ANNA UNIVERSITY, CHENNAI
NON-AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY
REGULATIONS 2021
CHOICE BASED CREDIT SYSTEM

B.E. AERONAUTICAL ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

<table>
<thead>
<tr>
<th>I.</th>
<th>To employ comprehensive knowledge in Aeronautical Engineering and analytical skills to work towards solving complex problems to excel in the professional career.</th>
</tr>
</thead>
<tbody>
<tr>
<td>II.</td>
<td>To design, analyze and produce cutting edge engineering solutions by employing modern techniques and adhering to moral values for sustainable development.</td>
</tr>
<tr>
<td>III.</td>
<td>To assume global careers and leadership responsibilities through consistent learning with idealistic managerial practices.</td>
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PROGRAM OUTCOMES (POs):

<table>
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<th>PO#</th>
<th>Graduate Attribute</th>
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<tbody>
<tr>
<td>1</td>
<td><strong>Engineering knowledge</strong>: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.</td>
</tr>
<tr>
<td>2</td>
<td><strong>Problem analysis</strong>: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.</td>
</tr>
<tr>
<td>3</td>
<td><strong>Design/development of solutions</strong>: 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.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Conduct investigations of complex problems</strong>: 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.</td>
</tr>
<tr>
<td>5</td>
<td><strong>Modern tool usage</strong>: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.</td>
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<tr>
<td>6</td>
<td><strong>The engineer and society</strong>: 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.</td>
</tr>
<tr>
<td>7</td>
<td><strong>Environment and sustainability</strong>: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.</td>
</tr>
<tr>
<td>8</td>
<td><strong>Ethics</strong>: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.</td>
</tr>
<tr>
<td></td>
<td><strong>Individual and team work:</strong> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.</td>
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<tr>
<td>10</td>
<td><strong>Communication:</strong> 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.</td>
</tr>
<tr>
<td>11</td>
<td><strong>Project management and finance:</strong> 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.</td>
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<tr>
<td>12</td>
<td><strong>Life-long learning:</strong> 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.</td>
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</table>

**PROGRAM SPECIFIC OUTCOMES (PSOs):**

1. To gather data using modern tools and apply design techniques to develop solutions for challenges in the domain of Aerodynamics, Propulsion, Aircraft Structures and Aircraft Maintenance with professional ethics.

2. To function as engineering solution providers or entrepreneurs, who are able to manage, innovate, communicate, train and lead a team for continuous improvement.

3. Graduate will be able to work as a team member which will be a main requirement in industry or research organisation or in any business enterprise. This will pave the way for successful career for the graduate and also play a role for the success of the organisation in which the graduate is employed.

**PEO’s – PO’s & PSO’s MAPPING:**

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<tr>
<th>PEO</th>
<th>PO</th>
<th>PSO</th>
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## ANNA UNIVERSITY, CHENNAI
NON-AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY
B. E. AERONAUTICAL ENGINEERING
REGULATIONS 2021
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTERS I TO VIII AND SYLLABI FOR SEMESTERS I TO IV

### SEMESTER I

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<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
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*NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

§ Skill Based Course
### SEMESTER III

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### PRACTICALS

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|        |             |                                       |          |      |     |     |                  |         |
|        |             |                                       |          |      |     |     |                  |         |
|        |             |                                       |          |      |     |     |                  |         |
| 7.     | AS3361      | Thermodynamics and Strength of Materials Laboratory | PCC      | 0    | 0   | 4   | 4               | 2       |
| 8.     | CE3362      | Fluid Mechanics and Machinery Laboratory | PCC      | 0    | 0   | 4   | 4               | 2       |
| 9.     | GE3361      | Professional Development$              | EEC      | 0    | 0   | 2   | 2               | 1       |

**TOTAL** 19 2 10 31 26

$ Skill Based Course

### SEMESTER IV

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<th>S. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
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### PRACTICALS

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|        |             |                                       |          |      |     |     |                  |         |
|        |             |                                       |          |      |     |     |                  |         |
| 8.     | AE3411      | Aerodynamics Laboratory                 | PCC      | 0    | 0   | 4   | 4               | 2       |
| 9.     | AE3412      | Propulsion Laboratory                   | PCC      | 0    | 0   | 4   | 4               | 2       |

**TOTAL** 17 2 8 27 23

$ NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.
## SEMESTER V

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### PRACTICALS

|        |             |                            |          | L | T | P |                      |          |
| 7.     | AE3511      | Aircraft Structures Laboratory | PCC | 0 | 0 | 4 | 4                      | 2        |
| 8.     | AE3581      | CAD Laboratory             | PCC      | 0 | 0 | 4 | 4                      | 2        |

**TOTAL**  | - | - | - | - | 19  |

* Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC-I)

## SEMESTER VI

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### PRACTICALS

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| 9.     | AE3611      | Aircraft Design Project    | PCC      | 0 | 0 | 4 | 4                      | 2        |
| 10.    | AE3612      | Flight Training / Flight Simulation Laboratory | PCC | 0 | 0 | 4 | 4                      | 2        |

**TOTAL**  | - | - | - | - | 23  |

* Open Elective – I shall be chosen from the emerging technologies.

* Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under MC-II)

* NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA
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*If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.*

**Open Elective – II shall be chosen from the emerging technologies.**

***Open Elective III and IV (Shall be chosen from the list of open electives offered by other Programmes)**

# Elective - Management shall be chosen from the elective Management courses

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<tr>
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*If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII*

**TOTAL CREDITS: 166**
### MANDATORY COURSES I

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### ELECTIVE – MANAGEMENT

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Registration of Professional Elective Courses from Verticals:

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialisation / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI.

The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2021, Clause 4.10.
## PROFESSIONAL ELECTIVE COURSES: VERTICALS

### VERTICAL 1: COMPUTATIONAL ENGINEERING

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### VERTICAL 4: AVIONICS AND DRONE TECHNOLOGY

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### VERTICAL 5: AIRCRAFT MAINTENANCE

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### VERTICAL 6: DIVERSIFIED COURSES GROUP 1

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OPEN ELECTIVES

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories)

OPEN ELECTIVE I AND II
(EMERGING TECHNOLOGIES)
To be offered other than Faculty of Information and Communication Engineering

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<td>7</td>
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<td>8</td>
<td>Non-Credit / (Mandatory)</td>
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</tr>
</tbody>
</table>
ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes. Moreover, for minor degree the student can register for courses from any one of the following verticals also.

Complete details are available in clause 4.10 of Regulations 2021.

**VERTICALS FOR MINOR DEGREE (In addition to the all the verticals of other programmes)**

<table>
<thead>
<tr>
<th>Vertical I</th>
<th>Vertical II</th>
<th>Vertical III</th>
<th>Vertical IV</th>
<th>Vertical V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fintech and Block Chain</td>
<td>Foundations of Entrepreneurship</td>
<td>Principles of Public Administration</td>
<td>Statistics For Management</td>
<td>Sustainable infrastructure Development</td>
</tr>
<tr>
<td>Fundamentals of Investment</td>
<td>Team Building &amp; Leadership Management for Business</td>
<td>Constitution of India</td>
<td>Data Mining For Business Intelligence</td>
<td>Sustainable Agriculture and Environmental Management</td>
</tr>
<tr>
<td>Banking, Financial Services and Insurance</td>
<td>Creativity &amp; Innovation in Entrepreneurship</td>
<td>Public Personnel Administration</td>
<td>Human Resource Analytics</td>
<td>Sustainable Bio Materials</td>
</tr>
<tr>
<td>Introduction to Blockchain and its Applications</td>
<td>Principles of Marketing Management For Business</td>
<td>Administrative Theories</td>
<td>Marketing And Social Media Web Analytics</td>
<td>Materials for Energy Sustainability</td>
</tr>
<tr>
<td>Fintech Personal Finance and Payments</td>
<td>Human Resource Management for Entrepreneurs</td>
<td>Indian Administrative System</td>
<td>Operation And Supply Chain Analytics</td>
<td>Green Technology</td>
</tr>
<tr>
<td>Introduction to Fintech</td>
<td>Financing New Business Ventures</td>
<td>Public Policy Administration</td>
<td>Financial Analytics</td>
<td>Environmental Quality Monitoring and Analysis</td>
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<td>Integrated Energy Planning for Sustainable Development</td>
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<td>-</td>
<td>Energy Efficiency for Sustainable Development</td>
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</tbody>
</table>
(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

**VERTICAL 1: FINTECH AND BLOCK CHAIN**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
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<tbody>
<tr>
<td>1.</td>
<td>CMG331</td>
<td>Financial Management</td>
<td>PEC</td>
<td>3 0 0</td>
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<tr>
<td>2.</td>
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<td>Fundamentals of Investment</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
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</tr>
<tr>
<td>3.</td>
<td>CMG333</td>
<td>Banking, Financial Services and Insurance</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
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</tr>
<tr>
<td>4.</td>
<td>CMG334</td>
<td>Introduction to Blockchain and its Applications</td>
<td>PEC</td>
<td>3 0 0</td>
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<tr>
<td>5.</td>
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<td>Fintech Personal Finance and Payments</td>
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<td>6.</td>
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<td>Introduction to Fintech</td>
<td>PEC</td>
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**VERTICAL 2: ENTREPRENEURSHIP**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CMG337</td>
<td>Foundations of Entrepreneurship</td>
<td>PEC</td>
<td>3 0 0</td>
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<tr>
<td>2.</td>
<td>CMG338</td>
<td>Team Building &amp; Leadership Management for Business</td>
<td>PEC</td>
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<tr>
<td>3.</td>
<td>CMG339</td>
<td>Creativity &amp; Innovation in Entrepreneurship</td>
<td>PEC</td>
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<tr>
<td>4.</td>
<td>CMG340</td>
<td>Principles of Marketing Management For Business</td>
<td>PEC</td>
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<tr>
<td>5.</td>
<td>CMG341</td>
<td>Human Resource Management for Entrepreneurs</td>
<td>PEC</td>
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<tr>
<td>6.</td>
<td>CMG342</td>
<td>Financing New Business Ventures</td>
<td>PEC</td>
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### VERTICAL 3: PUBLIC ADMINISTRATION

<table>
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<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
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<th>CREDITS</th>
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<tbody>
<tr>
<td>1.</td>
<td>CMG343</td>
<td>Principles of Public Administration</td>
<td>PEC</td>
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<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>CMG344</td>
<td>Constitution of India</td>
<td>PEC</td>
<td>L: 3, T: 0, P: 0</td>
<td>3</td>
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</tr>
<tr>
<td>3.</td>
<td>CMG345</td>
<td>Public Personnel Administration</td>
<td>PEC</td>
<td>L: 3, T: 0, P: 0</td>
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<tr>
<td>4.</td>
<td>CMG346</td>
<td>Administrative Theories</td>
<td>PEC</td>
<td>L: 3, T: 0, P: 0</td>
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<td>5.</td>
<td>CMG347</td>
<td>Indian Administrative System</td>
<td>PEC</td>
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<tr>
<td>6.</td>
<td>CMG348</td>
<td>Public Policy Administration</td>
<td>PEC</td>
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### VERTICAL 4: BUSINESS DATA ANALYTICS

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
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<tbody>
<tr>
<td>1.</td>
<td>CMG349</td>
<td>Statistics For Management</td>
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<tr>
<td>2.</td>
<td>CMG350</td>
<td>Datamining For Business Intelligence</td>
<td>PEC</td>
<td>L: 3, T: 0, P: 0</td>
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<tr>
<td>3.</td>
<td>CMG351</td>
<td>Human Resource Analytics</td>
<td>PEC</td>
<td>L: 3, T: 0, P: 0</td>
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<tr>
<td>4.</td>
<td>CMG352</td>
<td>Marketing And Social Media Web Analytics</td>
<td>PEC</td>
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<tr>
<td>5.</td>
<td>CMG353</td>
<td>Operation And Supply Chain Analytics</td>
<td>PEC</td>
<td>L: 3, T: 0, P: 0</td>
<td>3</td>
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<tr>
<td>6.</td>
<td>CMG354</td>
<td>Financial Analytics</td>
<td>PEC</td>
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VERTICAL 5: ENVIRONMENT AND SUSTAINABILITY

<table>
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<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
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<th>CREDITS</th>
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<tr>
<td>1.</td>
<td>CES331</td>
<td>Sustainable infrastructure Development</td>
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<tr>
<td>2.</td>
<td>CES332</td>
<td>Sustainable Agriculture and Environmental Management</td>
<td>PEC</td>
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<td>3.</td>
<td>CES333</td>
<td>Sustainable Bio Materials</td>
<td>PEC</td>
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<tr>
<td>4.</td>
<td>CES334</td>
<td>Materials for Energy Sustainability</td>
<td>PEC</td>
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<tr>
<td>5.</td>
<td>CES335</td>
<td>Green Technology</td>
<td>PEC</td>
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<td>6.</td>
<td>CES336</td>
<td>Environmental Quality Monitoring and Analysis</td>
<td>PEC</td>
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<tr>
<td>7.</td>
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<td>Integrated Energy Planning for Sustainable Development</td>
<td>PEC</td>
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<tr>
<td>8.</td>
<td>CES338</td>
<td>Energy Efficiency for Sustainable Development</td>
<td>PEC</td>
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</table>
This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

“Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.”

“One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.”

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity
This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts
Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values
This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity
Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.
(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the underprivileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering /Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References:
Guide to Induction program from AICTE

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HS3151 PROFESSIONAL ENGLISH - I

OBJECTIVES:

- To improve the communicative competence of learners
- To learn to use basic grammatic structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners’ ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.
UNIT I  INTRODUCTION TO EFFECTIVE COMMUNICATION  
What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C’s of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

UNIT 1   INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION  
Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Why/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT II  NARRATION AND SUMMATION  
Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

UNIT III  DESCRIPTION OF A PROCESS / PRODUCT  
Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

UNIT IV  CLASSIFICATION AND RECOMMENDATIONS  
Reading – Newspaper articles; Journal reports –and Non Verbal Communication (tables, pie charts etc.). Writing – Note-making / Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from non verbal ( chart , graph etc, to verbal mode) Grammar –Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.

UNIT V  EXPRESSION  
Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.

TOTAL : 45 PERIODS

LEARNING OUTCOMES :
At the end of the course, learners will be able
- To use appropriate words in a professional context
- To gain understanding of basic grammatic structures and use them in right context.
- To read and infer the denotative and connotative meanings of technical texts
- To write definitions, descriptions, narrations and essays on various topics

TEXT BOOKS :
1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.
REFERENCE BOOKS:

ASSESSMENT PATTERN
Two internal assessments and an end semester examination to test students’ reading and writing skills along with their grammatical and lexical competence.

MA3151 MATRICES AND CALCULUS
L T P C
3 1 0 4

COURSE OBJECTIVES:
- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT - I MATRICES
9+3

UNIT - II DIFFERENTIAL CALCULUS
9+3

UNIT - III FUNCTIONS OF SEVERAL VARIABLES
9+3

UNIT - IV INTEGRAL CALCULUS
9+3
Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications : Hydrostatic force and pressure, moments and centres of mass.
UNIT - V  MULTIPLE INTEGRALS
TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course the students will be able to
- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Able to use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXT BOOKS:
   [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES :

PH3151 ENGINEERING PHYSICS L T P C
3 0 0 3

COURSE OBJECTIVES
- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to be successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I MECHANICS
UNIT II ELECTROMAGNETIC WAVES
The Maxwell’s equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS

UNIT IV BASIC QUANTUM MECHANICS
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch’s theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

COURSE OUTCOMES
After completion of this course, the students should be able to
- Understand the importance of mechanics.
- Express their knowledge in electromagnetic waves.
- Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
- Understand the importance of quantum physics.
- Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.

REFERENCES:
COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT I    WATER AND ITS TREATMENT 9

UNIT II   NANOCHEMISTRY 9
Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III PHASE RULE AND COMPOSITES 9
Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process.
Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV   FUELS AND COMBUSTION 9
Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel.
Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO₂ emission and carbon foot print.

UNIT V     ENERGY SOURCES AND STORAGE DEVICES 9
Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles – working principles; Fuel cells: H₂-O₂ fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS
COURSE OUTCOMES
At the end of the course, the students will be able:

- To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
- To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- To apply the knowledge of phase rule and composites for material selection requirements.
- To recommend suitable fuels for engineering processes and applications.
- To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TEXT BOOKS:

REFERENCES:

GE3151 PROBLEM SOLVING AND PYTHON PROGRAMMING

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS
Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.
UNIT III  CONTROL FLOW, FUNCTIONS, STRINGS
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV  LISTS, TUPLES, DICTIONARIES
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V  FILES, MODULES, PACKAGES
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter’s age validation, Marks range validation (0-100).

TOTAL : 45 PERIODS

COURSE OUTCOMES:
Upon completion of the course, students will be able to
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and looping for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

REFERENCES:
5. https://www.python.org/
கலங்களின் விலக்கங்கள்:

3. குறிப்பிட்டு மூலம் குறிப்பிட்டு மூலம் - குறிப்பிட்டு மூலம் - குறிப்பிட்டு மூலம் - குறிப்பிட்டு மூலம் - குறிப்பிட்டு மூலம்

2. தொன்றுநாள் - தொன்றுநாள் - தொன்றுநாள் - தொன்றுநாள் - தொன்றுநாள் - தொன்றுநாள்

1. தினம் - தினம் - தினம் - தினம் - தினம் - தினம்

TEXT-CUM-REFERENCE BOOKS
1. Social Life of Tamils (Dr.K.K.Pillay) - A joint publication of TNTB & ESC and RMRL - (in print)
2. Social Life of Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies)

TOTAL : 15 PERIODS
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

GE3152 HERITAGE OF TAMILS L T P C
1 0 0 1

UNIT I LANGUAGE AND LITERATURE

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

UNIT III FOLK AND MARTIAL ARTS
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. தமிழ் மக்கள் பாடல் - மாற்றால் பாடல்பாடல் - வெளி. பிளகு புந்து (தமிழில்: தமிழ் மக்கள் பாடல் - மாற்றும் பாடல் - பாடல்பாடல் புந்து பிளகு).
2. தமிழில் தமிழ் - மாற்றால் புந்து. தமிழ் திருத்தம் (தமிழில்: புந்து பிளகு).
3. திருத்தம் - மாற்றால் தமிழ்மாற்றம் புந்து திருத்தம் (தமிழில்: பிளகு புந்து)
4. பிளகு-�ிருத்தம் தமிழ்மாற்றம் (தமிழில்: பிளகு-திருத்தம்)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

GE3171 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T P C 0 0 4 2

COURSE OBJECTIVES:
- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:
Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.
1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter’s age validity, student mark range validation)
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS
COURSE OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Implement programs in Python using conditionals and loops for solving problems.
CO4: Deploy functions to decompose a Python program.
CO5: Process compound data using Python data structures.
CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

REFERENCES:
5. https://www.python.org/

BS3171 PHYSICS AND CHEMISTRY LABORATORY

PHYSICS LABORATORY: (Any Seven Experiments)

COURSE OBJECTIVES:
- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young’s modulus
4. Uniform bending – Determination of Young’s modulus
5. Laser- Determination of the wave length of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
    b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde’s string experiment
14. Experiment with lattice dynamics kit.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the students should be able to
- Understand the functioning of various physics laboratory equipment.
- Use graphical models to analyze laboratory data.
- Use mathematical models as a medium for quantitative reasoning and describing physical reality.
- Access, process and analyze scientific information.
- Solve problems individually and collaboratively.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

COURSE OBJECTIVES:
- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles
  1. Preparation of Na$_2$CO$_3$ as a primary standard and estimation of acidity of a water sample using the primary standard
  2. Determination of types and amount of alkalinity in water sample.
     - Split the first experiment into two
  3. Determination of total, temporary & permanent hardness of water by EDTA method.
  4. Determination of DO content of water sample by Winkler’s method.
  5. Determination of chloride content of water sample by Argentometric method.
  6. Estimation of copper content of the given solution by Iodometry.
  7. Estimation of TDS of a water sample by gravimetry.
  8. Determination of strength of given hydrochloric acid using pH meter.
  9. Determination of strength of acids in a mixture of acids using conductivity meter.
 10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
 11. Estimation of iron content of the given solution using potentiometer.
 13. Preparation of nanoparticles (TiO$_2$/ZnO/CuO) by Sol-Gel method.
 14. Estimation of Nickel in steel
 15. Proximate analysis of Coal

TOTAL : 30 PERIODS

COURSE OUTCOMES:
- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques
- To analyse and determine the composition of alloys.
- To learn simple method of synthesis of nanoparticles
- To quantitatively analyse the impurities in solution by electroanalytical techniques

TEXT BOOK :
OBJECTIVES:
- To improve the communicative competence of learners
- To help learners use language effectively in academic/work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students’ English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION
6
Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions( filling out a bank application for example).

UNIT II NARRATION AND SUMMATION
6
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings-engaging in small talk- describing requirements and abilities.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT
6
Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)-talking about precautions.

UNIT IV CLASSIFICATION AND RECOMMENDATIONS
6
Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation-

UNIT V EXPRESSION
6
Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions-understanding a website-describing processes

TOTAL : 30 PERIODS

LEARNING OUTCOMES:
At the end of the course, learners will be able
- To listen and comprehend complex academic texts
- To speak fluently and accurately in formal and informal communicative contexts
- To express their opinions effectively in both oral and written medium of communication

ASSESSMENT PATTERN
- One online / app based assessment to test listening /speaking
- End Semester ONLY listening and speaking will be conducted online.
- Proficiency certification is given on successful completion of listening and speaking internal test and end semester exam.
OBJECTIVES:

- To engage learners in meaningful language activities to improve their reading and writing skills
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

UNIT I  MAKING COMPARISONS  6
Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases

UNIT II  EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING  6
Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints. Grammar - Active Passive Voice transformations, Infinitive and Gerunds

UNIT III  PROBLEM SOLVING  6
Reading - Case Studies, excerpts from literary texts, news reports etc. Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay. Grammar – Error correction; If conditional sentences

UNIT IV  REPORTING OF EVENTS AND RESEARCH  6

UNIT V  THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY  6
Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses.

TOTAL : 30 PERIODS

OUTCOMES:

At the end of the course, learners will be able

- To compare and contrast products and ideas in technical texts.
- To identify cause and effects in events, industrial processes through technical texts
- To analyse problems in order to arrive at feasible solutions and communicate them orally and in the written format.
- To report events and the processes of technical and industrial nature.
- To present their opinions in a planned and logical manner, and draft effective resumes in context of job search.

TEXT BOOKS :

3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.
REFERENCE BOOKS:

ASSESSMENT PATTERN

Two internal assessments and an end semester examination to test students' reading and writing skills along with their grammatical and lexical competence.

MA3251 STATISTICS AND NUMERICAL METHODS L T P C
3 1 0 4

COURSE OBJECTIVES:
- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9+3
Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9+3
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - $2^2$ factorial design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3
Lagrange’s and Newton’s divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.
UNIT V    NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS      9+3
Single step methods: Taylor’s series method - Euler’s method - Modified Euler’s method - Fourth
order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne’s
and Adams - Bash forth predictor corrector methods for solving first order differential equations.

TOTAL: 60 PERIODS

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

- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- Appreciate the numerical techniques of interpolation in various intervals and apply the numerical
techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order
ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by
using certain techniques with engineering applications.

TEXT BOOKS:

REFERENCES:

PH3205      APPLIED PHYSICS     L T P C
                      3 0 0 3

COURSE OBJECTIVES:
- To equip the students to have a knowledge on different types of electron theory, basics of
  quantum mechanics and about energy bands
- To introduce the physics of semiconducting materials and applications of semiconductors in
device fabrication
- To make the students to learn the mechanisms of polarization in dielectric materials, and about
  classification and properties of dielectric materials
- To make the students to learn the origin of magnetism in magnetic materials and their
  classification; to learn the physics of superconductivity and various properties exhibited by
  superconductors
- To make the students familiarize with the optical properties of materials.
UNIT I  ELECTRICAL PROPERTIES OF MATERIALS  9

UNIT II  SEMICONDUCTOR AND TRANSPORT PHYSICS  9

UNIT III  DIELECTRICS AND FERROELECTRICS  9
Macroscopic description of the static dielectric constant. The electronic and ionic polarizabilities of molecules - orientational polarization - Measurement of the dielectric constant of a solid. The internal field - Lorentz, Clausius - Mosotti relation. Behaviour of dielectrics in an alternating field, elementary ideas on dipole relaxation, - Piezo, pyro and ferroelectric properties of crystals -classification of ferroelectric crystals - BaTiO\textsubscript{3} and KDP.

UNIT IV  MAGNETISM AND SUPERCONDUCTIVITY  9

UNIT V  OPTICAL PROPERTIES OF MATERIALS  9

COURSE OUTCOMES:
Upon completion of this course, the students should be able to
- Familiarize with theories of electrical and thermal conduction is solids, basic quantum mechanics, and energy bands
- Gain knowledge on semiconducting materials based on energy level diagrams, its types, temperature effect.
- Understand the mechanisms of various types of polarization and about classification and properties of ferroelectric crystals
- Learn the classification of magnetic materials, theory and applications of ferromagnetic materials and superconductors
- Acquire knowledge on light waves, non-linear optical properties of materials and their applications

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:

BE3251 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
L T P C
3 0 0 3

COURSE OBJECTIVES:
- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics
- To introduce the functional elements and working of measuring instruments

UNIT I ELECTRICAL CIRCUITS
DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws – Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state)
Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)

UNIT II ELECTRICAL MACHINES

UNIT III ANALOG ELECTRONICS

UNIT IV DIGITAL ELECTRONICS
Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only)

UNIT V MEASUREMENTS AND INSTRUMENTATION

TOTAL: 45 PERIODS
COURSE OUTCOMES:
After completing this course, the students will be able to
1. Compute the electric circuit parameters for simple problems
2. Explain the working principle and applications of electrical machines
3. Analyze the characteristics of analog electronic devices
4. Explain the basic concepts of digital electronics
5. Explain the operating principles of measuring instruments

TEXT BOOKS:

REFERENCES:

GE3251 ENGINEERING GRAPHICS L T P C
2 0 4 4

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Drawing engineering curves.
2. Drawing freehand sketch of simple objects.
3. Drawing orthographic projection of solids and section of solids.
4. Drawing development of solids
5. Drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT I PLANE CURVES 6+12
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.
UNIT III      PROJECTION OF SOLIDS AND FREEHAND SKETCHING    6+12
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT IV      PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES    6 +12
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT V      ISOMETRIC AND PERSPECTIVE PROJECTIONS    6+12
Principles of isometric projection — isometric scale - Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids -Prisms, pyramids and cylinders by visual ray method. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

TOTAL: (L=30; P=60) 90 PERIODS

COURSE OUTCOMES:
On successful completion of this course, the student will be able to
- Use BIS conventions and specifications for engineering drawing.
- Construct the conic curves, involutes and cycloid.
- Solve practical problems involving projection of lines.
- Draw the orthographic, isometric and perspective projections of simple solids.
- Draw the development of simple solids.

TEXT BOOKS:

REFERENCES:
Publication of Bureau of Indian Standards:

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

GE3252 சங்க பாட்டு நெடுநைக்க கலைச் சங்க பாட்டு நெடுநைக்க கலைச் சங்க பாட்டு நெடுநைக்க கலைச்

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அப்பின் இரண்டுதோறு பாதுகாப்பு விளக்கம்:
1. சங்காலன நெடுநைக் கலைச் சங்காலன நெடுநைக் கலைச் சங்காலன நெடுநைக்
2. பாதுகாப்பு விளக்கம் - கலைச் சங்காலன நெடுநைக்
3. பாதுகாப்பு விளக்கம் - கலைச் சங்காலன நெடுநைக்
4. பாதுகாப்பு விளக்கம் - கலைச் சங்காலன நெடுநைக்
5. பாதுகாப்பு விளக்கம் - கலைச் சங்காலன நெடுநைக்

அப்பின் இரண்டுதோறு பாதுகாப்பு விளக்கம்:
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2. பாதுகாப்பு விளக்கம் - கலைச் சங்காலன நெடுநை 
3. பாதுகாப்பு விளக்கம் - கலைச் 
4. பாதுகாப்பு விளக்கம் - கலைச் 
5. பாதுகாப்பு விளக்கம் - கலைச் 

TOTAL : 15 PERIODS
TEXT-CUM-REFERENCE BOOKS:
1. தமிழ் வரலாறு – மதமாரம் பாடல்பாடுகள் – தோணோண் பிரகாரம் (மரபுமுறை: தமிழினால் பாடல்பாட்டுகள் பாடல்பாடு;
   கலந்துபெற்று பாடல்பாடுகளும்).
2. கணினித் தமிழ் – பாடல்பாடு தேசிகம். (சிலிக் பிரகாரம்).
3. சிற்பங்கள் – கலாசாரவுக்குக் காணப்பட்ட தரைகள் கற்கையில் (இருந்துவிழுங்கும் கற்கை;
   பொழுதுபோக்கு).
4. பாராட்ட கலைகள் தொடர்பில் (இருந்துவிழுங்கும் கற்கை;
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International
   Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International
   Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International
   Institute of Tamil Studies.)
9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by:
   Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,
   Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published
    by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book
    and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference
    Book.

GE3252 TAMILS AND TECHNOLOGY L T P C
1 0 0 1

UNIT I WEAVING AND CERAMIC TECHNOLOGY
3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries
(BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY
3
Designing and Structural construction House & Designs in household materials during Sangam Age
- Building materials and Hero stones of Sangam age – Details of Stage Constructions in
Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other
worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai
Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY
3
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and gold-
Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads
- Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described
in Silappathikaram.
UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. தமிழ் வரலாறு - மக்கள் பண்பாடு - எளிதான பிரித்தல் (தமிழில்: தமிழ்வரலாறு - மக்கள் பண்பாடு - எளிதான பிரித்தல்).
2. கணினித் தமிழ் - மாதிரியான துறை. குழுவம். (சிற்று பிரித்தல்).
3. கல்வியிடம் - தமிழ் தொழில்கல்விகளில் குழுக்கள் துறை தொழில்கல்வி (தமிழில்: கல்வியிடம் - தமிழ் தொழில்கல்விகளில் குழுக்கள் துறை தொழில்கல்வி).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
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10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
### NCC Credit Course Level 1*

#### NX3251  (ARMY WING) NCC Credit Course Level - I

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**NCC GENERAL**
- NCC 1: Aims, Objectives & Organization of NCC 1
- NCC 2: Incentives 2
- NCC 3: Duties of NCC Cadet 1
- NCC 4: NCC Camps: Types & Conduct 2

**NATIONAL INTEGRATION AND AWARENESS**
- NI 1: National Integration: Importance & Necessity 1
- NI 2: Factors Affecting National Integration 1
- NI 3: Unity in Diversity & Role of NCC in Nation Building 1
- NI 4: Threats to National Security 1

**PERSONALITY DEVELOPMENT**
- PD 1: Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving 2
- PD 2: Communication Skills 3
- PD 3: Group Discussion: Stress & Emotions 2

**LEADERSHIP**
- L 1: Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour & Code 3
- L 2: Case Studies: Shivaji, Jhasi Ki Rani 2

**SOCIAL SERVICE AND COMMUNITY DEVELOPMENT**
- SS 1: Basics, Rural Development Programmes, NGOs, Contribution of Youth 3
- SS 4: Protection of Children and Women Safety 1
- SS 5: Road / Rail Travel Safety 1
- SS 6: New Initiatives 2
- SS 7: Cyber and Mobile Security Awareness 1

**TOTAL:** 30 PERIODS

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### NX3252  (NAVAL WING) NCC Credit Course Level - I

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**NCC GENERAL**
- NCC 1: Aims, Objectives & Organization of NCC 1
- NCC 2: Incentives 2
- NCC 3: Duties of NCC Cadet 1
- NCC 4: NCC Camps: Types & Conduct 2

**NATIONAL INTEGRATION AND AWARENESS**
- NI 1: National Integration: Importance & Necessity 1
- NI 2: Factors Affecting National Integration 1
- NI 3: Unity in Diversity & Role of NCC in Nation Building 1
- NI 4: Threats to National Security 1

**PERSONALITY DEVELOPMENT**

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PD 1  Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving  2
PD 2  Communication Skills  3
PD 3  Group Discussion: Stress & Emotions  2

LEADERSHIP  5
L 1  Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code  3
L 2  Case Studies: Shivaji, Jhasi Ki Rani  2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT  8
SS 1  Basics, Rural Development Programmes, NGOs, Contribution of Youth  3
SS 4  Protection of Children and Women Safety  1
SS 5  Road / Rail Travel Safety  1
SS 6  New Initiatives  2
SS 7  Cyber and Mobile Security Awareness  1

TOTAL : 30 PERIODS

NCC Credit Course Level 1*

NX3253  (AIR FORCE WING) NCC Credit Course Level - I  L  T  P  C
2  0  0  2

NCC GENERAL  6
NCC 1  Aims, Objectives & Organization of NCC  1
NCC 2  Incentives  2
NCC 3  Duties of NCC Cadet  1
NCC 4  NCC Camps: Types & Conduct  2

NATIONAL INTEGRATION AND AWARENESS  4
NI 1  National Integration: Importance & Necessity  1
NI 2  Factors Affecting National Integration  1
NI 3  Unity in Diversity & Role of NCC in Nation Building  1
NI 4  Threats to National Security  1

PERSONALITY DEVELOPMENT  7
PD 1  Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving  2
PD 2  Communication Skills  3
PD 3  Group Discussion: Stress & Emotions  2

LEADERSHIP  5
L 1  Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code  3
L 2  Case Studies: Shivaji, Jhasi Ki Rani  2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT  8
SS 1  Basics, Rural Development Programmes, NGOs, Contribution of Youth  3
SS 4  Protection of Children and Women Safety  1
SS 5  Road / Rail Travel Safety  1
SS 6  New Initiatives  2
SS 7  Cyber and Mobile Security Awareness  1

TOTAL : 30 PERIODS
COURSE OBJECTIVES:
The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I  CIVIL ENGINEERING PRACTICES  15
PLUMBING WORK:
   a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
   b) Preparing plumbing line sketches.
   c) Laying pipe connection to the suction side of a pump.
   d) Laying pipe connection to the delivery side of a pump.
   e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:
   a) Sawing,
   b) Planing and
   c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:
   a) Studying joints in door panels and wooden furniture
   b) Studying common industrial trusses using models.

PART II  ELECTRICAL ENGINEERING PRACTICES  15
a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
b) Staircase wiring
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/calibration
e) Study of Iron Box wiring and assembly
f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
g) Study of emergency lamp wiring/Water heater
GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES

WELDING WORK:
  a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
  b) Practicing gas welding.

BASIC MACHINING WORK:
  a) (simple) Turning.
  b) (simple) Drilling.
  c) (simple) Tapping.

ASSEMBLY WORK:
  a) Assembling a centrifugal pump.
  b) Assembling a household mixer.
  c) Assembling an airconditioner.

SHEET METAL WORK:
  a) Making of a square tray

FOUNDRY WORK:
  a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES

SOLDERING WORK:
  a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:
  a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:
  a) Study an elements of smart phone.
  b) Assembly and dismantle of LED TV.
  c) Assembly and dismantle of computer/ laptop

TOTAL = 60 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:

1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.
COURSE OBJECTIVES:
- To train the students in conducting load tests on electrical machines
- To gain practical experience in characterizing electronic devices
- To train the students to use DSO for measurements.

LIST OF EXPERIMENTS
1. Verification of ohms and Kirchhoff’s Laws.
2. Load test on DC Shunt Motor.
3. Load test on Self Excited DC Generator
4. Load test on Single phase Transformer
5. Load Test on Induction Motor
6. Characteristics of PN and Zener Diodes
7. Characteristics of BJT, SCR and MOSFET
8. Half wave and Full Wave rectifiers
9. Study of Logic Gates
10. Implementation of Binary Adder and Subtractor
11. Study of DSO

TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completing this course, the students will be able to
1. Use experimental methods to verify the Ohm’s and Kirchhoff’s Laws.
2. Analyze experimentally the load characteristics of electrical machines
3. Analyze the characteristics of basic electronic devices
4. Use DSO to measure the various parameters

OBJECTIVES
- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To be able to communicate effectively through writing.

UNIT I
Speaking: Role Play Exercises Based on Workplace Contexts, - talking about competition, discussing progress toward goals, talking about experiences, talking about events in life, discussing past events. Writing: writing emails (formal & semi-formal).

UNIT II
Speaking: discussing news stories, talking about frequency, talking about travel problems, discussing travel procedures, talking about travel problems, making arrangements, describing arrangements, discussing plans and decisions, discussing purposes and reasons, understanding common technology terms. Writing: - writing different types of emails.

UNIT III
Speaking: discussing predictions, describing the climate, discussing forecasts and scenarios, talking about purchasing, discussing advantages and disadvantages, making comparisons, discussing likes and dislikes, discussing feelings about experiences, discussing imaginary scenarios. Writing: short essays and reports (formal/semi-formal letters).
UNIT IV
Speaking: discussing the natural environment-describing systems-describing position and movement-explaining rules-(example-discussing rental arrangements)-understanding technical instructions-Writing: writing instructions-writing a short article.

UNIT V
Speaking: describing things relatively-describing clothing-discussing safety issues (making recommendations) talking about electrical devices-describing controlling actions-Writing: job application (Cover letter + Curriculum vitae)-writing recommendations.

TOTAL: 60 PERIODS

LEARNING OUTCOMES
- Speak effectively in group discussions held in a formal/semi formal contexts.
- Write emails and effective job applications.

Assessment Pattern
- One online/app based assessment to test speaking and writing skills
- Proficiency certification is given on successful completion of speaking and writing.

MA3351 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

OBJECTIVES:
- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS
Formation of partial differential equations–Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types- Lagrange’s linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval’s identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
Classification of PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (Cartesian coordinates only).

UNIT IV FOURIER TRANSFORMS
UNIT V   Z - TRANSFORMS AND DIFFERENCE EQUATIONS                                          9+3
Z-transforms - Elementary properties – Convergence of Z-transforms - – Initial and final value
theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of
difference equations – Solution of difference equations using Z - transforms.

TOTAL: 60 PERIODS

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

- Understand how to solve the given standard partial differential equations.
- Solve differential equations using Fourier series analysis which plays a vital role in engineering
applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two
dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would
provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using
Z transform techniques for discrete time systems.

TEXT BOOKS:

REFERENCES:

AE3351 AERO ENGINEERING THERMODYNAMICS    L   T   P   C
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COURSE OBJECTIVES:
- To make the student understand the quantitative analysis of machine and processes for
transformation of energy and between work and heat.
- To Make the student understand the Laws of thermodynamics would be able to quantify
through measurement of related
- To Apply the thermodynamic properties, energies and their interactions in real time, e problems
- To develop basic concept of air cycle, gas turbine engines and heat transfer.
- To analyse different types of Heat transfer
- To identify the different components of Jet Engines
UNIT I FUNDAMENTAL CONCEPT AND FIRST LAW  
Concept of continuum, macroscopic approach, thermodynamic systems – closed, open and isolated. Property, state, path and process, quasi-static process, work, internal energy, enthalpy, specific heat capacities and heat transfer, SFEE, application of SFEE to jet engine components, First law of thermodynamics, relation between pressure, volume and temperature for various processes, Zeroth law of thermodynamics.

UNIT II SECOND LAW AND ENTROPY  

UNIT III AIR STANDARD CYCLES  
Otto, Diesel, Dual, Ericsson, Atkinson, Stirling and Brayton cycles - Air standard efficiency – Mean effective pressure.

UNIT IV FUNDAMENTALS OF VAPOUR POWER CYCLES  
Properties of pure substances – solid, liquid and vapour phases, phase rule, p-v, p-T, T-v, T-s, h-s diagrams, p-v-T surfaces, thermodynamic properties of steam - calculations of work done and heat transfer in non-flow and flow processes - standard Rankine cycle, Reheat and Regeneration cycle. Heat rate, Specific steam consumption, Tonne of refrigeration.

UNIT V BASICS OF PROPULSION AND HEAT TRANSFER  
Classification of jet engines - basic jet propulsion arrangement – Engine station number, thrust equation – Specific thrust, SFC, TSFC, specific impulse, actual cycles, isentropic efficiencies of jet engine components, polytropic efficiency, conduction in parallel, radial and composite wall, Basics of convective and radiation heat transfer.

COURSE OUTCOMES:  
Upon successful completion of the course, students should be able to:  
- CO1: Apply the laws of thermodynamics in real time problems.  
- CO2: Demonstrate the principal operation of piston engine and jet engines.  
- CO3: Demonstrate the efficiency of different air standard cycles.  
- CO4: Determine the heat transfer in different conditions of working medium.  
- CO5: Solve heat transfer problems in complex systems.  
- CO6: Solve problems related to conduction convention and radiation

TEXT BOOKS:  

REFERENCES:  
### MAPPING OF COS AND POS:

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UNIT V         STRESS TRANSFORMATION, DEFLECTION OF BEAM AND BUCKLING OF COLUMN

Plane stress, Principal stresses, Mohr’s circle and Hooke’s law for plane stresses. Spherical and Cylindrical pressure vessels. Deflection of beams, Column buckling.

COURSE OUTCOMES:
Upon completion of the course, Students will be able to
CO1: Clear understanding of mechanical behaviour of materials.
CO2: Knowledge of different structural members and load types.
CO3: Design members under axial loading.
CO4: Design member under torsion loading.
CO5: Calculate beams deflections.

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:

MAPPING OF COS AND POS:

\[
\begin{array}{cccccccccccccc}
\text{PO} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 0 & 1 & 2 & 3 & 4 \\
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\text{CO5} & 3 & 3 & 2.5 & 3 & - & - & - & - & - & - & 1 & 3 & 3 & 1 & 1 \\
\text{Avg} & 3 & 2.6 & 2.1 & 2.7 & - & - & - & - & - & - & 1 & 3 & 3 & 1 & 1 \\
\end{array}
\]

Low (1) ;   Medium (2) ;   High (3)
COURSE OBJECTIVES:
1. To introduce the students about properties of the fluids, behaviour of fluids under static conditions.
2. To impart basic knowledge of the dynamics of fluids and boundary layer concept.
3. To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on pipe bends.
4. To exposure to the significance of boundary layer theory and its thicknesses.
5. To expose the students to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps.

UNIT I  
FLUID PROPERTIES AND FLOW CHARACTERISTICS  10+3
Properties of fluids – Fluid statics - Pressure Measurements - Buoyancy and floatation - Flow characteristics - Eulerian and Lagrangian approach - Concept of control volume and system - Reynold’s transportation theorem - Continuity equation, energy equation and momentum equation - Applications.

UNIT II  
FLOW THROUGH PIPES AND BOUNDARY LAYER  9+3
Reynold’s Experiment - Laminar flow through circular conduits - Darcy Weisbach equation - friction factor - Moody diagram - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness.

UNIT III  
DIMENSIONAL ANALYSIS AND MODEL STUDIES  8+3
Fundamental dimensions - Dimensional homogeneity - Rayleigh’s method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

UNIT IV  
TURBINES  9+3

UNIT V  
PUMPS  9+3
Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies – Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and it’s variations - Work saved by fitting air vessels - Rotary pumps.

TOTAL: 60 PERIODS

OUTCOMES: On completion of the course, the student is expected to be able to
1. Understand the properties and behaviour in static conditions. Also to understand the conservation laws applicable to fluids and its application through fluid kinematics and dynamics
2. Estimate losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel. Also to understand the concept of boundary layer and its thickness on the flat solid surface.
3. Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies
4. Explain the working principles of various turbines and design the various types of turbines.
5. Explain the working principles of centrifugal, reciprocating and rotary pumps and design the centrifugal and reciprocating pumps

TEXT BOOKS:
REFERENCES:

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</table>

Low (1) ; Medium (2) ; High (3)

AE3301 ELEMENTS OF AERONAUTICAL ENGINEERING

COURSE OBJECTIVES:
- To acquire the knowledge on the Historical evaluation of Airplanes
- To learn the different component systems and functions
- To know the concepts of basic properties and principles behind the flight
- To learn the basics of different structures & construction
- To learn the various types of power plants used in aircrafts

UNIT I HISTORY OF FLIGHT
Balloon flight-ornithopter-Early Airplanes by Wright Brothers, biplanes and monoplanes, Developments in aerodynamics, materials, structures and propulsion over the years.

UNIT II AIRCRAFT CONFIGURATIONS AND ITS CONTROLS
Different types of flight vehicles, Classifications-Components of an airplane and their functions- Conventional control, powered control- Basic instruments for Flying-Typical systems for control actuation.

UNIT III BASICS OF AERODYNAMICS

UNIT IV BASICS OF AIRCRAFT STRUCTURES
UNIT V  BASICS OF PROPULSION

Basic ideas about piston, turboprop and jet engines – use of propeller and jets for thrust Production - Comparative merits, Principle of operation of rocket, types of rocket and typical applications, Exploration into space.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to
CO1: Illustrate the history of aircraft & developments over the years
CO2: Ability to identify the types & classifications of components and control systems
CO3: Explain the basic concepts of flight & Physical properties of Atmosphere
CO4: Identify the types of fuselage and constructions.
CO5: Distinguish the types of Engines and explain the principles of Rocket

TEXT BOOKS:

REFERENCES:

MAPPING OF COS AND POS:

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</table>

AE3302  AIRCRAFT SYSTEMS AND INSTRUMENTS  L  T  P  C
3       0       0       0       3

COURSE OBJECTIVES:
1. To impart knowledge of the hydraulic and pneumatic systems components
2. To Study the types of instruments and its operation including navigational instruments.
3. Acquire the knowledge of essential systems of safe aircraft operation.
4. To learn the concepts of display systems
5. To study the various engine systems in aircraft

UNIT I  AIRCRAFT SYSTEMS

UNIT II  AIRPLANE CONTROL SYSTEMS

UNIT III  ENGINE SYSTEMS
Piston and Jet Engines- Fuel systems – Components - Multi-engine fuel systems, lubricating systems – Starting and Ignition systems.

UNIT IV  AIRCONDITIONING AND PRESSURIZING SYSTEM

UNIT V  AIRCRAFT INSTRUMENTS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to

CO1: Demonstrate the ability to design a various system using pneumatic and hydraulic components.
CO2: Keep abreast knowledge on various flight control system and its recent advancements.
CO3: Demonstrate the fundamental understanding of the operation of engine auxiliary systems.
CO4: To understand the various cabin comfort system used in aircraft modern display systems.
CO5: Describe the principle behind the operation of various vital parameter displays and its uses in effective conduct of the flight.

TEXT BOOKS:

REFERENCES:

MAPPING OF COS AND POS:

| CO/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 | PO16 | PSO1 | PSO2 | PSO3 |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|
| CO1    | 3   | 2   | 3   | 2   | 2   | 2   | 1   | 2   | 3   | 1    | 2    | 3    | 1    | 2    | 3    | 1    | 1    |
| CO2    | 3   | 3   | 2   | 2   | 1   | 2   | 1   | 2   | 3   | 1    | 1    | 3    | 1    | 1    | 3    | 1    |
| CO3    | 3   | 3   | 2   | 2   | 3   | 1   | 2   | 1   | 2   | 3    | 1    | 1    | 3    | 1    | 1    | 1    |
| CO4    | 3   | 3   | 2   | 2   | 3   | 3   | 1   | 2   | 3   | 1    | 1    | 3    | 1    | 1    | 1    |
| CO5    | 3   | 3   | 3   | 2   | 2   | 1   | 2   | 1   | 1   | 3    | 1    | 1    | 3    | 1    | 1    |
| Avg    | 3   | 2.8 | 2.4 | 2   | 2.2 | 1.8 | 2   | 1   | 1.8 | 3    | 1    | 1.2  | 3    | 1    | 1    |
OBJECTIVES:
- To study the mechanical properties of materials when subjected to different types of loading.
- To study how to improve the material properties.
- To understand the nature of materials under microscopic Examination

STRENGTH OF MATERIALS

LIST OF EXPERIMENTS
1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminum rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
10. Tempering - Improvement Mechanical properties Comparison
    (i) Unhardened specimen
    (ii) Quenched Specimen and
    (iii) Quenched and tempered specimen.
11. Microscopic Examination of
    (i) Hardened samples and
    (ii) Hardened and tempered samples

OUTCOMES:
- Analyse the Hardness and Tensile strength of the given material
- Examine the deformation and torsion strength of the given material
- Analyse the compression and shear strength of given materials

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Universal Tensile Testing machine with double 1 shear attachment –</td>
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<tr>
<td>2</td>
<td>Torsion Testing Machine(60 NM Capacity)</td>
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<tr>
<td>3</td>
<td>Impact Testing Machine (300J Capacity)</td>
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<td>4</td>
<td>Brinell Hardness Testing Machine</td>
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<td>5</td>
<td>Rockwell Hardness Testing Machine</td>
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<tr>
<td>6</td>
<td>Spring Testing Machine for tensile and compressive loads (2500N)</td>
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<tr>
<td>7</td>
<td>Metallurgical Microscopes</td>
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<td>Muffle Furnace(800C)</td>
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</table>
THERMODYNAMICS LABORATORY

OBJECTIVE:
- To study the engine types and its performance
- To understand the importance of heat transfer and its application.
- To understand the fuel properties.

LIST OF EXPERIMENTS
1. Performance test on a 4-stroke engine
2. Valve timing of a 4-stroke engine and port timing of a 2-stroke engine
3. Determination of effectiveness of a parallel flow heat exchanger
4. Determination of effectiveness of a counter flow heat exchanger
5. Determination of heating value of a fuel
6. Determination of specific heat of solid
7. Determination of thermal conductivity of solid
8. Determination of thermal resistance of a composite wall
9. COP test on a vapour compression refrigeration test rig
10. COP test on a vapour compression air-conditioning test rig

TOTAL: 60 PERIODS

OUTCOMES:
- Perform test on diesel/petrol engine
- Determine the properties of the fuels.
- Analyze the heat transfer properties of solid and composite walls

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Details of Equipments</th>
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<td>1</td>
<td>4 stroke twin cylinder diesel engine</td>
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<td>Parallel and counter flow heat exchanger test rig</td>
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<td>6</td>
<td>Vapour compression air-conditioning test rig</td>
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<td>7</td>
<td>Conductive heat transfer set up</td>
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<td>Composite wall</td>
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CO/P0 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
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</table>
COURSE OBJECTIVES:
- Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices.
- Also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.,

LIST OF EXPERIMENTS

A. FLOW MEASUREMENT
1. Verification of Bernoulli’s theorem
2. Flow through Orifice/Venturi meter
3. Friction factor for flow through pipes
4. Impact of jet on fixed plate

B. METACENTRE
5. Determination of metacentric height

C. PUMPS
6. Characteristics of Centrifugal pump
7. Characteristics of Gear pump
8. Characteristics of Submersible pump
9. Characteristics of Reciprocating pump

D. TURBINES
10. Characteristics of Pelton wheel turbine
11. Characteristics of Francis turbine

TOTAL : 60 PERIODS

COURSE OUTCOMES:
On completion of the course, the student is expected to be able to

CO1 Verify and apply Bernoulli equation for flow measurement like Orifice/Venturi meter.
CO2 Measure friction factor in pipes and compare with Moody diagram and verify momentum conservation law.
CO3 Determine the performance characteristics of Rotodynamic pumps.
CO4 Determine the performance characteristics of positive displacement pumps.
CO5 Determine the performance characteristics of turbines.

REFERENCES:
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<th>PO/PSO</th>
<th>Course Outcome</th>
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<tr>
<td>PO2</td>
<td>Problem analysis</td>
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<tr>
<td>PO3</td>
<td>Design / development of solutions</td>
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<tr>
<td>PO4</td>
<td>Investigation</td>
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<td>PO5</td>
<td>Modern Tool Usage</td>
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<td>PO6</td>
<td>Individual and Team work</td>
<td>M M H H H H</td>
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<td>PO7</td>
<td>Communication</td>
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<td>PO8</td>
<td>Engineer and Society</td>
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<tr>
<td>PSO1</td>
<td>Knowledge of Civil Engineering discipline</td>
<td>M H H H H H</td>
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<tr>
<td>PSO2</td>
<td>Critical analysis of Civil Engineering problems and innovation</td>
<td>L L M M M M</td>
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<tr>
<td>PSO3</td>
<td>Conceptualization and evaluation of engineering solutions to Civil Engineering Issues</td>
<td>L L L L L L</td>
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L - Low, M – Medium, H - High

**GE3361 PROFESSIONAL DEVELOPMENT**

<table>
<thead>
<tr>
<th>OBJECTIVES:</th>
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<tbody>
<tr>
<td>To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.</td>
</tr>
<tr>
<td>To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.</td>
</tr>
<tr>
<td>To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered</td>
</tr>
<tr>
<td>To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.</td>
</tr>
</tbody>
</table>

**MS WORD:**

Create and format a document
Working with tables
Working with Bullets and Lists
Working with styles, shapes, smart art, charts
Inserting objects, charts and importing objects from other office tools
Creating and Using document templates
Inserting equations, symbols and special characters
Working with Table of contents and References, citations
Insert and review comments
Create bookmarks, hyperlinks, endnotes footnote
Viewing document in different modes  
Working with document protection and security  
Inspect document for accessibility

**MS EXCEL:**  
10 Hours  
Create worksheets, insert and format data  
Work with different types of data: text, currency, date, numeric etc.  
Split, validate, consolidate, Convert data  
Sort and filter data  
Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)  
Work with Lookup and reference formulae  
Create and Work with different types of charts  
Use pivot tables to summarize and analyse data  
Perform data analysis using own formulae and functions  
Combine data from multiple worksheets using own formulae and built-in functions to generate results  
Export data and sheets to other file formats  
Working with macros  
Protecting data and Securing the workbook

**MS POWERPOINT:**  
10 Hours  
Select slide templates, layout and themes  
Formatting slide content and using bullets and numbering  
Insert and format images, smart art, tables, charts  
Using Slide master, notes and handout master  
Working with animation and transitions  
Organize and Group slides  
Import or create and use media objects: audio, video, animation  
Perform slideshow recording and Record narration and create presentable videos

**OUTCOMES:**  
On successful completion the students will be able to  
- Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements  
- Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding  
- Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects. 

TOTAL: 30 PERIODS
OBJECTIVES:
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

UNIT I VECTOR CALCULUS
Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT II ANALYTIC FUNCTION
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c, az, \frac{1}{z}, z^2$ - Bilinear transformation.

UNIT III COMPLEX INTEGRATION

UNIT IV LAPLACE TRANSFORMS

UNIT V ORDINARY DIFFERENTIAL EQUATIONS

OUTCOMES:
Upon successful completion of the course, students should be able to:
- Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem.
- Appreciate how complex methods can be used to prove some important theoretical results.
- Evaluate line, surface and volume integrals in simple coordinate systems.
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities.
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TOTAL: 60 PERIODS
TEXT BOOKS

REFERENCES

AE3401 AERODYNAMICS I

COURSE OBJECTIVES:
- To introduce the concepts of mass, momentum and energy conservation relating to aerodynamics.
- To introduce the Navier Stroke equations and its application
- To make the student understand the concept of vorticity, irrotationality, theory of airfoil and wing sections.
- To introduce the basics of viscous flow.
- To make the student to understand the different boundary layers and Blasius Solution
- To introduce the basics of turbulence flow

UNIT I INTRODUCTION TO LOW-SPEED FLOW
Euler equation, incompressible Bernoulli’s equation, circulation and vorticity, green’s lemma and Stoke’s theorem, barotropic flow, kelvin’s theorem, streamline, stream function, irrotational flow, potential function, Equipotential lines, elementary flows and their combinations.

UNIT II TWO-DIMENSIONAL INVISCID INCOMPRESSIBLE FLOW
Ideal Flow over a circular cylinder, D’Alembert’s paradox, magnus effect, Kutta Joukowski’s theorem, starting vortex, Kutta condition, real flow over smooth and rough cylinder.

UNIT III AIRFOIL THEORY
Cauchy-Riemann relations, complex potential, methodology of conformal transformation, Kutta-Joukowski transformation and its applications, thin airfoil theory and its applications.

UNIT IV SUBSONIC WING THEORY
Vortex filament, Biot and Savart law, bound vortex and trailing vortex, horse shoe vortex, lifting line theory and its limitations.

UNIT V INTRODUCTION TO BOUNDARY LAYER THEORY
Boundary layer and boundary layer thickness, displacement thickness, momentum thickness, energy thickness, shape parameter, boundary layer equations for a steady, two-dimensional incompressible flow, boundary layer growth over a flat plate, critical Reynolds number, Blasius solution, basics of turbulent flow.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
On completion of the course, the student is expected to be able to
CO1: Apply the basics physics for low-speed flows.
CO2: Apply the concept of 2D, inviscid incompressible flows in low-speed aerodynamics.
CO3: Solve lift generation problems using aerofoil theories.
CO4: Make use of lifting line theory for solving flow properties.
CO5: Solve the boundary layer equations for a steady, two-dimensional incompressible flow
CO6: Solve the properties of turbulent flow.

TEXT BOOKS:

REFERENCES:

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AE3402 AIR BREATHING PROPULSION

OBJECTIVES:
1. To establish fundamental approach and application of jet engine components.
2. To learn about the analysis of flow phenomenon and estimation of thrust developed by jet engine.
3. To introduce about the application of various equations in Gas Turbine Engines.
4. To learn the concepts of jet engine combustion chambers
5. To acquire knowledge on compressors and turbines

UNIT I PRINCIPLES OF AIR BREATHING ENGINES
UNIT II  JET ENGINE INTAKES AND EXHAUST NOZZLES  9+6

UNIT III  JET ENGINE COMBUSTION CHAMBERS  9+6

UNIT IV  JET ENGINE COMPRESSORS  9+6

UNIT V  JET ENGINE TURBINES  9+6

TOTAL: 75 PERIODS

COURSE OUTCOMES:
On completion of the course, the student is expected
CO1: To be able to apply control volume and momentum equation to estimate the forces produced by aircraft propulsion systems
CO2: To be able to describe the principal figures of merit for aircraft engine
CO3:To be able to describe the principal design parameters and constraints that set the performance of gas turbine engines.
CO4: To apply ideal and actual cycle analysis to a gas turbine engine to relate thrust and fuel burn to component performance parameters.
CO5: Understanding the workings of multistage compressor or turbine, and to be able to use velocity triangles and the Euler Turbine Equation to estimate the performance of a compressor or turbine stage.

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AE3491 MECHANICS OF MACHINES L T P C 3 0 0 3

COURSE OBJECTIVES:
1. To understand the principles in the formation of mechanisms and their kinematics.
2. To learn the basic concepts of toothed gearing and kinematics of gear trains.
3. To study the effect of friction in different machine elements.
4. To analyse the forces and torque acting on simple mechanical systems.
5. To understand the importance of balancing and vibration.

UNIT I KINEMATIC ANALYSIS IN SIMPLE MECHANISMS AND CAMS 9

UNIT II TOOTHED GEARING AND GEAR TRAINS 9

UNIT III FRICTION ASPECTS IN MACHINE COMPONENTS 9

UNIT IV STATIC AND DYNAMIC FORCE ANALYSIS 9

UNIT V BALANCING OF ROTATING MASSES AND VIBRATION 9

TOTAL: 45 PERIODS
COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
CO1: Design the linkages and the cam mechanisms for specified output motions.
CO2: Determine the gear parameters of toothed gearing and speeds of gear trains in various applications.
CO3: Evaluate the frictional torque in screw threads, clutches, brakes and belt drives.
CO4: Determine the forces on members of mechanisms during static and dynamic equilibrium conditions.
CO5: Determine the balancing masses on rotating machineries and the natural frequencies of free and forced vibratory systems.

TEXT BOOK

REFERENCES
5. Thomas Bevan, “The Theory of Machines”, Pearson Education Ltd., 2010

MAPPING OF COS AND POS:

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AE3403 AIRCRAFT STRUCTURES – I

COURSE OBJECTIVES:
- To provide the students an understanding on the linear static analysis of determinate and indeterminate aircraft structural components.
- To provide the students an understanding on energy methods to statically determinate and indeterminate structures
- To make the students to Create a structure to carry the given load.
- To make the students to Calculate the response of statically indeterminate structures under various loading conditions.
- To provide the design process using different failure theories
UNIT I  STATICALLY DETERMINATE & INDETERMINATE STRUCTURES
principle of super position, Clapeyron's 3 moment equation and moment distribution method for
indeterminate beams.

UNIT II  ENERGY METHODS
Strain Energy in axial, bending, torsion and shear loadings. Castigliano’s theorems and their
applications. Energy theorems – dummy load & unit load methods – energy methods applied to
statically determinate and indeterminate beams, frames, rings & trusses.

UNIT III  COLUMNS
Euler’s column curve – inelastic buckling – effect of initial curvature – Southwell plot – columns with
eccentricity – use of energy methods – theory of beam columns – beam columns with different end
conditions – stresses in beam columns.

UNIT IV  FAILURE THEORIES
Ductile and brittle materials – maximum principal stress theory - maximum principal strain theory -
maximum shear stress theory - distortion energy theory – octahedral shear stress theory.

UNIT V  INDUCED STRESSES
Thermal stresses – impact loading – Fatigue – Creep - Stress Relaxation

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, Students can able to
  CO1: Explain the method to analyse the linear static analysis of determinate and indeterminate
    aircraft structural components
  CO2: Apply the energy methods to determine the reactions of structure.
  CO3: Analyse the column structure with different end condition.
  CO4: Design the component using different theories of failure.
  CO5: Create a structure to carry the given load by considering effect of induced stresses

TEXT BOOKS:
1. ‘Mechanics of Materials’ by James M. Gere & Barry J Goodno, cengage Learning Custom

REFERENCES:

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UNIT - I ENVIRONMENT AND BIODIVERSITY

UNIT – II ENVIRONMENTAL POLLUTION

UNIT – III RENEWABLE SOURCES OF ENERGY.
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT - IV SUSTAINABILITY AND MANAGEMENT
Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and Protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT - V SUSTAINABILITY PRACTICES

TEXT BOOKS:
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

REFERENCES:
OBJECTIVE:
- To understand pressure distribution and characteristic over an airfoil and bluff bodies due to airflow.
- To measure the forces and moments acting on the airfoil at different angle of attack using wind tunnel balance set up.
- To visualize the flow pattern over an object by different method.

LIST OF EXPERIMENTS
1. Calibration of a subsonic Wind tunnel.
2. Determination of lift for the given airfoil section.
3. Pressure distribution over a smooth circular cylinder.
4. Pressure distribution over a rough circular cylinder.
5. Pressure distribution over a symmetric aerofoil.
6. Pressure distribution over a cambered aerofoil.
7. Force measurement using wind tunnel balancing set up.
8. Flow over a flat plate at different angles of incidence.
10. Flow visualization studies in low speed flows over airfoil with different angle of incidence.
11. Flow visualization on bluff bodies using water flow channel

TOTAL: 60 PERIODS

OUTCOMES:
- Calculate the aerodynamic forces and moments experienced by airfoils, wings and bluff bodies.
- Evaluate the performance of thin airfoils with the effects of angle of attack and camber by considering thin aerofoil theory
- Measure flow velocity, lift and drag by use of wind tunnel instrument and to Visualize the flow by water flow and smoke methods.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

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OBJECTIVES:

- To explore practically components of aircraft piston and gas turbine engines and their working principles.
- To impart practical knowledge of flow phenomenon of subsonic and supersonic jets.
- To determine practically thrust developed by rocket propellants.

LIST OF EXPERIMENTS

1. Study of aircraft piston and its components.
2. Determine the velocity profiles of free jets.
3. Determine Velocity profiles of wall jets.
4. Wall pressure measurements of a subsonic diffusers and ramjet ducts.
5. Flame stabilization studies using conical and hemispherical flame holders.
6. Cascade testing of compressor blades.
7. Velocity and pressure measurements high speed jets.
8. Wall Pressure measurements of supersonic nozzle.
9. Wall pressure measurements on supersonic inlet
11. Performance test of propeller
12. Study of gas turbine engines and its components

TOTAL:60 PERIODS

OUTCOMES

- Identify components and information of piston and gas turbine engine.
- Analyze the behaviour of flow through ducts and jet engine components to distinguish subsonic and supersonic flow characteristics.
- Visualize flow phenomenon in supersonic flow.

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TOTAL:60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

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<td>Wind tunnel</td>
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<td>0-5 bar pressure transducer with pressure indicator</td>
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<td>OR DSA pressure scanner</td>
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<td>7</td>
<td>Ramjet facility</td>
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<tr>
<td>8</td>
<td>Conical flame holder model</td>
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<td>Hemispherical flame holder model</td>
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<td>Water flow channel</td>
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<td>Compressor blade set</td>
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<td>Schlieren or Shadowgraph set up</td>
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<tr>
<td>13</td>
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<tr>
<td>14</td>
<td>Convergent divergent nozzle</td>
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<td>15</td>
<td>Thruster with load cells</td>
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