Course Objective:

1. To enable the students analyze microprocessors and microcontrollers.
2. To grow programming concept using microprocessor.
3. To make students able to write programs, interface with peripherals and implement them in projects.
4. To be able to choice suitable microprocessors and microcontrollers for any design and implementations.
5. To be able to interfacing microprocessors and microcontrollers with peripherals device.

Course Outcome:

EI 492.1: Design microcontroller based innovative projects.
EI 492.2: To write any complex programs.
EI 492.3: To develop awareness for advantages and disadvantages using different series of microprocessors and microcontrollers.

LIST OF EXPERIMENTS-

1. Familiarization with 8085 and 8051 trainer kit components.

2. Program development using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) using 8085 trainer kit such as
   a) Addition and subtraction
   b) Copying and shifting a block of memory
   c) Packing and unpacking of BCD numbers
   d) Addition of BCD numbers
   e) Binary to ASCII conversions
   f) String matching
   g) Multiplication of two numbers
   h) Sorting of array of numbers

3. Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit, write subroutine for delay, reading switch state & glowing LEDs accordingly, finding out the frequency of a pulse train etc.

4. Study of 8051 Microcontroller kit and writing programs as mentioned in section 2.

5. Extramural experiment

REFERENCES-


Electronic Measurement &Instrumentation Lab

Code : EI 493

Contacts : 3P

Credits : 2
**Course objective:**

1. To understand how different types of bridge circuits are to be operated
2. To understand about different types of static and dynamic characteristics.
3. To understand the operation of VCO and PLL
4. To understand the operation of Digital Storage Oscilloscope
5. To familiarize the calibration procedure of different electrical meters

**Course outcome:**

On completion of this Subject/Course the student shall be able to:

EI 493.1: Calibrate different electrical meters.

EI 493.2: Use Digital Storage Oscilloscope for measuring and storing different waveforms.

EI 493.3: Measure different static and dynamic characteristics of any measuring instrument.

**List of Experiments:**

1. Measure the resistivity of material using Kelvin Double Bridge
2. Measurement of Capacitance by De Sauty Bridge
3. Calibrate dynamometer type Wattmeter by potentiometer
5. Measurement of Power using Instrument transformer
6. Study of Static Characteristics of a Measuring Instrument
7. Study of Dynamic Characteristics of a Measuring Instrument
10. Study of VCO (Voltage controlled oscillator) & PLL (Phase Locked Loop).
11. Familiarization with Digital Storage Oscilloscope.
12. Extramural experiment
Technical Report Writing & Language Practice
Code: HU481
Contact Hours/Week (P): 2
Credits: 1

Pre-requisite: A basic knowledge of listening and speaking skills and the ability to infer meaning from audio-video/online lessons.

Course Objective: By the end of the course the student should be able to
1. Understand and make use of a wide taxonomy of listening skills & sub-skills for comprehending & interpreting data in English
2. Speak in English, using appropriate vocabulary and pronunciation in contextualized situations
3. Understand and put into effective practice the pragmatics of Group Discussion
4. Understand and write a detailed technical report as per organizational needs
5. Understand and interact in professional presentations and interviews

Course outcome:
HU481.1: To maximize exposure and train students in the professional use of English in the globalized workplace.

Syllabus:

Module 1: The Need for a Language Laboratory [2L+2P]
(a)Introduction to the Language Lab
(b)Skill-building exercises in the lab

Module 2: Power Listening [2L+3P]
(a)Taxonomy of Listening Skills & Sub-skills [Aural Skimming, Scanning, Listening for Details, Note taking, Evaluative Listening, Empathetic Listening, Paralinguistic and Kinesic Inferencing]
(b)Audio-based Lessons
(c) Repairing Listening ‘Gaps’ through Learner Feedback

Module 3: Speaking Skills [2L+6P]
(a)The Need for Speaking: Content and Situation-based speaking
(b)Speaking Activities: [Just a Minute, Paired Role Play, Situational Speaking Exercises]
(c) The Pragmatics of Speaking—Pronunciation practice and learner feedback.

Module 4: Group Discussion [2L+6P]
(a)Teaching GD Strategies
(b)In-house video viewing sessions
(c) Group Activities [Topic Brainstorming, Situational Analysis, Frame Story]
(d)Extended Practice and feedback

Module 5: Writing a Technical Report[2L+6P]
(a)Organizational Needs for Reports and types
(b)Report Formats
(c)Report Writing Practice Sessions and Workshops

Module 6: SWOT Analysis [2L+3P]
(a)SWOT Parameters
(b)Organizational SWOT
(c) Case Study

Module 7: Presentation [2L+6P]
(a) Teaching Presentation as a Skill
(b) Speaking Strategies and Skills
(c) Media and Means of Presentation
(d) Extended Practice and Feedback

Module 8: Personal Interview [2L+3P]
(a) Preparing for the Interview: Interview Basics, Dressing and Grooming, Q & A
(b) Mock Interview sessions and feedback

**CO-PO Mapping:**

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO.1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CO.2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>CO.3</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>CO.4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CO.5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
### A. THEORY:

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>HS</td>
<td>HU501</td>
<td>Environmental Science</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>PC</td>
<td>EI 501</td>
<td>Industrial Instrumentation</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>PC</td>
<td>EI 502</td>
<td>Analog &amp; Digital Communication Theory</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>PC</td>
<td>EI 503</td>
<td>Control Engineering</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>PE</td>
<td>EI 504A / EI 504B / EI 504C</td>
<td>Digital Signal Processing/ Microwave Engineering/ Antenna Theory &amp; Propagation</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total Theory</strong></td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

### B. PRACTICAL & SESSIONAL:

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Field</th>
<th>Code</th>
<th>Subjects</th>
<th>Contact hours/week</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>PC</td>
<td>EI 591</td>
<td>Industrial Instrumentation Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>PC</td>
<td>EI 592</td>
<td>Analog &amp; Digital Communication Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>PC</td>
<td>EI 593</td>
<td>Control Engineering Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>PE</td>
<td>EI 594A / EI 594B / EI 594C</td>
<td>Digital Signal Processing Lab / Microwave Engineering Lab / Antenna &amp; Propagation Lab</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Sessional</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>MC</td>
<td>MC581</td>
<td>Technical Skill development-II</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total practical</strong></td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total 5th Semester</strong></td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>
ENVIRONMENTAL SCIENCE  
CODE: HU 501  
STREAMS: AEIE, ECE, EE  
CREDITS: 2L  
TOTAL CONTACT HOURS: 22

**Pre-requisite:** Basic knowledge of Chemistry & Mathematics

**Course Objective:**

1. Be able to understand the natural environment and its relationships with human activities.
2. Be able to apply the fundamental knowledge of science and engineering to assess environmental and health risk.
3. Be able to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues.
4. Be able to solve scientific problem-solving related to air, water, noise & land pollution.

**Course Outcome:**

HU501.1 : Study the mathematics and calculations of population growth, material balance and sustainable development.

HU501.2 : Study the components and diversity of eco system.

HU501.3 : Study the fundamental knowledge of air pollution, calculations of earth’s surface temperature, atmospheric window and lapse rate.

HU501.4 : Acquire fundamental knowledge of water pollution and its consequences knowledge and calculations regarding BOD, COD.

HU501.5 : Understand the basic concepts regarding noise and musical sound, decibel unit and its relation with sound intensity, reasons and consequences of noise pollution.

HU501.6 : Understand the concepts of land pollution and its remedies.

1. General  

1.1 **Natural Resources:** Forest Resource, water resource, mineral resource, energy resources (renewable, non-renewable, potentially renewable)  
1.2 **Population Growth:** Exponential Growth, logistic growth, Maximum sustainable yield  
1.3 **Disaster Management:** Types of disasters (Natural & Man-made), Floods, Earthquake, Tsunamis, Cyclones, landslides (cause, effect & control)  
1.4 **Ecology & Ecosystem:** Elements of ecology, definition of ecosystem- components types and function, Food chain & Food web, Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems  
1.5 **Environmental Management:** Environmental impact assessment, Environmental laws and protection act of India, Different international environmental agreement.

2. Air pollution and control
2.1 **Sources of Pollutants**: point sources, nonpoint sources and manmade sources primary & secondary pollutant

2.2 **Types of air pollutants**: primary & secondary pollutant; Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN, Smog (Photochemical smog and London smog).

2.3 **Effects on human health & climate**: Greenhouse effect, Global Warming, Acid rain, Ozone Layer Depletion

2.4 **Air pollution and meteorology**: Ambient Lapse Rate, Adiabatic Lapse Rate, Atmospheric stability & Temperature inversion

2.5 control of air pollution (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury)

3. **Water Pollution**

3.1 Classification of water (Ground & surface water)

3.2 Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, heavy metals, pesticides, volatile organic compounds.

3.3 **Surface water quality parameters**: pH, DO, 5 day BOD test, BOD reaction rate constants, COD. Numerical related to BOD

Lake: Eutrophication [Definition, source and effect].

3.4 **Ground water**: Aquifers, hydraulic gradient, ground water flow (Definition only),ground water pollution (Arsenic & Fluoride; sources, effects, control)

3.7 **Quality of Boiler fed water**: DO, hardness, alkalinity, TDS and Chloride

3.7 Layout of waste water treatment plant (scheme only).

4. **Land Pollution**

4.1 Types of Solid Waste: Municipal, industrial, commercial, agricultural, domestic, hazardous solid wastes (bio-medical), E-waste

4.2 Solid waste disposal method: Open dumping, Land filling, incineration, composting, recycling (Advantages and disadvantages).

5. **Noise Pollution**

5.1 Definition of noise, effect of noise pollution on human health,

5.2 Average Noise level of some common noise sources

5.3 Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, $L_{10}$ (18 hr Index).

5.4 Noise pollution control.

References/Books
2. Environmental Studies, Dr. J P Sharma, University Science Press
3. Environmental Engineering, J K Das Mohapatra, Vikas Publication
INDUSTRIAL INSTRUMENTATION
CODE: EI501
CONTACT: 3P
CREDITS: 3
TOTAL CONTACT HOURS: 35

Prerequisite: Knowledge of Sensor & Transducer

Course Objective:
1. To understand the importance of different industrial instruments.
2. To understand the working principle of different measuring instruments.
3. To measure different physical parameters like pressure, temperature, flow rate, level etc
4. To install the different instruments.

Course Outcome:

EI501.1: Able to explain working principle of different measuring instruments

EI501.2: Able to Describe the specification of different instruments and advantages and disadvantages.

C501.3: Able to Measure different physical parameters like pressure, temperature, flow rate, level etc

EI501.4: Able to install the instrument

Module I : Measurement of Pressure and Vacuum : [5L]
Manometers – U tube, Inclined Tube and Well type Manometers, Characteristics of Elastic Pressure Sensor, Bourdon Tube Pressure Gauge, Diaphragm, Bellows, Capsule Gauge, Differential Pressure Gauge, Pressure Switch, DP transmitters, McLeod Gauge, thermal conductivity gauge, ionization gauge.

Module II : Flow rate Measurement: [11L]
Types of Flow, Reynolds’s number, Bernoulli’s Equation, Calibration of flow meters,
Head type flow measurement – analysis and calculation - orifice, venturi, pitot tube, flow nozzle,
Variable Area Flowmeters – Glass and metal tube rotameters,
Mass flow meters : Coriolis, Thermal, Impeller type,
Electromagnetic type, Ultrasonic type, Positive displacement type

Module III : Level Measurement: [5L]
Gauge glass, Bi-Colour, Magnetic and Reflex Level Gauge, Float and displacers type instruments,
Hydrostatic type level measurement, Capacitive type level instrument, Ultrasonic and Microwave type level instruments

Module IV : Temperature Measurement: [9L]
Temperature scale, Thermometers: Liquid, vapour and gas filled: construction details and comparison, Bimetal elements, Thermostats,
RTD: review of materials, construction, types; measuring circuits, ranges, errors and minimization of errors,
Thermocouples: types, thermoelectric power, circuits, ranges, errors, cold junction compensation, compensating cables, Linearization techniques of thermocouples, Thermopile, thermowell. Thermistors, Radiation Thermometer sensors: spectral and other characteristics, Pyrometers.

Module V: [5L]
Installation of pressure measuring instruments and Temperature elements
Pneumatic Instrumentation : Flapper nozzle system - pneumatic force balance and motion balance system, Pneumatic Transmitter.
Hazardous Area Instrumentation: Basic Concept

Text Books:
2. S.K.Singh:’Industrial instrumentation And Control’ TMH, New Delhi, Third edition,
8. CO-PO matrices of courses HU501

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>HU501.1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>HU501.2</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HU501.3</td>
<td>2</td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HU501.4</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EI502: ANALOG & DIGITAL COMMUNICATION THEORY
CONTACT: 3L
CREDITS: 3
TOTAL CONTACT HOURS: 34

Prerequisite: Signals and Systems, Analog and digital electronic circuits

Course Objectives:
1. To understand the building blocks of communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal flow in a communication system.
4. To analyze error performance of a communication system in presence of noise and other interferences.
5. To understand concept of spread spectrum communication system.

Course Outcome

C502.1: Able to analyze the performance of a baseband and pass band communication system in terms of error rate and spectral efficiency.
C502.2: Able to perform the time and frequency domain analysis of the signals in a communication system.
C502.3: Able to select the blocks in a design of communication system.
C502.3: Able to analyze Performance of spread spectrum communication system.

Module I: Elements of communication system: [10L]

The basic elements of a communication system, Concept of transmitter and receiver, origin of noise and its effects in communication system, Concept and effects of SNR and its importance in system design. Linear (AM) modulation, Generation and demodulation of AM wave. Concept of DSBSC, SSBSC and brief discussion of VSBSC. Concept of QAM. Basic principle of nonlinear (FM, PM) modulation and their relations. Generation and demodulation of FM waves.

Module II: Sampling and Pulse Modulation techniques: [8L]

Sampling theorem, sampling rate, impulse sampling, natural & flat topped sampling, reconstruction of signal from samples, Concept of Aliasing and anti-aliasing filter. Quantization noise, Uniform quantization, Non-uniform quantization, A-law and µ-law. A/D and D/A conversion techniques, Concept of Bit rate, Baud rate, M-ary encoding. Analog pulse modulation-PAM, PWM, PPM. Fundamentals of PCM, Block diagram of PCM, basic concept of Delta modulation, Adaptive delta modulation. Introduction to DPCM. Different types of multiplexing: TDM, FDM.

Module III: Digital Transmission: [8L]

Basic concept of Digital communication, comparative study of digital communication and analog communication.
Encoding, coding efficiency. Line coding & its desirable properties, Different types of line coding: NRZ & RZ, AMI, Manchester coding and their spectra.
Base band pulse transmission, optimum filter, Matched filter and correlation filter, Inter Symbol Interference (ISI), Eye pattern, Signal power in binary digital signal.

Module IV: Digital carrier modulation & demodulation technique: [4L]
Introduction to the digital modulation techniques- ASK, FSK, PSK, BPSK, QPSK, M-ary PSK and their comparisons.
Basic concept of spread spectrum modulation and CDMA.

Module V: Introduction to coding theory: [4L]
Introduction, Measurement of Information and its unit, Entropy, Mutual information, Information rate, Basic principle of error control & error correction coding.

Text Books:
1. Modern Digital and Analog Communication systems, B.P. Lathi, Oxford University press
2. An Introduction to Analog and Digital communication, Simon Haykin, Wiley India.
3. Analog communication system, P. Chakrabarti, Dhanpat Rai & Co.

Reference Books:
2. Communication Systems (Analog and Digital), Dr. Sanjay Sharma, S. K. Kataria & Sons

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>C502.1</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>C502.2</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>C502.3</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>C502.4</td>
<td>1</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
CONTROL ENGINEERING
CODE: EI 503
CREDITS: 3
TOTAL CONTACT HOURS: 33
Prerequisite:

1. Knowledge of Signals & Systems
2. Basic Elements & Laws of circuits and Networks
3. Laplace Transformation and its application in different networks

Course Objective:

1. To construct the model of a physical dynamical system by a linear time invariant ordinary differential equation.
2. To analyze the under-damped, over-damped and critically damped cases of a second order system in time domain.
3. To illustrate the effects of poles and zeros location in the s-plane on the transient and steady state behavior of a system.
4. To determine the system stability in frequency domain.
5. To explain the effects of Lead, Lag and Lag-Lead compensator on second order system.

Course Outcome:
The students will be:
EI503.1. Able to apply Laplace transform and state space techniques to model dynamic systems.
EI503.2. Able to understand of the fundamentals of control systems.
EI503.3. Able to determine the time domain responses of first and second-order systems.
EI503.4. Able to analyze the system behavior in frequency domain.
EI503.5. Able to manipulate the system stability using compensator.

Module I: [11L]

Module II: [8L]

Module III: [11L]

Text Books :

3. Automatic Control Systems [Farid Golnaraghi, Benjamin C. Kuo]
5. Automatic Control Engineering, 5th Edition by Raven, Francis H at Biblio

Reference Books :

2. Classical Feedback Control by B. Lurie and P. Enright

CO and PO Mapping:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI503.1</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>EI503.2</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>EI503.3</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>EI503.4</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EI503.5</td>
<td>3</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>PSO1</td>
</tr>
</tbody>
</table>
EI 504A : DIGITAL SIGNAL PROCESSING
CONTACT: 3L
CREDITS: 3
TOTAL CONTACT HOURS: 34

Prerequisite: Analog Electronics circuit, Signals & Systems, Analog Filters

Course Objective:

1. To develop the knowledge on signals used in digital signal processing.
2. To impart the knowledge of the principles of discrete-time signal analysis to perform various signal operations.
3. Apply the principles of Fourier transform analysis to describe the frequency characteristics of discrete-time signals and systems.
4. To study various sampling techniques and different types of filters.
5. To learn the use of computer programming tools to create, analyze process and visualize signals and to plot and interpret magnitude and phase of LTI system frequency responses.
6. To understand the architecture of a digital signal processor and some programming issues in fixed-point digital signal processor in real-time implementation.

Course Outcome:

The students will be able to:

EI 504A.1: Apply the knowledge about continuous and discrete time signals.
EI 504A.2: Understand the Fourier Transform, and examine the process of Quantization and the effects of finite register length.

EI 504A.3: Understand and implement DFTs on long data sets such as speech signals and images.

EI 504A.4: Develop different types of IIR filter structures and their implementations.

EI 504A.5: Determine and implement the appropriate type of design method for FIR filter.

EI 504A.6: Use of FFTs for efficient implementation of linear convolution.

EI 504A.7: Excel in fields such as speech processing, audio signal processing, digital image processing, video and audio compression.
Module I:
LTI systems: [6L]
Concept of signals & systems, digital signal processing and its relevance to digital communication. Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlap-add methods to compute convolution supported with examples and exercise, properties of convolution, interconnection of LTI systems with physical interpretations, stability and causality conditions, recursive and non recursive systems.

Module II:
Discrete Time Fourier Transform(DTFT): [2L]
Concept of frequency in discrete and continuous domain and their relationship (radian and radian/sec), freq. response in the discrete domain. Discrete system's response to sinusoidal/complex inputs (DTFT), Representation of LTI systems in complex frequency domain.

Discrete Fourier Transform: [8L]
Concept and relations for DFT/IDFT; Relation between DTFT & DFT; Twiddle factors and their properties; DFT/DFT as linear transformation and matrices; Computation of DFT/IDFT by matrix method; Properties of DFT – periodicity, linearity, time reversal, circular time & frequency shift, symmetry, circular symmetry, duality, multiplication of two DFTs, circulation convolution, circular correlation; Computation of circular convolution by graphical; Linear filtering using DFT, aliasing error, filtering of long data sequences- Overlap-Save and Overlap-Add methods.

Fast Fourier Transforms: [4L]
Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithm, signal flow graph, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations and exercises.

Module III:
Filter design: [6L]

Multirate Digital Signal Processing: [2L]
Introduction to multirate digital signal processing, Sampling rate conversion, multistage interpolator & decimator, digital filter banks.

Module IV:
Digital Signal Processor: [6L]
Elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor, writing of small programs.

Text Books:

**Reference Books:**
4. Digital Signal Processing: A. Nagoor Kani, TMH Education
5. Digital Signal Processing: S. Poornachandra & B. Sasikala, MH Education
7. Texas Instruments DSP Processor user manuals and application notes.
9. Modern Digital Signal Processing, V. Udayashankara, PHI Learning

**CO Mapping with POs & PSOs**

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PSO1</th>
<th>PSO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI 504A.1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>EI 504A.2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>EI 504A.3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>EI 504A.4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>EI 504A.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>EI 504A.6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
EI 504B: RF & MICROWAVE ENGINEERING
CONTACT: 3P
CREDITS: 3
TOTAL CONTACT HOURS: 34

Prerequisite: Analog Electronics circuit, Electrical and Electronic measurement systems, Transmission Line, Planar Transmission Line, Study of passive filter.

Course Objective:

1. To distinguish the RF & Microwave spectrum, Planar transmission lines and High frequency circuit elements.
2. To determine the Microwave passive components and Scattering matrix representation.
3. To illustrate the Microwave tubes, Semiconductor Microwave Devices.
4. To justify the microwave sensor and typical microwave test bench.

Course Outcome

EI504B.1: Able to understand and analyze Planar transmission lines and High frequency circuit elements.

EI504B.2: Able to illustrate the construction and working principle of Microwave tubes, Semiconductor Microwave Devices and their typical characteristics and applications.

EI504B.3: Able to understand the application of microwaves as a Duplexer, Radar etc.

EI504B.4: Able to demonstrate the measuring techniques of microwave devices such as Detector, Power meter and sensors, Slotted line, Spectrum analyzer, Mixer, Network analyzer.

Module I: Two Port RF Networks and Matching Techniques: [6L]
Introduction to RF & Microwave signal, Spectrum bandwidth and its necessity in communication system, Formulation of S- parameters, properties of S- matrix , S- matrices of series and shunt elements; Simulation of lumped elements; Impedance matching network design using lumped elements and quarter wave transformer microstrip line.

Module II: Microwave Passive Devices: [8L]
Microwave passive components and their S matrix representation: Waveguide attenuators, phase shifters, directional couplers, Magic tee, hybrid ring, circulators, isolators, filters design (maximally flat and equal ripple)using insertion loss method from low pass prototype design.

Module III: Microwave Active Devices [10L]
Vacuum Tubes: High frequency limitations; Principle of two cavity Klystron, Reflex Klystron, Traveling Wave Tube, Magnetron (only operating principles and applications).
Microwave Semiconductor Devices:
Principles of detector and varactor diodes, Construction and Operating principles of Gunn diode, IMPATT diode, PIN diode- characteristics and applications, Operating principles of microwave bipolar transistor, microwave field effect transistor ( MESFET).

Module IV: Applications of Microwaves [5L]
Radar systems-range equation, duplexer, pulse and CW radar; Principle of microwave communication, path loss; Industrial applications of microwaves- heating, thickness measurements, diathermy.
Module V: Instrumentations and Measurement Techniques: Detector, Power meter and sensors, Slotted line, Spectrum analyzer, Mixer, Network analyzer, Microwave measurements: VSWR, power- low, medium, and high; frequency and wavelength; impedance, attenuation, and Q.

Text Books:

Reference Books:

CO Mapping with POs & PSOs

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO1 0</th>
<th>PO1 1</th>
<th>PO1 2</th>
<th>PO1 3</th>
<th>PO2</th>
<th>PO2 1</th>
<th>PO2 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>C504B.1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C504B.2</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C504B.3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C504B.4</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C504B.5</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
PAPER NAME: ANTENNA THEORY & PROPAGATION
PAPER CODE : EI 504C
CONTACTS : 3L/WEEK
CREDITS :3
TOTAL CONTACT HOURS :34

Prerequisite:
Basic concept of electromagnetic wave, Maxwell's equation in differential and integral form and its interpretation. Vector calculus.

Course objectives:
1. To understand the fundamentals of antenna and its characteristics.
2. To understand the difference between different types of antenna and their characteristics
3. To understand radio wave propagation phenomena in communication systems
4. To understand the fundamentals of electromagnetic radiation with application to antenna theory and design

Course Outcome:
After successful completion of this course, students should be able to:
- EI 504C.1: To analyze the fundamentals of antenna theory.
- EI 504C.2: Understand the different types of antennas and the radiation mechanism.
- EI 504C.3: To expose students to examples of applications and various antenna types.
- EI 504C.4: Identify the atmospheric and terrestrial effects on radio wave propagation

Module -I [7L]
A. Antenna Introduction: Radiation of EM waves and introducing Antenna, Antenna in communication system; Its application.[2]
B. Antenna Characteristics: Radiation Pattern, Beam Width; Isotropic ,Omnidirectional radiation, Radiation Resistance and efficiency; Directivity and Gain; Impedance, VSWR, Polarization; Effective height and Receive Aperture; Noise Temperature of Antenna. [3]
C. Link Budget; Radiation Hazards. [2]

Module -II [7L]
A. Radiation fields of a Hertzian dipole(electric);Radiation fields and Characteristics of λ/2 dipole; discussion on λ/4 monopole antenna; Current distribution and Radiation patterns of center-fed dipoles of length λ, 3λ/2 and 2λ. Design of dipole antenna, Folded dipole, Yagi-uda Array [4]
B. Antenna Arrays: electric Field due to 2 element arrays, Pattern Multiplication; Uniform Linear Array: End fire and Broad side; Planar array;Phased array. [3]

Module-III [10L]
A. Characteristics , Properties: Travelling Wave Antenna, Helical Antenna, Loop Antenna, Electrically Short Antennas, Broad Band Antenna (Log periodic Antenna), Microstrip Patch Antenna (Broadband MSA). [6]
B. Radiation from an aperture: Sectoral and Pyramidal Horn Antennas, Parabolic and Corner Reflectors and feed systems. [4]

Module-IV [10L]

Text Books

Reference Books
1. Fields & Waves in Communication Electronics, S. Ramo, J. R. Whinnery & T. Van Duzer, John Wiley
2. Electromagnetic Waves, R K Shevgaonkar,– Tata-McGaw-Hill

CO-PO –PSO Mapping

<table>
<thead>
<tr>
<th>Course Outcome</th>
<th>Programme Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO PO 1 PO 2</td>
<td>PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO1 0 PO1 1 PO1 2 PSO 1 PSO 2</td>
</tr>
<tr>
<td>EI504C. 1</td>
<td>3 - 3 - 2 2 - 2 2 - - 1 3 3</td>
</tr>
<tr>
<td>EI504C. 2</td>
<td>- 3 - - 3 3 2 - 1 1 3 2</td>
</tr>
<tr>
<td>EI504C. 3</td>
<td>3 - 3 - 3 2 2 - - 2 3 3</td>
</tr>
<tr>
<td>EI504C. 4</td>
<td>- - 3 - 3 3 2 2 - 1 1 3 2</td>
</tr>
</tbody>
</table>
Course Objectives:
1. To understand the importance of calibration of different industrial instruments.
2. To measure different physical parameters like pressure, temperature, flow rate, level etc
3. To understand the working principle of different measuring instruments
4. To choose the suitable instrument for desired measuring parameter.

Course Outcomes:

EI 591.1: Able to calibrate different instruments.
EI 591.2: Able to measure different industrial parameter like pressure, temperature, flow, level etc.
EI 591.3: Able to understand the working principle of different instruments
EI 591.4: Able to choose the suitable instrument for desired measuring parameter.

Experiments:

1. Calibration of Pressure Gauge using Dead Weight Tester
2. Study of Thermocouple characteristics and Measurement of Temperature.
3. Study of Thermistor characteristics and Measurement of Temperature.
4. Study of RTD characteristics and Measurement of Temperature.
5. Measurement of temperature using AD590
7. Measurements of flow rate and velocity of fluid flow by Variable Area type flow meter.
9. Measurement of moisture using moisture analyzer
10. Measurement of viscosity
ANALOG & DIGITAL COMMUNICATION LAB
CODE: EI 592
CONTACT (PERIODS/WEEK): L-T-P: 0-0-3
CREDIT: 2

Course Objective:

The course objectives are to enable the students to
1. Understand the fundamental concepts of communication systems.
2. Understand and compare different analog modulation schemes.
3. Understand and compare different digital modulation schemes.
4. Understand the design tradeoffs and performance of communications systems.
5. Learn about practical communication systems

Course Outcome:

EI592.1: To learn signal and linear time invariant system properties.

EI592.2: Study, design, and build modulation systems examining trade-offs in different communication systems.

EI592.3: To be able to perform experiments in converting analog information into digital data via sampling, quantization, and coding.

EI592.4: To be able to choose necessary modulation technique for specific signal transmission.

Experiments:

1. Observation of modulation index in Amplitude modulation and construction of envelope for different values of modulation index.
2. Observation and generation of Double Side Band Suppressed Carrier (DSB-SC) signal.
3. Observation and generation of Single Side Band Suppressed Carrier (SSB-SC) signal.
4. Observation of Frequency Modulation & Demodulation and calculation of modulation index.
5. Generation of Time Division Multiplexing (TDM) & Demultiplexing interlacing several sampled signal using PAM.
6. To interpret Pulse Amplitude Modulation (PAM) and demodulation for various modulating voltages.
7. Generation of Pulse Width Modulation (PWM) and demodulation for various modulating voltages.
8. To analyze a FSK modulation system and interpret the modulated and demodulated waveforms.
9. Extramural experiments related to analog and digital communication.
CONTROL ENGINEERING LABORATORY
CODE: EI 593
CONTACT (PERIODS/WEEK): L-T-P: 0-0-3
CREDITS: 2

Prerequisite:
Use of MATLAB with SIMULINK for control system analysis and design.

Course Objective:
1. Will have a strong knowledge on MATLAB software.
2. They get the basic knowledge on practical control system and Design applications.
3. They get the knowledge of stability analysis of different control systems.

Course Outcome:
The students will be able to:

EI 593.1: Apply formulate transfer function for given control system problems.
EI 593.2: Demonstrate an understanding of the fundamentals of control systems.
EI 593.3: Determine time response of given control system model.
EI 593.4: Analyze the system behavior through Root Locus, Bode plots & Nyquist plot for a given control system model.

List of Experiments:
1. Familiarization with MATLAB & SIMULINK control system toolbox.
2. Study of impulse, step, ramp & sinusoidal response for first and second order system with unity feedback and calculation of parameters for different system designs.
5. Modelling of a second order system and its response analysis.
6. Simulation of impulse response for types 0, 1 and 2 with unity feedback using MATLAB.
7. Determination of root-locus, using MATLAB toolbox for a given second order transfer function and analysis of result.
8. Bode plot, using MATLAB toolbox for a given second order transfer function and analysis of result.
9. Nyquist plot using MATLAB toolbox for a given second order transfer function and analysis of result.
10. Study of position control system (AC/DC).
Course Objective:

1. The course aims at practical experience with the simulation and development of basic signal processing algorithms.
2. This imparts knowledge using standardized environments such as MATLAB and general-purpose DSP development kits.
3. The experiments cover fundamental concepts of digital signal processing like sampling and aliasing, internal arithmetic operations, digital filter design and implementation, signal generation.
4. It also delivers knowledge on different algorithms associated with filtering of long data sequences.

Course Outcome:
After completion of the laboratory course students will be able to:

EI594A.1: Analyze various signals in transform domain.

EI594A.2: Develop various DSP Algorithms using MATLAB functions.

EI594A.3: Enable students to analyze and design different signals using MATLAB.

EI594A.4: Understand and verify the properties of DFTs/IDFT.

EI594A.5: Apply knowledge to verify the different algorithms associated with digital filter design for various applications.

Experiments:

1. Sampled sinusoidal signal, various sequences and different arithmetic operations using MATLAB.
2. Convolution of two sequences using graphical methods and using commands- verification of the properties of convolution.
3. Z-transform of various sequences – verification of the properties of Z-transform.
4. Twiddle factors – verification of the properties.
5. DFTs / IDFTs using matrix multiplication and also using commands.
7. Verifications of the different algorithms associated with filtering of long data sequences and Overlap –add and Overlap-save methods.
8. Implementation of FFT of given sequence.
9. Implementation of LP & HP FIR filter for a given sequence.
10. Hardware Laboratory:
    Writing & execution of small programs related to arithmetic operations and convolution using Assembly Language of TMS320C 5416/6713 Processor.
EI 594B: RF & MICROWAVE ENGINEERING LAB
CONTACT: 3P
CREDITS: 2
CONTACT (PERIODS/WEEK): L-T-P: 0-0-3

Course Objective:

1. To understand the function and design of the major components in a wireless transceiver: oscillator, antenna, filter, and mixer.
2. To analyze passive and active devices in microwave subsystems.
3. To provide practical analysis of transmission lines and microwave circuits, hands-on training on engineering tools.
4. To obtain engineering design experience through team-based design projects.

Course Outcome:

EI594B.1: Able to Define, identify and list out special type transmission line, its characteristics in microwave frequencies and concept of load.

EI594B.2: Able to recognize, memorize, categorize, arrange and implement suitably the various microwave passive devices with the utilization of engineering mathematics.

EI594B.3: Able to analyse and use the various sources of microwave energy and the characters of its operation.

EI594B.4: Able to use, compute, solve, demonstrate and apply various hardware, software tools and measuring instruments in the field of Radio Frequencies, for the betterment of communication engineering, medical science and various domestic and commercial engineering.

Experiments:

1. Measurement of unknown impedance using shift in minima technique using a waveguide test bench/ Measurement of the susceptance of an inductive and or a capacitive window using shift in minima technique using a waveguide test bench
2. Study of the characteristics of a Reflex Klystron oscillator
5. Scattering matrix of a magic tee / E-plane tee / H-plane tee using waveguide test bench at X-band.
7. Measuring of dielectric constant of a material using waveguide test bench at X-band.
8. Study of Spectrum analyzer.
Course Objective:

1. Determination of the fields radiated from antennas; wire antennas; array antennas; antenna radiation pattern; antenna directivity.
2. To learn the basic working principle of antenna
3. To understand the various methods involved in the measurement of antenna parameters

Course Outcome:

EI 594C.1: Basic knowledge of radiation pattern, smith chart, azimuth and elevation plane, broadside and endfire radiation
EI 594C.2: Able to define, analyze and draw the radiation pattern of dipole antenna, Half wave dipole antenna, folded-dipole antenna
EI 594C.3: Able to define, analyze and draw the radiation pattern of N-element Yagi-Uda antenna
EI 594C.4: Basic understanding of performance parameter- Pyramidal Horn Antenna., Log Periodic antenna, broad side antenna array, end-fire antenna array
EI 594C.5: Able to do research and development with the utilization of engineering mathematics.

Experiments:

1. Radiation Pattern of dipole antenna.
2. To study and plot the radiation pattern of Half wave dipole antenna.
3. Radiation Pattern of a folded-dipole antenna.
4. Radiation pattern of a 3-element Yagi-Uda Antenna.
5. Radiation pattern of a 4-element Yagi-Uda Antenna.
6. Radiation pattern, Gain, Directivity of a Pyramidal Horn Antenna.
7. To study and plot the radiation pattern of Log Periodic antenna.
8. To study and plot the radiation pattern of broad side antenna array .
9. To study and plot the radiation pattern of end fire antenna array.
10. Study of Spectrum Analyzer.
MC581: DESIGN AND DEVELOPMENT OF IOT BASED INSTRUMENTATION SYSTEM
CONTACT: 2P
CREDITS: 0
TOTAL CONTACT HOURS: 20

Prerequisite:
1. Microprocessor, Microcontroller & Computer Networking

Course Objective:
1. To introduce IOT Devices.
2. To acquire the basic knowledge to design & develop IOT Devices.
4. To Understand Hardware platforms and operating systems commonly used in IoT systems.

Course Outcome:

After the completion of the course, the students will be

MC581.1: Able to understand the building blocks of IoT technology.
MC581.1: Able to understand the application areas of IOT.
MC581.1: Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.
MC581.1: Able to use processors & peripherals to design & build IoT hardware.

Module I: Introduction to IoT: [5L]
Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models, Machine-to-Machine Communications

Module II: Network & Communication aspects [4L]
Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery

Module III: Developing IOTs [6L]
Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino. Introduction to Python programming, Introduction to Raspberry Picture, developing sensor based application through embedded system platform, Implementation of IoT with Raspberry Pi

Module IV: Data handling & Domain specific applications of IoT [5L]
Data Handling and Analytics, Cloud Computing, Sensor cloud, Fog computing. Applications: Smart Cities and Smart Homes, Smart Grid, Industrial Io


**CO-PO-PSO mapping:**

<table>
<thead>
<tr>
<th>COs for Course C3</th>
<th>Statement</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
<th>PSO 1</th>
<th>PSO 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC581 :CO1</td>
<td>The students have ability to understand the building blocks of IoT technology</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>MC581 :CO2</td>
<td>The students have ability to understand the application areas of IOT</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>MC581 :CO3</td>
<td>The students have ability to realize the revolution of Internet in Mobile Devices, Cloud &amp; Sensor Networks.</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>MC581 :CO4</td>
<td>The students have ability to use processors &amp; peripherals to design &amp; build IoT hardware</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>