PROGRAMME EDUCATIONAL OBJECTIVES:

1. Graduates will have the knowledge for the application of scientific principles, Mathematical methods, technical and Innovative skills to perform analysis, application engineering, and system or process development in Marine Industry.
2. Graduates will have the knowledge by engaging in continuous education and will have the ability to function effectively as leaders on professional teams with ability to communicate effectively using speaking, writing and presentation skills.
3. Graduates of the program are to have demonstrated the competent to carry out the Engineering watch at sea and to maintain systems or processes and to direct, supervise, and make important decisions regarding the design and engineering of problems based on engineering fundamentals and modern technological tools.
4. Graduates will demonstrate a respect for professional, ethical and social and environmental issues as well as a commitment to safety, quality and productivity.

PROGRAMME SPECIFIC OBJECTIVE

1. The ability to have thorough knowledge of maritime industry in accordance with the STCW-conventions amended time-to-time,
2. Possess an overall and conscious understanding about marine engineering at the operational and management level
3. Posses knowledge of national and international rules and regulations concerning marine engineering
4. Posses the Necessary skill for the technical operation of ships in both off-shore and on-shore.

2. PROGRAMME OUTCOMES

a. Ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology to problems associated with marine equipment, systems, and vehicles.
b. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
c. Ability to conduct, use proper laboratory practices, use instrumentation for measuring physical phenomena, analyze and interpret experiments and apply experimental results to improve processes and design.
d. Ability to apply creativity in the design of systems, components, or processes in the marine environment.
e. Ability to apply the principles of fluid mechanics, hydrostatic stability, solid mechanics, materials, dynamics, and energy systems to technical problems related to marine equipment, systems, and vehicles. (including selecting appropriate materials and methods for manufacturing of machine parts).
f. Graduates should be able to operate maintain and repair main, auxiliary machinery and associated control System and automation. Graduate should be capable of using appropriate hand tools, machine tools and measuring instruments.
g. Graduates should be capable of preventing, controlling, and fighting fire on board and be aware of proper use of Fire Fighting Appliances & Life Saving Appliances and have the knowledge of Ship safety and First aid.

h. Ability to understand and apply professional, ethical and social responsibilities and global issues

i. An ability to communicate effectively and apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature including technical report.

j. Commitment to quality, timeliness and continuous improvement with lifelong learning

k. Ability to engage in the operation, maintenance, analysis and management of modern marine power plants and associated equipment and systems and competent to undertake independent watch-keeping at Engine room.

l. Competency of the knowledge, techniques, skills and to use design manuals, equipment specifications, and industry regulations, modern tools of marine engineering technology as specified in Table III/I as per 2010 STCW Convention.

3. PEO/PO Mapping

<table>
<thead>
<tr>
<th>PEO/PO</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
### 4. Semester Course wise PEO mapping

<table>
<thead>
<tr>
<th></th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR I</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SEMESTER I</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical English – I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics for Marine Engineering – I</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering Physics</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry for Marine Engineering</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem solving and Python Programming</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering Graphics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Practical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem solving and Python Programming Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics and Chemistry Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SEMESTER II</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical English for Marine Engineering – II</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics for Marine Engineering – II</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials Science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basics of Electrical and Electronics Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Environmental Science and Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Engineering Mechanics</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Practical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering Practices Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Basic Electrical and Electronics Engineering Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
<td>-----------------------------------------------------</td>
<td>--------------------------------------</td>
<td>-----------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------</td>
<td>---------------------------------</td>
<td>--------------------------</td>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEMESTER IV</td>
<td>Marine Engineering Thermodynamics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marine Diesel Engines – I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marine Boilers and Steam Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marine Electrical Machines – II</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marine Engineering Materials</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marine Electronics</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marine Refrigeration and Air Conditioning</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YEAR III</td>
<td>SEMESTER V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Welding Techniques, Lathe and Special Machine Shop</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heat Engines, Boiler Chemistry and Refrigeration Laboratory</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marine Auxiliary Machinery I</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marine Diesel Engines II</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stability of Ships</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ship Construction</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanics of Marine Machines</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seamanship, Elementary Navigation and Survival At Sea</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Open Elective -I</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical Engg., Electronics and Microprocessor Laboratory</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Communication</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SEMESTER VI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marine Workshop Practical and Afloat Training</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Semester I

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>HS8101</td>
<td>Technical English – I</td>
<td>HS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>MA8101</td>
<td>Mathematics for Marine Engineering – I</td>
<td>BS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>PH8151</td>
<td>Engineering Physics</td>
<td>BS</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>CY8101</td>
<td>Chemistry for Marine Engineering</td>
<td>BS</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>GE8151</td>
<td>Problem Solving and Python Programming</td>
<td>ES</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>GE8152</td>
<td>Engineering Graphics</td>
<td>ES</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GE8161</td>
<td>Problem Solving and Python Programming Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>BS8161</td>
<td>Physics and Chemistry Laboratory</td>
<td>BS</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>31</td>
<td>19</td>
<td>0</td>
<td>12</td>
</tr>
</tbody>
</table>

### Semester II

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>HS8201</td>
<td>Technical English for Marine Engineering – II</td>
<td>HS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>MA8201</td>
<td>Mathematics for Marine Engineering – II</td>
<td>BS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>PH8251</td>
<td>Materials Science</td>
<td>BS</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>BE8253</td>
<td>Basic Electrical, Electronics and Instrumentation Engineering</td>
<td>ES</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>GE8291</td>
<td>Environmental Science and Engineering</td>
<td>HS</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>GE8292</td>
<td>Engineering Mechanics</td>
<td>ES</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GE8261</td>
<td>Engineering Practices Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>BE8261</td>
<td>Basic Electrical, Electronics and Instrumentation Engineering Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>30</td>
<td>20</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>
### SEMESTER – III

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MA8353</td>
<td>Transforms and Partial Differential Equations</td>
<td>BS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>MV8301</td>
<td>Marine Hydraulics and Fluid Machinery</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MV8302</td>
<td>Basics of Marine Engineering</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MV8303</td>
<td>Marine Manufacturing Technology</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>MV8304</td>
<td>Marine Electrical Machines – I</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>CE8395</td>
<td>Strength of Materials for Mechanical Engineers</td>
<td>ES</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>MV8305</td>
<td>Marine Machinery Drawing</td>
<td>PC</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>MV8311</td>
<td>Marine Hydraulics and Fluid Machinery Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>MV8312</td>
<td>Strength of Materials and Applied Mechanics Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>34</td>
<td>20</td>
<td>2</td>
<td>12</td>
</tr>
</tbody>
</table>

### SEMESTER – IV

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MV8401</td>
<td>Marine Engineering Thermodynamics</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MV8402</td>
<td>Marine Diesel Engines – I</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MV8403</td>
<td>Marine Boilers and Steam Engineering</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MV8404</td>
<td>Marine Electrical Machines – II</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>MV8405</td>
<td>Marine Engineering Materials</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>MV8406</td>
<td>Marine Electronics</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>MV8407</td>
<td>Marine Refrigeration and Air Conditioning</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>MV8411</td>
<td>Welding Techniques, Lathe and Special Machine Shop</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>MV8412</td>
<td>Heat Engines, Boiler Chemistry and Refrigeration Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>31</td>
<td>21</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>
### SEMESTER V

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MV8501</td>
<td>Marine Auxiliary Machinery I</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MV8502</td>
<td>Marine Diesel Engines II</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MV8503</td>
<td>Stability of Ships</td>
<td>PC</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>MV8504</td>
<td>Ship Construction</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>MV8505</td>
<td>Mechanics of Marine Machines</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>MV8506</td>
<td>Seamanship, Elementary Navigation and Survival At Sea</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>Open Elective -I</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**PRACTICAL**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>MV8511</td>
<td>Electrical Engineering, Electronics and Microprocessor Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>HS8581</td>
<td>Professional Communication</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td>30</td>
<td>22</td>
<td>2</td>
<td>6</td>
<td>26</td>
</tr>
</tbody>
</table>

**Note:** *This course and syllabi are prescribed as per directions of the Director General of Shipping, Government of India.

### SEMESTER –VI

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MV8611</td>
<td>Marine Workshop Practical and Afloat Training</td>
<td>EEC</td>
<td>8hrs per day – 6 days a week, 26 weeks, 500 Marks. Sessional Marks 200 Report + Viva 300</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SEMESTER – VII

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MV8701</td>
<td>Marine Machinery and Systems Design</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MV8702</td>
<td>Marine Electrical Technology</td>
<td>PC</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>MV8703</td>
<td>Marine Control Engineering and Automation</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MV8704</td>
<td>Marine Auxiliary Machinery – II</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>MV8705</td>
<td>Ship’s Fire Prevention and Control</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Open Elective – II</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>Professional Elective – I</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>MV8711</td>
<td>Fire Fighting, Controls and Simulator Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>MV8712</td>
<td>Marine Propulsion and Auxiliary Machinery Overhauling Laboratory</td>
<td>PC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>10.</td>
<td>MV8713</td>
<td>Measurement and Instrumentation Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>32</td>
<td>22</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

### SEMESTER – VIII

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MV8801</td>
<td>Marine Vehicles Performance</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MV8802</td>
<td>Ship Operational Management and IMO Requirements</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MV8803</td>
<td>Safety Precautions and Watch Keeping</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MV8804</td>
<td>Offshore Technology</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Professional Elective II</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>MV8811</td>
<td>Project Work</td>
<td>EEC</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>35</td>
<td>15</td>
<td>0</td>
<td>20</td>
</tr>
</tbody>
</table>

Total number of credits to be earned for award of the degree = 193
### HUMANITIES AND SOCIAL SCIENCES (HS)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>HS8101</td>
<td>Technical English – I</td>
<td>HS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>HS8201</td>
<td>Technical English for Marine Engineering – II</td>
<td>HS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>GE8291</td>
<td>Environmental Science and Engineering</td>
<td>HS</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### BASIC SCIENCE (BS)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MA8101</td>
<td>Mathematics for Marine Engineering – I</td>
<td>BS</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>PH8151</td>
<td>Engineering Physics</td>
<td>BS</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>CY8101</td>
<td>Chemistry for Marine Engineering</td>
<td>BS</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>BS8161</td>
<td>Physics and Chemistry Laboratory</td>
<td>BS</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>MA8201</td>
<td>Mathematics for Marine Engineering – II</td>
<td>BS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>PH8251</td>
<td>Materials Science</td>
<td>BS</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>MA8353</td>
<td>Transforms and Partial Differential Equations</td>
<td>BS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

### ENGINEERING SCIENCES (ES)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>GE8151</td>
<td>Problem Solving and Python Programming</td>
<td>ES</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>GE8152</td>
<td>Engineering Graphics</td>
<td>ES</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>GE8161</td>
<td>Problem Solving and Python Programming</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>BE8253</td>
<td>Basic Electrical, Electronics and Instrumentation Engineering</td>
<td>ES</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>GE8292</td>
<td>Engineering Mechanics</td>
<td>ES</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>GE8261</td>
<td>Engineering Practices Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>BE8261</td>
<td>Basic Electrical, Electronics and Instrumentation Engineering Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>CE8395</td>
<td>Strength of Materials for Mechanical Engineers</td>
<td>ES</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
### PROFESSIONAL CORE (PC)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MV8301</td>
<td>Marine Hydraulics and Fluid Machinery</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>MV8302</td>
<td>Basics of Marine Engineering</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>MV8303</td>
<td>Marine Manufacturing Technology</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>MV8304</td>
<td>Marine Electrical Machines – I</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>MV8305</td>
<td>Marine Machinery Drawing</td>
<td>PC</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>MV8311</td>
<td>Marine Hydraulics and Fluid Machinery Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>MV8312</td>
<td>Strength of Materials and Applied Mechanics Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>MV8401</td>
<td>Marine Engineering Thermodynamics</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>MV8402</td>
<td>Marine Diesel Engines – I</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>MV8403</td>
<td>Marine Boilers and Steam Engineering</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>MV8404</td>
<td>Marine Electrical Machines – II</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>MV8405</td>
<td>Marine Engineering Materials</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>MV8406</td>
<td>Marine Electronics</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>MV8407</td>
<td>Marine Refrigeration and Air Conditioning</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>MV8411</td>
<td>Welding Techniques, Lathe and Special Machine Shop</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>MV8412</td>
<td>Heat Engines, Boiler Chemistry and Refrigeration Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>MV8501</td>
<td>Marine Auxiliary Machinery I</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>MV8502</td>
<td>Marine Diesel Engines II</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>19</td>
<td>MV8503</td>
<td>Stability of Ships</td>
<td>PC</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>MV8504</td>
<td>Ship Construction</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>21</td>
<td>MV8505</td>
<td>Mechanics of Marine Machines</td>
<td>PC</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>22</td>
<td>MV8506</td>
<td>Seamanship, Elementary Navigation and Survival At Sea</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>23</td>
<td>MV8511</td>
<td>Electrical Engineering, Electronics and Microprocessor Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>24</td>
<td>MV8701</td>
<td>Marine Machinery and Systems Design</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>25</td>
<td>MV8702</td>
<td>Marine Electrical Technology</td>
<td>PC</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>26</td>
<td>MV8703</td>
<td>Marine Control Engineering and Automation</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>27</td>
<td>MV8704</td>
<td>Marine Auxiliary Machinery – II</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>28</td>
<td>MV8705</td>
<td>Ship’s Fire Prevention and Control</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>29</td>
<td>MV8711</td>
<td>Fire Fighting, Controls and</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>MV8712</td>
<td>Marine Propulsion and Auxiliary Machinery Overhauling Laboratory</td>
<td>PC</td>
<td>2</td>
<td>0 0 2 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>MV8713</td>
<td>Measurement and Instrumentation Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0 0 4 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>MV8801</td>
<td>Marine Vehicles Performance</td>
<td>PC</td>
<td>3</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td>MV8802</td>
<td>Ship Operational Management and IMO Requirements</td>
<td>PC</td>
<td>3</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>MV8803</td>
<td>Safety Precautions and Watch Keeping</td>
<td>PC</td>
<td>3</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.</td>
<td>MV8804</td>
<td>Offshore Technology</td>
<td>PC</td>
<td>3</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Electives for B. E. Marine Engineering

### Semester VII, Elective I

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MV8001</td>
<td>Advanced Marine Heat Engines</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>MV8002</td>
<td>Ship Safety and Environmental Protection</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>MV8003</td>
<td>Pressure Vessels and Piping</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>GE8074</td>
<td>Human Rights</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>GE8077</td>
<td>Total Quality Management</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>GE8071</td>
<td>Disaster Management</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### Semester VIII, Elective II

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MV8004</td>
<td>Special Duty Vessels and Type of Operation</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>MV8005</td>
<td>Marine Robotics</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>MV8006</td>
<td>Marine Corrosion and Prevention</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>GE8076</td>
<td>Professional Ethics in Engineering</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>GE8075</td>
<td>Intellectual Property Rights</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>GE8073</td>
<td>Fundamentals of Nano Science</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
### EMPLOYABILITY ENHANCEMENT COURSES (EEC)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HS8581</td>
<td>Professional Communication</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>MV8611</td>
<td>Marine Workshop Practical and Afloat Training</td>
<td>EEC</td>
<td>8hrs per day – 6 days a week, 26 weeks, 500 Marks. Sessional Marks 200 Report + Viva 300</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>MV8811</td>
<td>Project Work</td>
<td>EEC</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

### Summary

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Area</th>
<th>Credits Per Semester</th>
<th>Credit Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I  II  III IV V VI VII VIII</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>HS</td>
<td>4  7</td>
<td>11</td>
<td>7.77</td>
</tr>
<tr>
<td>2</td>
<td>BS</td>
<td>12 7 4</td>
<td>23</td>
<td>9.84</td>
</tr>
<tr>
<td>3</td>
<td>ES</td>
<td>9 11 3</td>
<td>23</td>
<td>10.36</td>
</tr>
<tr>
<td>4</td>
<td>PC</td>
<td>20 26 22 21 12 10 23 12 21 12</td>
<td>101</td>
<td>53.89</td>
</tr>
<tr>
<td>5</td>
<td>PE</td>
<td>3 3 6</td>
<td>6</td>
<td>3.11</td>
</tr>
<tr>
<td>6</td>
<td>OE</td>
<td>3 3 6</td>
<td>6</td>
<td>3.11</td>
</tr>
<tr>
<td>7</td>
<td>EEC</td>
<td>1 12 10 23 11.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Non-Credit/(Mandatory)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To enable learners of Engineering and Technology develop their basic communications skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.

UNIT I
Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family/ friend; Reading - Skimming a reading passage – Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one’s leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials – Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II
Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking and answering questions - Writing - Process descriptions (general/specific) – Definitions Recommendations – Instructions; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association (connotation); E-materials - Interactive exercises for Grammar and Vocabulary - Reading exercises with sample telephone conversations.

UNIT III
Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing – Writing - Channel conversion (flowchart into process) - Types of paragraph (cause and effect / compare and contrast / narrative / analytical) - Informal writing - Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV
Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations and acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - writing.

UNIT V
Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast and telecast from Radio and TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Sending their responses through email; Writing - Creative
writing, Grammar- Direct and indirect speech; Vocabulary - Lexical items (fixed / semifixed expressions); E-materials - Interactive exercises for Grammar and Vocabulary – Sending emails with attachment – Audio / video excerpts of different accents - Interpreting posters.

TOTAL: 60 PERIODS

OUTCOMES:
Learners should be able to
- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- Listen/view and comprehend different spoken discourses/excerpts in different accents

TEXTBOOKS:

REFERENCES:

TEACHING METHODS:
- Lectures
- Activities conducted individually, in pairs and in groups like self-introduction, peer introduction, group poster making, grammar and vocabulary games, etc.
- Discussions
- Role play activities
- Short presentations
- Listening and viewing activities with follow up activities like discussion, filling up worksheets, writing exercises (using language lab wherever necessary/possible) etc.

EVALUATION PATTERN:
Internal assessment: 20%
3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like
- Project
- Assignment
- Reviews
- Creative writing
OBJECTIVES:
The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus and three-dimensional analytical geometry. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of Marine Engineering students to model the engineering problems mathematically and provide solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and three-dimensional analytic geometry and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I THREE DIMENSIONAL ANALYTICAL GEOMETRY 12

UNIT II DIFFERENTIAL CALCULUS 12
Differentiation of algebraic, circular, exponential and logarithmic functions, products, quotient functions of a function and simple implicit functions - Successive differentiation : Introduction and notation - \( n^{th} \) order derivatives of standard functions - \( n^{th} \) order derivatives using (a) Trigonometric identities and standard functions (b) Partial fractions - Leibnitz’s theorem - Maclaurin’s theorem - Taylor’s theorem - Indeterminate forms and L’Hospital’s rule - Curve tracing of cartesian and polar curves.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12

UNIT IV INTEGRAL CALCULUS 12
Integration of standard forms by substitution and by parts - Definite integral as the limit of a sum - Application of integration to area under curve - Volume of revolution - First moment of area and the position of a centroid of an area - Work done by variable forces - Mean values, Root mean square values of sin \( nx \) and cos \( nx \). Rules of Guldinus -Theorems of parallel and perpendicular axes - Second moments of area and moments of inertia of a rectangular and circular lamina.

UNIT V MULTIPLE INTEGRALS 12

TOTAL : 60 PERIODS

OUTCOMES:
After completing this course, students should demonstrate competency in the following skills:
- Use rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals using the Fundamental Theorem of Calculus.
- Apply integration to compute arc lengths, volumes of revolution and surface areas of revolution.
- Apply integration to compute multiple integrals, area, moment of inertia, integrals in polar coordinates, in addition to change of order.
• Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
• Apply the concepts of three-dimensional geometry to model engineering problems.

TEXT BOOKS:

REFERENCES:

PH8151 ENGINEERING PHYSICS

OBJECTIVES:
• To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I PROPERTIES OF MATTER

UNIT II WAVES AND FIBER OPTICS

UNIT III THERMAL PHYSICS
UNIT IV QUANTUM PHYSICS


UNIT V CRYSTAL PHYSICS

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

OUTCOMES:
Upon completion of this course,
- the students will gain knowledge on the basics of properties of matter and its applications,
- the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- the students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
On Completion of the course the Students are expected to
- Have a thorough knowledge of Boiler Chemistry and Feed Water Treatment methods.
- Have a knowledge of various Water Hardness analysis procedures
- Have a basic concept on Nanochemistry.

UNIT I WATER TECHNOLOGY
Water and its impurities - Significance and estimation - turbidity, colour, pH, acidity, solids, chlorides, residual chlorine, sulphates, fluorides, phosphates, iron and manganese, DO, BOD, COD, nitrogen, grease, volatile acids.

UNIT II WATER TREATMENT PROCESSES
Lime and Soda treatment, zeolites process and ion exchange (demineralization) - pH treatment, salinometer, use of litmus paper, test for partial, total alkalinity, chloride, sulphite, phosphate test, caustic soda treatment, condensate lime treatment. Desalination of water, reverse osmosis and electro dialysis, and control, effects of salts and gases in feed water.

UNIT III BOILER CHEMISTRY
Purpose of water treatment in boilers, scale and sludge formation and prevention, priming and foaming - Boiler corrosion – fretting, pitting corrosion, corrosion fatigue, atoms and ions, electro chemical corrosion, hydrogen and hydroxyl ions, types and causes of corrosion and it's control ; chemical and mechanical deareation, methods of chemical deareation, dezincification, stress corrosion.

UNIT IV WATER HARDNESS ANALYSIS
Hardness, units of hardness, estimation of hardness by EDTA method, treatment for hardness, total dissolved solids, dissolved oxygen test, use of coagulants, typical test valves for smoke and water tube boilers.

UNIT V ENERGY SOURCES AND NANOCHEMISTRY
Introduction - Properties (Electrical, Mechanical and vibration) – carbon nano tubes -Applications in fuel cells, catalysis and use of gold nanoparticles - batteries -secondary batteries - alkaline batteries – lead acid, Ni – Cd and Li batteries, principles and applications of solar cells, fuels cells – Hydrogen and methanol.

OUTCOME:
The knowledge gained on various aspects of water chemistry, energy sources and nanochemistry will provide a strong platform to understand concepts on these subjects for further learning.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I  ALGORITHMIC PROBLEM SOLVING  9
Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II  DATA, EXPRESSIONS, STATEMENTS  9
Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III  CONTROL FLOW, FUNCTIONS  9
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  9
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: selection sort, insertion sort, mergesort, histogram.

UNIT V  FILES, MODULES, PACKAGES  9
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.

OUTCOMES:
Upon completion of the course, students will be able to
- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.

TOTAL : 45 PERIODS
TEXT BOOKS:

REFERENCES:

GE8152 ENGINEERING GRAPHICS
OBJECTIVES:
- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

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 AND FREEHAND SKETCHING
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.
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

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE
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
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.
UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

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.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

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.

OUTCOMES:
On successful completion of this course, the student will be able to

- familiarize with the fundamentals and standards of Engineering graphics
- perform freehand sketching of basic geometrical constructions and multiple views of objects.
- project orthographic projections of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

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.
OBJECTIVES:
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS
1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton’s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED
Python 3 interpreter for Windows/Linux

OUTCOMES:
Upon completion of the course, students will be able to
- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

TOTAL : 60 PERIODS
OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS

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

- apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometry.

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.
   1. Conductometric titration of strong acid vs strong base.
OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TOTAL: 30 PERIODS

TEXTBOOKS:


HS8201 TECHNICAL ENGLISH FOR MARINE ENGINEERING - II

OBJECTIVES:

- To make learners acquire listening and speaking skills in both formal and informal contexts.
- To help them develop their reading skills by familiarizing them with different types of reading strategies.
- To equip them with writing skills needed for academic as well as workplace contexts.
- To make them acquire language skills at their own pace by using e-materials and language lab components.

UNIT I

Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on topics like weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Using ‘emoticons’ as symbols in email messages; Grammar - Regular and irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. ‘can’) - Homophones (e.g. ‘some’, ‘sum’); E-materials - Interactive exercise on Grammar and vocabulary - Listening to different types of conversation and answering questions.

UNIT II

Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his / her success, thanking one’s friends / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercises on Grammar and vocabulary, - Language Lab - Dialogues (Fill up exercises), Recording students’ dialogues.

UNIT III

Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret, etc.); Reading - Speed reading – reading passages with time limit - Skimming; Writing -Writing strategies- essay writing; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. ‘rock’, ‘train’, ‘ring’); E-materials - Interactive exercise on Grammar and vocabulary
UNIT IV
Listening - Listening to a telephone conversation, Speaking- Role play practice in telephone skills - listening and responding, - asking questions, - note taking – passing on messages, Role play and mock interview for grasping interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar and Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V
Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading; Writing – Checklist - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises; Language Lab - Different models of group discussion.

OUTCOMES:
Learners should be able to
- Speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
- Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
- Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXT BOOKS:

REFERENCES:
6. EXTENSIVE Reading (Not for Examination) http://owl.english.purdue.edu
TEACHING METHODS:
- Lectures and activities conducted individually, in pairs and in groups like individual writing and presentations, group discussions, interviews, reporting, etc.
- Long presentations using visual aids
- Listening and viewing activities with follow up activities like discussions, filling up worksheets, writing exercises (using language lab wherever necessary/possible) etc

MA8201 MATHEMATICS FOR MARINE ENGINEERING – II

OBJECTIVES:
This course is designed to cover topics such as Ordinary Differential Equations, Vector Calculus, Complex Analysis and Laplace Transform. Ordinary Differential Equations is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modeling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I ORDINARY DIFFERENTIAL EQUATIONS – FIRST ORDER AND APPLICATIONS
12
Definition - Order and degree - Formation of differential equation - Solution of first order, first degree equations in variable separable form, homogeneous equations, other substitutions - Equations reducible to homogeneous and exact differential equations - Equations reducible to exact Integration - Factor - Linear differential equation of first order first degree, reducible to linear - Applications to electrical circuits and orthogonal trajectories

UNIT II ORDINARY DIFFERENTIAL EQUATIONS – HIGHER ORDER AND APPLICATIONS
12
Higher (n\textsuperscript{th}) order linear differential equations - Definition and complementary solution - Methods of obtaining particular integral - Method of variation of parameters - Method of undetermined coefficients - Cauchy’s homogeneous linear differential equations and Legendre’s equations - System of ordinary differential equations - Simultaneous equations in symmetrical form - Applications to deflection of beams, struts and columns - Applications to electrical circuits and coupled circuits

UNIT III VECTOR CALCULUS
12
Gradient - Divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT IV ANALYTIC FUNCTIONS
12
Functions of a complex variable – Analytic functions – Necessary conditions - Cauchy – Riemann equation and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping
\[ w = z + c, \quad cz, \quad \frac{1}{z}, \quad \text{and bilinear transformation.} \]
UNIT V  LAPLACE TRANSFORM


TOTAL : 60 PERIODS

OUTCOMES :
After successfully completing the course, the student will have a good understanding of the following topics:

- Apply various techniques in solving differential equations.
- Gradient, divergence and curl of a vector point function and related identities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green’s theorems and their verification.
- Analytic functions, conformal mapping and complex integration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS :

REFERENCES :

MATERIALS SCIENCE

PH8251
(Common to courses offered in Faculty of Mechanical Engineering Except B.E. Materials Science and Engineering )

OBJECTIVES:
• To introduce the essential principles of materials science for mechanical and related engineering applications.

UNIT I  PHASE DIAGRAMS

Solid solutions - Hume Rothery’s rules – the phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.
UNIT II  
FERROUS ALLOYS  

UNIT III  
MECHANICAL PROPERTIES  

UNIT IV  
MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS  

UNIT V  
NEW MATERIALS  

OUTCOMES:
Upon completion of this course,
- the students will have knowledge on the various phase diagrams and their applications
- the students will acquire knowledge on Fe-Fe₃C phase diagram, various microstructures and alloys
- the students will get knowledge on mechanical properties of materials and their measurement
- the students will gain knowledge on magnetic, dielectric and superconducting properties of materials
- the students will understand the basics of ceramics, composites and nanomaterials.

TEXT BOOKS:

REFERENCES
OBJECTIVES:
To impart knowledge on
• Electric circuit laws, single and three phase circuits and wiring
• Working principles of Electrical Machines
• Working principle of Various electronic devices and measuring instruments

UNIT I ELECTRICAL CIRCUITS

UNIT II AC CIRCUITS
Introduction to AC circuits – waveforms and RMS value – power and power factor, single phase and three-phase balanced circuits – Three phase loads - housing wiring, industrial wiring, materials of wiring

UNIT III ELECTRICAL MACHINES
Principles of operation and characteristics of ; DC machines, Transformers (single and three phase), Synchronous machines , three phase and single phase induction motors.

UNIT IV ELECTRONIC DEVICES & CIRCUITS

UNIT V MEASUREMENTS & INSTRUMENTATION
Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect and Mechanical - ,Classification of instruments - Types of indicating Instruments - multimeters –Oscilloscopes- – three-phase power measurements– instrument transformers (CT and PT )

OUTCOMES:
Ability to
• Understand electric circuits and working principles of electrical machines
• Understand the concepts of various electronic devices
• Choose appropriate instruments for electrical measurement for a specific application

TEXT BOOKS

REFERENCES

GE8291 ENVIRONMENTAL SCIENCE AND ENGINEERING

OBJECTIVES:
- To study the nature and facts about environment.
- To find and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources,
use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

TOTAL: 45 PERIODS

OUTCOMES:
- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT I STATICS OF PARTICLES 9+6

UNIT II EQUILIBRIUM OF RIGID BODIES 9+6
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9+6

UNIT IV DYNAMICS OF PARTICLES 9+6

UNIT V FRICTION AND RIGID BODY DYNAMICS 9+6
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL : 45+30=75 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to
- illustrate the vectorial and scalar representation of forces and moments
- analyse the rigid body in equilibrium
- evaluate the properties of surfaces and solids
- calculate dynamic forces exerted in rigid body
- determine the friction and the effects by the laws of friction

TEXT BOOKS:
REFERENCES:

GE8261 ENGINEERING PRACTICES LABORATORY L T P C 0 0 4 2

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

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 13

Buildings:
(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:
(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:
(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE 18

Welding:
(a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
(b) Gas welding practice

Basic Machining:
(a) Simple Turning and Taper turning
(b) Drilling Practice
Sheet Metal Work:
(a) Forming & Bending:
(b) Model making – Trays and funnels.
(c) Different type of joints.

Machine assembly practice:
(a) Study of centrifugal pump
(b) Study of air conditioner

Demonstration on:
(a) Smithy operations, upsetting, swaging, setting down and bending. Example –
   Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 13
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
5. Measurement of energy using single phase energy meter.

IV ELECTRONICS ENGINEERING PRACTICE 16
1. Study of Electronic components and equipments – Resistor, colour coding measurement
   of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to
- fabricate carpentry components and pipe connections including plumbing works.
- use welding equipments to join the structures.
- Carry out the basic machining operations
- Make the models using sheet metal works
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings
- Carry out basic home electrical works and appliances
- Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL
1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools: (a) Rotary Hammer 2 Nos  
   (b) Demolition Hammer 2 Nos  
   (c) Circular Saw 2 Nos  
   (d) Planer 2 Nos  
   (e) Hand Drilling Machine 2 Nos  
   (f) Jigsaw 2 Nos

**MECHANICAL**

1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
9. Study-purpose items: centrifugal pump, air-conditioner One each.

**ELECTRICAL**

1. Assorted electrical components for house wiring 15 Sets
2. Electrical measuring instruments 10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each
4. Megger (250V/500V) 1 No.
5. Power Tools: (a) Range Finder 2 Nos  
   (b) Digital Live-wire detector 2 Nos

**ELECTRONICS**

1. Soldering guns 10 Nos.
2. Assorted electronic components for making circuits 50 Nos.
3. Small PCBs 10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply
OBJECTIVE:
- To train the students in performing various tests on electrical drives, sensors and circuits.

LIST OF EXPERIMENTS:
1. Load test on separately excited DC generator
2. Load test on Single phase Transformer
3. Load test on Induction motor
4. Verification of Circuit Laws
5. Verification of Circuit Theorems
6. Measurement of three phase power
7. Load test on DC shunt motor.
8. Diode based application circuits
9. Transistor based application circuits
10. Study of CRO and measurement of AC signals
11. Characteristics of LVDT
12. Calibration of Rotometer
13. RTD and Thermistor

Minimum of 10 Experiments to be carried out :-

TOTAL: 60 PERIODS

OUTCOMES:
- Ability to determine the speed characteristic of different electrical machines
- Ability to design simple circuits involving diodes and transistors
- Ability to use operational amplifiers

LIST OF EQUIPMENT FOR A 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>D. C. Motor Generator Set</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>D.C. Shunt Motor</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Single Phase Transformer</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Single Phase Induction Motor</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Ammeter A.C and D.C</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>Voltmeters A.C and D.C</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>Watt meters LPF and UPF</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Resistors &amp; Breadboards</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Cathode Ray Oscilloscopes</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Dual Regulated power supplies</td>
<td>6</td>
</tr>
<tr>
<td>11</td>
<td>A.C. Signal Generators</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>Transistors (BJT, JFET)</td>
<td>-</td>
</tr>
</tbody>
</table>
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 – Singular integrals - Solutions of standard types of first order partial differential equations - 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  

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.

UNIT IV  FOURIER TRANSFORMS  

UNIT V  Z-TRANSFORMS AND DIFFERENCE EQUATIONS  

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:

MV 8301           MARINE HYDRAULICS AND FLUID MACHINERY       L   T   P   C
                                                             3   0   0   3

OBJECTIVE:
- To develop the theoretical and application skills of students in Marine Hydraulics and Fluid Machinery.

UNIT I          FLUID STATICS     9

UNIT II           FLUID KINEMATICS AND DYNAMICS     9

UNIT III          LAMINAR AND TURBULENT FLOWS     9

UNIT IV           PUMPS     9
Rotodynamic pumps – principles of dimensional analysis – Buckinghams theorem – important dimensionless numbers applicable to fluid mechanics – impact of jets – force exerted by a jet on flat, curved plates and pipe bends. surge pressure and control – centrifugal pumps – some definitions – pump output and efficiencies – effect of vane angle– cavitation – constructional

UNIT V HYDRAULIC TURBINES
Classification of hydraulic turbines – pelton turbines, velocity triangle – efficiencies – non dimensional numbers, working principle of the pelton wheel. francis and kaplan turbines – velocity triangles, - efficiencies of the draft tubes, hydraulic turbine characteristics.

OUTCOMES:
- The Fluid properties and effect of various forces acting on different planes, surfaces and Pipes.
- The In-viscid flow and Real Viscous flow and their characteristics.
- The principles of theoretical aspect of pumps and hydraulic turbines fitted on board ships.

TEXT BOOKS:

REFERENCES

MV8302 BASICS OF MARINE ENGINEERING

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

OBJECTIVES:
- Have studied the renewable and Non-Renewable Energy Sources
- Have a good knowledge of working principle of 2 Stroke and 4 Stroke Marine IC Engines
- Have sound knowledge of Marine Refrigeration and Air-Conditioning Plant
- Have a Knowledge of Metal Forming and Joining Processes and various Power Transmission methods

UNIT I ENERGY RESOURCES AND POWER GENERATION
Renewable and Non-renewable resources – thermal, hydel, solar, wind, tidal, geothermal and nuclear – Indian energy scenario.
Power Plants - Steam, gas turbine, diesel, nuclear and hydel power plants – Layout, major components and working. Choice of the type of plant, Combined cycles, cogeneration, Importance of Energy storage, Environmental constraints of power generation using fossil fuels and nuclear energy.
Steam generators - Classification, working or Cochran, Babcock Wilcox, Lamont and Benson boilers, Principles and features of modern high pressure boiler – tower type boilers. (A separate study of boiler mountings and accessories are beyond the scope of this course).
UNIT II  MARINE I.C. ENGINES  9

UNIT III  MARINE REFRIGERATION & AIR CONDITIONING  9
Refrigeration – application and types, Vapour compression refrigeration system – working principles and features, working fluids.
Air conditioning – requirement of conditioned air, summer and winter air conditioning, layout of a typical window air conditioner, Thermoelectric cooling.

UNIT IV  METAL FORMING AND MACHINE TOOLS  9
Introduction to CAD, CAM, CIM and ROBOT.

UNIT V  POWER TRANSMISSION  9
Introduction to belt, rope, chain, friction drives, shaft, clutch and couplings. Simple and compound gear trains. Introduction to Brakes - Electromagnetic brakes.
TOTAL : 45 PERIODS

OUTCOMES:
- Ability to identify the sources of renewable and nonrenewable energy towers.
- Ability to explain the working principles of 2 Stroke and 4 Stroke Marine Engines
- Ability to explain the working cycle of Refrigeration and Air-Conditioning used in marine
- Ability to explain different forming and metal forming processes.

TEXT BOOKS:

REFERENCES
OBJECTIVE:

- To develop theoretical Knowledge of students on the process of manufacture of Marine Components.

UNIT I  METAL JOINING PROCESSES  

UNIT II  CASTING PROCESSES  

UNIT III  FINISHING PROCESSES  

UNIT IV  METAL FORMING PROCESSES  

UNIT V  MACHINING PROCESSES  
Lathe: working principle, classification, specification accessories, lathe and tool holders, different operations on a lathe, methods of taper turning machining time and power required for cutting, Drilling and boring - classification, specification, cutters speed feed, machining time parts and description of parts parts-boring machines- jig borer –description, types and hole location procedures – milling - classification, principle, parts- specification milling cutters indexing, selection of milling m/c fundamentals of inches processes, milling processes and operations – CNC machines.

TOTAL :  45  PERIODS

OUTCOMES:
- Metal joining processes
- Casting processes.
- Metal forming, Machining and finishing processes.

TEXT BOOKS:
REFERENCES

MV 8304 MARINE ELECTRICAL MACHINES – I

OBJECTIVE:
- To expose the students to the Electrical equipments fitted on boards ships, the concepts of electrical measurements and electrical distribution systems.

UNIT I PRINCIPLES OF D.C. MACHINES AND GENERATORS 9+6

UNIT II D.C. MOTORS 9+6

UNIT III TRANSFORMERS 9+6

UNIT IV INSTRUMENTS AND TESTING 9+6
Basic requirements of measuring instrument-static and dynamic characteristics of measuring instruments – principles of indicating instruments – control and damping devices – moving coil and moving iron instruments and their use as voltmeters and ammeters – dynamometer type wattmeter – thermocouple type ammeter, voltmeters and wattmeter. extension of instrument range.

UNIT V DISTRIBUTION AND TRANSMISSION SYSTEMS 9+6

TOTAL : 75 PERIODS
OUTCOMES:
- The knowledge about construction and operation of D.C. Machines in general and generators in particular
- To introduce the concepts about measurement practices and measuring instruments.
- To familiarize the students with the operation and control of D.C. motors.
- To study the construction and operation of transformer.
- To study the structure and functioning of transmission and distribution.

TEXT BOOKS:

REFERENCES

CE8395 STRENGTH OF MATERIALS FOR MECHANICAL ENGINEERS

OBJECTIVES:
- To understand the concepts of stress, strain, principal stresses and principal planes.
- To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
- To determine stresses and deformation in circular shafts and helical spring due to torsion.
- To compute slopes and deflections in determinate beams by various methods.
- To study the stresses and deformations induced in thin and thick shells.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM
UNIT III TORSION
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS
Double Integration method – Macaulay’s method – Area moment method for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame’s theorem.

OUTCOMES:
Students will be able to
- Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
- Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
- Apply basic equation of simple torsion in designing of shafts and helical spring
- Calculate the slope and deflection in beams using different methods.
- Analyze and design thin and thick shells for the applied internal and external pressures.

TEXT BOOKS:

REFERENCES:

MV 8305 MARINE MACHINERY DRAWING L T P C
1 0 4 3

OBJECTIVE:
- To make the students understand and practice Machine Drawing.

UNIT I EXPLANATION AND SKETCHING 3+12
Dimensioning conventions of shafts, arcs, angles, holes, tapers, welded joints, threads and pipes conventional representation of metals and materials. sectioning conventions, removed sections and revolved sections, parts not usually sectioned, conventions of gears
UNIT II  LIMITS, FITS AND TOLERANCES  3+12
Limits and tolerances, Surface Finish, Type of fits – description, hole basis system and shaft basis system, calculations involving minimum and maximum clearances for given combination of tolerance grades - simple problems, geometric tolerances

UNIT III  RIVETS AND JOINTS  3+12
Sketching screw-threads, screwed fastenings, rivets and riveted joints keep. cotter joints & pin joints.

UNIT IV  MARINE MACHINERY PARTS  3+12
Drawing of machine components in assembly - details like couplings, glands, non-return valves, cocks & plugs, cylinder, connecting rod & bearings. boiler mountings – full bore safety valve, gauge glass, main stop valve.

UNIT V  MARINE COMPONENT  3+12
Assembly drawings of simple marine components - bilge strainer boxes, control valves, cylinder relief valves, boiler blow down cock.

TOTAL: 75 PERIODS

OUTCOMES:
- The Method of sketching to Explain the Limits, Fits and Tolerances arcs etc., with respect to the Marine Machinery.
- To Sketch Valves, Cocks and Plugs.
- To draw Various parts of Marine Machinery and the general Marine components

TEXT BOOKS:

REFERENCES

MV 8311  MARINE HYDRAULICS AND FLUID MACHINERY  L T P C
LABORATORY  0 0 4 2

OBJECTIVE:
- To impart skill and knowledge on Fluid Mechanics and Fluid Machinery operation

LIST OF EXPERIMENTS
(A) FLUID MECHANICS LAB  20
(B) FLUID MACHINERY LAB

Centrifugal pumps- Performance characteristics of a constant speed pump, specific speed. Performance characteristics of multistage pump. Characteristics of Impulse and Reaction Turbine Specific speed and unit quantities. Positive displacement pumps. Performance characteristics of a deep well pump, Jet pump

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Understand the flow behavior of fluids
- Calculate the frictional losses and $C_d$ of fluids when it passes through various obstructions
- Calculate the performance characteristics of hydraulic pumps and turbines.

REFERENCES
1. Laboratory Manuals

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>SL.No.</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Buoyancy Experiment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cargo Ship Model</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>War Ship Model</td>
<td>01</td>
</tr>
<tr>
<td>02</td>
<td>Pitot tube</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flow nozzle</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>Rotameter</td>
<td>02</td>
</tr>
<tr>
<td></td>
<td>Notches</td>
<td>02</td>
</tr>
<tr>
<td>03</td>
<td>Venturimeter</td>
<td>02</td>
</tr>
<tr>
<td>04</td>
<td>Orifice meter</td>
<td>01</td>
</tr>
<tr>
<td>05</td>
<td>Frictional Losses in pipes</td>
<td>01</td>
</tr>
</tbody>
</table>

FLUID MACHINERY LABORATORY

<table>
<thead>
<tr>
<th>SL.No.</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Centrifugal pump</td>
<td>01</td>
</tr>
<tr>
<td>02</td>
<td>Multistage Centrifugal Pump</td>
<td>01</td>
</tr>
<tr>
<td>03</td>
<td>Impulse Turbine (Pelton)</td>
<td>01</td>
</tr>
<tr>
<td>04</td>
<td>Reaction Turbine (Francis)</td>
<td>01</td>
</tr>
<tr>
<td>05</td>
<td>Reciprocating pump</td>
<td>01</td>
</tr>
<tr>
<td>06</td>
<td>Submersible pump</td>
<td>01</td>
</tr>
<tr>
<td>07</td>
<td>Jet pump</td>
<td>01</td>
</tr>
</tbody>
</table>
OBJECTIVE:
- To impart skill to the students to understand and conduct the experiments to test materials in the Strength of materials and applied mechanics Laboratory

STRENGTH OF MATERIALS LAB

LIST OF EXPERIMENTS
1. Tension Test on M.S. Rod.
2. Compression test – Bricks, concrete cubes.
3. Deflection Test - Bench type verification of Maxwell theorem.
4. Tension test on thin wire.
5. Hardness test on various machines.
6. Tests on wood - Tension, compression, bending, impact in work testing machine.
7. Tests on springs - Tension, compression.

APPLIED MECHANICS LAB

8. Impact test.
9. Double shear Test in U.T.M.
10. Load measurement using load indicator, load coils.
11. Fatigue test.
12. Strain measurement using Rosette strain gauge.

TOTAL: 60 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- To operate the various testing machines.
- To carry out various tests on materials
- To choose the best materials for a particular use, based on the test results

REFERENCES
1. Laboratory Manuals

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>SL.NO</th>
<th>NAME OF THE EQUIPMENT</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>UTM (Universal Testing Machine)</td>
<td>01</td>
</tr>
<tr>
<td>2.</td>
<td>Compression Testing Machine</td>
<td>01</td>
</tr>
<tr>
<td>3.</td>
<td>Deflection Testing Rig</td>
<td>01</td>
</tr>
<tr>
<td>5.</td>
<td>Spring Testing Machines – Tension, Compression</td>
<td>01</td>
</tr>
<tr>
<td>6.</td>
<td>Impact Testing Machines – (Izod, Charpy)</td>
<td>01</td>
</tr>
<tr>
<td>7.</td>
<td>Load Cells</td>
<td>01</td>
</tr>
<tr>
<td>8.</td>
<td>Fatigue Testing Machine</td>
<td>01</td>
</tr>
<tr>
<td>1.</td>
<td>Crucible furnace</td>
<td>01</td>
</tr>
<tr>
<td>2.</td>
<td>Sand Strength Testing Machine</td>
<td>01</td>
</tr>
<tr>
<td>3.</td>
<td>Permeability</td>
<td>01</td>
</tr>
<tr>
<td>4.</td>
<td>Shear Strength Testing Machine</td>
<td>01</td>
</tr>
<tr>
<td>5.</td>
<td>Compression Strength Testing Machine</td>
<td>01</td>
</tr>
<tr>
<td>6.</td>
<td>Transfer Strength Testing Machine</td>
<td>01</td>
</tr>
</tbody>
</table>
MV 8401 MARINE ENGINEERING THERMODYNAMICS  

L T P C  

3 0 0 3  

OBJECTIVE:
- At the end of the study of this topic the students should have the knowledge on basic Thermodynamics and solve the problems on First and Second Law of Thermodynamics and Gas power cycles. Also should have the knowledge on fuel used in IC Engines and Combustion of Fuels.

UNIT I  BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS  
Thermodynamic systems, concepts of continuum, thermodynamic properties, equilibrium, processes, cycle, work, heat, temperature, Zeroth law of thermodynamics. First law of thermodynamics – applications to closed and open systems, internal energy, specific heats, enthalpy,.. – applications to steady and unsteady flow conditions.

UNIT II  BASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS  
Thermodynamic systems, Second law of thermodynamics Statements, Reversibility, causes of irreversibility, Carnot cycle, reversed Carnot cycle, heat engines, refrigerators, and heat pumps. Clausius inequality, entropy, principles of increase in entropy, Carnot theorem, available energy, availability.

UNIT III  FLUID CYCLES  
Thermodynamic properties of pure substances, property diagram, PVT surface of water and other substances, calculation of properties, first law and second law analysis using tables and charts.

UNIT IV  GAS POWER CYCLES  

UNIT V  THERMODYNAMIC RELATIONS AND COMBUSTION OF FUEL  
Exact differentials, T-D diagrams, Maxwell relations, Clasius Claperon Equations, Joule-Thomson coefficients. Heat value of fuels, Combustion equations, Theoretical and excess air, Air fuel ratio and Exhaust gas analysis

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply the Thermodynamic Principles to Mechanical Engineering Application.
- Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To Teach students so as to have the basic knowledge in Marine Diesel Engines

UNIT I PERFORMANCE CHARACTERISTICS OF I.C. ENGINE 9
4-Stroke and 2-Stroke cycles; Deviation from ideal condition in actual engines; Limitation in parameters, Timing Diagrams of 2-Stroke and 4-Stroke engines. Comparative study of slow speed, medium speed and high-speed diesel engines – suitability and requirements for various purposes. Mean Piston speed, M.C.R. & C.S.R. ratings. Practical heat balance diagrams and thermal efficiency.

UNIT II GENERAL DESCRIPTION OF MARINE DIESEL ENGINE 9
Constructional Details of I.C. engines and marine diesel engines: components: jackets and liners, cylinder heads and fittings, pistons, cross heads, connecting rods, crank shaft, bearings, bed plates, A-frames, welded construction for bedplates & frames and tie rods etc.

UNIT III SCAVENGING SYSTEM 9
Scavenging arrangements in 2-stroke engines; air charging and exhausting in 4-stroke engines; various types of scavenging in 2-stroke engines; uniflow, loop and cross flow scavenging, their merits and demerits, scavenge pumps for normally aspirated engines, under piston scavenging, scavenge manifolds.

SUPERCHARGING ARRANGEMENTS
Pulse and constant pressure type; merits and demerits in highly rated marine propulsion engines. air movements inside the cylinders. turbocharger and its details.

UNIT IV FUEL TECHNOLOGY 9

UNIT V MARINE LUBRICATING OIL 9

SELECTION OF LUBRICANTS

TOTAL: 45 PERIODS
OUTCOMES:
- On Various types of Marine Diesel Engines.
- Of Various systems used in Marine Diesel Engine plants.
- On the theoretical aspect of Scavenging and super charging system.
- Of qualities and behavior of various types of fuel Oil and Lubricating Oil used in Marine Diesel Engines.

TEXT BOOKS:

REFERENCES

MV 8403 MARINE BOILERS AND STEAM ENGINEERING L T P C
3 0 0 3

OBJECTIVE:
- To provide knowledge to the students about Marine Boilers and Steam Engines.

UNIT I MARINE BOILERS & BOILER MOUNTINGS
Safety Valves – Improved High Lift, Full lift and full Bore type:
Gauge glass – Ordinary plate type and remote Indicator; Automatic feed regulator, three element High & Low water level alarms, Main Steam stop valve, Retractable type Soot blower etc.

UNIT II OPERATION & MAINTENANCE OF BOILERS
Pre-commissioning procedures, Hydraulic tests, steam raising and Operating procedures, Action in the event of shortage of water. Regular boiler water tests on board. Blowing down of boiler, Laying up a boiler; general maintenance, External and internal tube cleaning. Tube renewals, etc., maintenance, inspection and survey of boilers. Refractory: Purposes of refractory, types of refractory and reasons for failure. Oil burning: Procedure of Liquid fuel burning in open furnace, Various types of atomizer, Furnace arrangement for oil burning, Boiler Control System i.e. master control, fuel control, air control and viscosity control, Introduction to Automation.
UNIT III  MARINE STEAM PLANTS
Steam engines - History of multiple expansion marine reciprocating engines & steam turbines. Description of different types of steam turbines. Layout of plant - General layout of plant & description of a modern geared steam turbine installation including auxiliaries in modern use, open and closed feed system.
Condensers - Types of condensers, constructional details, location & working principles, contraction and expansion allowances, leak test. Effect of change of temperature, circulating water quantity, change of main engine power, condenser surface.

UNIT IV  LUBRICATION FOR STEAM ENGINES AND TURBINES
Suitable oils and their properties, lubrication of main bearings, thrust bearings and gears. Gravity and pressure lubrication-oil system and emergency lubrication arrangement.

UNIT V  OPERATION AND MAINTENANCE OF TURBINES
Turbine drain system, turbine gland system, warming through a turbine plant, control of speed and power of propulsion, throttle valve control and nozzle control, emergency controls, emergency operation of turbines, vibration in marine steam turbine, steam turbine losses. Breakdown and faultfinding. Selection of materials: Materials used in various components like blades, rotors, casings, sealing glands, gears etc & their justification.

TOTAL: 45 PERIODS

OUTCOMES:
- Waste heat boilers and boiler mountings.
- Operation and Maintenance of boilers.
- Construction of steam turbines and steam engines.
- The various Method of Lubrication of turbines
- The operation and maintenance of steam turbines.

TEXT BOOKS:

REFERENCES
OBJECTIVE:
- To expose the students to the concepts about Electricity production, measurements, cable faults and AC Machines used in Marine engineering.

UNIT I  ELECTRICAL MEASUREMENTS AND CONTROL SYSTEM  8
Induction type energy meters-megger (Basic construction & principles of operation only).– Single phase and three phase wattmeter for power measurement – Measurement of energy, speed, frequency and phase devices– Measurement of resistance, inductance and capacitance by Bridge method – Magnetic measurement. Location of cable faults – transducers and its application in the measurement of pressure, flow, temperature, Torque, Humidity, Water content etc – simple electronic measuring devices – CRO, IC tester, Signal generator, Timers, Multi Tester, Clamp meter-Principle of operation and Application of Automatic control system-PID controller.

UNIT II  ALTERNATORS  11
Alternators – general arrangement – construction of salient pole and cylindrical rotor types – types of stator windings – e.m.f equation – distribution and pitch factor –waveform of e.m.f. generated – rotating magnetic field – armature reaction – voltage regulation – load characteristics – open circuit and short circuit tests – e.m.f and m.m.f. methods – parallel operation of alternators – KW and KVA sharing – Brushless alternator – static excitation system.

UNIT III  SYNCHRONOUS MOTORS  5

UNIT IV  INDUCTION MACHINES  12

UNIT V  CONTROL OF INDUCTION MACHINES  9

TOTAL : 45 PERIODS

OUTCOMES:
- The procedure for producing electricity on board ships through alternators and associated controls
- To measure the power method of finding cable faults.
- Design features of Alternators – their construction and operation.
- Principles of operation and construction details of synchronous motors, induction machines
- Speed control and trouble shooting in induction machines.
TEXT BOOKS:
3. IHerman, “Electrical Transformers and Rotating Machines”, 3rd Ed. Cengage, First Indian Reprint 2012 (Yesdee Publishings Pvt. Ltd.),

REFERENCES

MV 8405 MARINE ENGINEERING MATERIALS

OBJECTIVE:
- To impart knowledge on the properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various Marine Engineering applications.

UNIT I FUNDAMENTALS OF METALLURGY

UNIT II HEAT TREATMENT

UNIT III MECHANICAL PROPERTIES AND TESTING
Mechanism of plastic deformation, slip and twinning – Types of fracture – Failure modes - Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Impact test - Izod and Charpy, Fatigue and creep tests, fracture toughness tests.

UNIT IV MATERIAL PROCESSING
Properties and applications of materials used in machinery on board ships. Engineering processes used in construction and repair. Design characteristics and selection of materials in construction of equipment – Welding, Gas cutting methods.
UNIT V  TESTING OF JOINTS
Materials under load, self-secured joints, permanent joints, bonding plastics, adhesives and bonding. Vibration tests. Destructive and non-destructive testing of materials – different methods

TOTAL : 45 PERIODS

OUTCOMES:
- Properties of metals and non-metals and uses
- Various heat treatment processes
- Metal Processing methods
- Testing of joints using destructive and non-destructive methods

TEXT BOOKS:

REFERENCES
Yesdee Publishings Pvt. Ltd.)

MARINE ELECTRONICS

L T P C
3 0 0 3

MV 8406

OBJECTIVE:
- To make the students understand the Marine Electronics and its applications.

UNIT I  OPERATION AMPLIFIER THEORY
Concept of Differential Amplifiers – its use in DP AMPS, Linear OP amp circuits.

UNIT II  DIGITAL CIRCUITS

ITL & CMOS GATES:
Digital integrated circuits – Semi conductor memories – ROM – RAM and PROM.
UNIT III CONVERTERS; (A-D AND D- A):
Analog to Digital and Digital to Analog Converters and their use in Data – Loggers.

ELECTRONIC INSTRUMENTS

UNIT IV INDUSTRIAL ELECTRONICS
Power rectification – silicon control rectifier power control-Filters ,RPS –Photoelectric devices – invertors. Satellite communication as applicable to GMDSS,GPS, Inmarsat. Introduction to ECDIS

UNIT V MICROPROCESSORS
8085 Architecture – interfacing and Control of motors – Temperature-Speed control –Basics and Control mechanism of PLC.

OUTCOMES:
- Amplifier Theory, Digital Circuits, Logic systems and Gates.
- Analog and Digital Converters and their applications
- Electronic Instruments and Micro Processors.

TEXT BOOKS:

REFERENCES

MV 8407 MARINE REFRIGERATION AND AIR CONDITIONING L T P C
3 2 0 4

OBJECTIVE:
- To develop the knowledge of students in Marine Refrigeration and Air conditioning.

UNIT I RECIPROCATING COMPRESSORS
UNIT II  BASIC REFRIGERATION AND AIR CONDITIONING  9+6

UNIT III  MARINE REFRIGERATING PLANTS  9+6

UNIT IV  MARINE AIR CONDITIONING  9+6
Principles of air conditioning – Psychrometric properties of air – comfort conditions – control of humidity – airflow and air conditioning capacity – calculation for ships plants.

UNIT V  BASIC DESIGN OF HEAT EXCHANGERS  9+6
Introduction - types - LMTD and NTU method - double-pipe, shell and tube type, condenser and evaporator – problems

TOTAL :  75 PERIODS

OUTCOMES:
- The performance of Reciprocating Compressors,
- The theoretical aspects of Marine refrigeration and air-conditioning
- The method of economical and efficient design of Heat Exchangers for Air conditioning and refrigeration plants.

TEXT BOOKS:

REFERENCES
OBJECTIVE:
- To develop skill of the students in welding and machining techniques

WELDING TECHNIQUES

LIST OF EXPERIMENTS
1. WELDING - Exercises in Electric Arc welding and Gas welding Advanced Techniques.
2. HAND TOOLS - Hand tools, sharpening, Powered hand tools, Measurements etc. Exercise involving above.
3. SHEET METAL WORKING - Simple Exercise.
4. PIPE WORK - Experiments involving thin pipes, Joining, bending, welding and inspection.

LATHE & SPECIAL M/C SHOP

TOTAL: 60 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- To carry out repair of Ship machinery and components by welding
- To do any kind of sheet metal works
- To make machine components using Lathes and Special machines such as milling, grinding and slotting machine.

REFERENCES:
1 Youssef, “Machining Technology”, 1st Vol., Taylor & Francis, Indian Reprint 2012 (Yesdee Publishing Pvt. Ltd.)
3 Mukherjee, S., “Metal Fabrication Technology”, 1st Ed., PHI Learning Pvt. Ltd., 2010

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Light duty Lathe</td>
<td>01</td>
</tr>
<tr>
<td>2.</td>
<td>Medium duty Lathe</td>
<td>03</td>
</tr>
<tr>
<td>3.</td>
<td>Heavy duty Lathe</td>
<td>04</td>
</tr>
<tr>
<td>4.</td>
<td>Shaper</td>
<td>01</td>
</tr>
<tr>
<td>5.</td>
<td>Slotter</td>
<td>01</td>
</tr>
<tr>
<td>6.</td>
<td>Planner</td>
<td>01</td>
</tr>
<tr>
<td>7.</td>
<td>Radial drilling m/c</td>
<td>01</td>
</tr>
<tr>
<td>8.</td>
<td>Surface grinder</td>
<td>01</td>
</tr>
<tr>
<td>9.</td>
<td>Pedestal grinder</td>
<td>01</td>
</tr>
<tr>
<td>10.</td>
<td>Vertical milling m/c</td>
<td>01</td>
</tr>
<tr>
<td>11.</td>
<td>Universal milling m/c</td>
<td>03</td>
</tr>
<tr>
<td>12.</td>
<td>Tool &amp; cutter grinder</td>
<td>01</td>
</tr>
</tbody>
</table>
13. Gear hobber 01
14. CNC Lathe Machine 01
15. Capstan Lathe 01
16. Cylindrical grinding m/c 01
17. Power hacksaw 01
18. Duplicating Lathe 01

**WELDING WORK SHOP**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Welding Transformer Air Cooled with Fan</td>
<td>04</td>
</tr>
<tr>
<td>2</td>
<td>Maxi – MIG 400A Welding Set</td>
<td>01</td>
</tr>
<tr>
<td>3</td>
<td>AOL make TIG Control Outfit</td>
<td>01</td>
</tr>
<tr>
<td>4</td>
<td>Welding Rectifier Throluxe – 401 MMA</td>
<td>01</td>
</tr>
<tr>
<td>5</td>
<td>Water Cooled Torch 0150102071 400 AMPS</td>
<td>02</td>
</tr>
<tr>
<td>6</td>
<td>Bending Machine Pipe dia ½” to 3”</td>
<td>01</td>
</tr>
<tr>
<td>7</td>
<td>Gas welding and cutting set</td>
<td>02</td>
</tr>
</tbody>
</table>

**FITTING SHOP**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Hacksaw</td>
<td>01</td>
</tr>
<tr>
<td>2</td>
<td>Vernier Height Gauge</td>
<td>02</td>
</tr>
<tr>
<td>3</td>
<td>Surface Plate with stand</td>
<td>02</td>
</tr>
<tr>
<td>4</td>
<td>Fitting Bench Vice</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>Hand tools (Different types)</td>
<td>-</td>
</tr>
</tbody>
</table>

**MV 8412 HEAT ENGINES, BOILER CHEMISTRY AND REFRIGERATION LABORATORY**

**OBJECTIVE:**
- To impart skills to students to demonstrate the ability to carry out the different tests to understand the performance characteristics of heat engines and also to perform the tests on boiler feed water

**HEAT ENGINES LAB**

**LIST OF EXPERIMENTS**

1. Flue gas analysis by Orsat apparatus.
2. Study and performance characteristics of steam turbine.
3. Dryness fraction of steam using calorimeters.
4. Performance characteristics of a constant speed air blower.
5. Verification of fan laws and static efficiency of air blower.
6. Test on Reciprocating compressor.
10. Testing of fuels - Ultimate analysis, octane number, cetane number.
11. Testing of lubricants - flash point, fire point, pour point.
14. Wind Tunnel - Drag and lift measurements.
15. Performance test on IC Engine as per BIS specifications.

**BOILER CHEMISTRY LAB**
16. To determine hardness content of the sample of boiler water in P.P.M. in terms of CaCO3.
17. To determine Chloride Content of the sample of water in P.P.M. in terms of CaCO3.
18. To determine Alkalinity due to Phenolphthaline, total Alk. and Caustic Alk. Of the sample of water (in P.P.M).
19. To determine Phosphate Content of the sample of water.
20. To determine dissolved Oxygen content of the sample of water.
21. To determine sulphate content of given sample of water.
22. To determine Ph-value of the given sample of water.
23. Boiler trial.
24. Water Testing - Dissolved oxygen, total-dissolved solids, turbidity.
25. Water Analysis (Fresh and sea water) - Chloride, sulphate, hardness.
26. Sludges and scale deposit - Silica, volatile and non-volatile suspended matter.

**REFRIGERATION LABORATORY**
27. Watch keeping: Parameters to be monitored during running of refrigeration unit.
28. Various cut-outs, viz, pressure, temperature
29. Determination of actual COP, theoretical COP and Carnot COP.

**TOTAL: 60 PERIODS**

**OUTCOMES:**
Upon Completion of the course, the students will be able to:
- To perform various tests on the heat engines
- To Analyse the results to understand the performance characteristics of engines
- To Perform Boiler water tests, Sea water and fresh water tests
- To Choose the best water, oils, fuels and lubricants based on the test results.

**REFERENCES:**
1. Laboratory Manuals

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Orsat Apparatus</td>
<td>02 nos</td>
</tr>
<tr>
<td>2.</td>
<td>Steam Turbine</td>
<td>01</td>
</tr>
<tr>
<td>3.</td>
<td>Steam Calorimeter</td>
<td>01</td>
</tr>
<tr>
<td>4.</td>
<td>Air Blower</td>
<td>01</td>
</tr>
<tr>
<td>5.</td>
<td>Air Compressor</td>
<td>02 nos</td>
</tr>
<tr>
<td>6.</td>
<td>Vapour Compression Refrigeration test rig</td>
<td>01</td>
</tr>
<tr>
<td>7.</td>
<td>Vapour compression Air Conditioning test rig</td>
<td>01</td>
</tr>
<tr>
<td>8.</td>
<td>Bomb calorimeter and Junker’s calorimeter</td>
<td>01</td>
</tr>
<tr>
<td>Sl.No</td>
<td>Name of the Equipment</td>
<td>Qty.</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>9.</td>
<td>Crucible Metener Burner, Electric Benser Hot air oven</td>
<td>01</td>
</tr>
<tr>
<td>10.</td>
<td>Flash &amp; Fire point – closed cup apparatus</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>Redwood’s Viscometer</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>Saybolt’s Viscometer</td>
<td>01</td>
</tr>
<tr>
<td>11.</td>
<td>Carbon residue apparatus</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Wind Tunnel</td>
<td>01</td>
</tr>
</tbody>
</table>

**FUELS AND LUBRICATION OIL TESTING EQUIPMENTS**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Redwood Viscometer</td>
<td>01</td>
</tr>
<tr>
<td>2.</td>
<td>Saybolt’s Viscometer</td>
<td>01</td>
</tr>
<tr>
<td>3.</td>
<td>Abel’s flash point and fire point apparatus</td>
<td>01</td>
</tr>
<tr>
<td>4.</td>
<td>Closed cup apparatus (Pensky)</td>
<td>01</td>
</tr>
<tr>
<td>5.</td>
<td>Bomb Calorimeter with Beckman (Digital)</td>
<td>01</td>
</tr>
<tr>
<td>6.</td>
<td>Junker’s Gas Calorimeter</td>
<td>01</td>
</tr>
</tbody>
</table>

**BOILER CHEMISTRY LAB**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Burette, Pipette, Beaker, Conical Flask, Bunsen Burner</td>
<td>01 each</td>
</tr>
<tr>
<td>2.</td>
<td>Burette, Pipette, Conical Flask, STD Flask 100ml</td>
<td>01 each</td>
</tr>
<tr>
<td>3.</td>
<td>Burette, Pipette, Conical Flask, STD Flask</td>
<td>01 each</td>
</tr>
<tr>
<td>4.</td>
<td>Burette, Pipette, Conical Flask</td>
<td>01 each</td>
</tr>
<tr>
<td>5.</td>
<td>Burette, Pipette, Conical Flask</td>
<td>01 each</td>
</tr>
<tr>
<td>6.</td>
<td>Wephlo turbidity meter, STD Flask Pipette</td>
<td>01 each</td>
</tr>
<tr>
<td>7.</td>
<td>PH meter, Buffer tablets, beaker</td>
<td>01 each</td>
</tr>
<tr>
<td>8.</td>
<td>Petridish, Hot air Oven, Weighing Balance</td>
<td>01 each</td>
</tr>
<tr>
<td>9.</td>
<td>Water Analysis kit</td>
<td>01 nos</td>
</tr>
<tr>
<td>10.</td>
<td>Burner, Silica, Crucible, Electric Bunsen, Petridish Hot air Oven</td>
<td>01 each</td>
</tr>
<tr>
<td>11.</td>
<td>Burette, Pipette, Conical Flask, turbidity meter, Bunsen Burner, Beaker, STD Flask</td>
<td>01 each</td>
</tr>
</tbody>
</table>

**THERMAL ENGINEERING**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Internal Combustion Engines Section</td>
<td>01</td>
</tr>
<tr>
<td>2.</td>
<td>Fuel and Lubrication Oil Testing Equipments</td>
<td>01</td>
</tr>
<tr>
<td>3.</td>
<td>Heat Transfer Equipments</td>
<td>01</td>
</tr>
<tr>
<td>4.</td>
<td>Steam Lab. Equipments</td>
<td>01</td>
</tr>
<tr>
<td>5.</td>
<td>Refrigeration and Air Conditioning Equipments</td>
<td>01 set</td>
</tr>
<tr>
<td>6.</td>
<td>Automobile Components</td>
<td>01</td>
</tr>
<tr>
<td>7.</td>
<td>Engine Research Centre</td>
<td>01</td>
</tr>
<tr>
<td>8.</td>
<td>Computers with UPS</td>
<td>01</td>
</tr>
<tr>
<td>9.</td>
<td>Miscellaneous Equipments</td>
<td>01</td>
</tr>
</tbody>
</table>

**INTERNAL COMBUSTION ENGINES SECTION**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Multi Cylinder Petrol Engine</td>
<td>01</td>
</tr>
<tr>
<td>2.</td>
<td>Twin Cylinder Diesel Engine</td>
<td>01</td>
</tr>
<tr>
<td>3.</td>
<td>Kirloskar Diesel Engine</td>
<td>01</td>
</tr>
<tr>
<td>4.</td>
<td>Greaves Cotton diesel engine</td>
<td>01</td>
</tr>
<tr>
<td>5.</td>
<td>Two Stroke Petrol Engine</td>
<td>03 nos</td>
</tr>
<tr>
<td>6.</td>
<td>Two Stroke Diesel Engine Model</td>
<td>01</td>
</tr>
<tr>
<td>7.</td>
<td>Four Stroke Petrol Engine</td>
<td>01</td>
</tr>
<tr>
<td>8.</td>
<td>Four Stroke Diesel Engine Model</td>
<td>01</td>
</tr>
</tbody>
</table>
9. Two Stroke Petrol Engine Model  01
10. Multi Cylinder Petrol Engine  01
11. Four Stroke Single Cylinder Diesel Engine (Anil)  01
12. MK-12 Petrol Start Kerosene run Engine  01
13. Battery charger  01

MARINE AC & REFRIGERATION LABORATORY

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Marine Refrigeration Plant (10 ton capacity)</td>
<td>01</td>
</tr>
<tr>
<td>02</td>
<td>Marine Air Conditioning Plant (10 ton capacity)</td>
<td>01</td>
</tr>
<tr>
<td>03</td>
<td>Vapour compression and Vapour Absorption refrigeration test - RIG</td>
<td>01</td>
</tr>
</tbody>
</table>

MV 8501 MARINE AUXILIARY MACHINERY – I

OBJECTIVE:
- To impart Knowledge on Ship’s Auxiliary Machines

UNIT I ENGINE ROOM LAYOUT, PIPING SYSTEMS AND FITTINGS

Layout of main and auxiliary machinery in Engine Rooms in different ships. Steam and condensate system, water hammering in pipes, Expansion joints in pipelines, Bilge – ballast, fuel oil bunkering and transfer system, bunkering procedure, precautions taken, fuel oil service system to main and auxiliary engines, lubricating oil and Engine cooling system to main and auxiliary engines, central cooling and central priming systems, control and service air system, domestic fresh water and sea water (Hydrophore) service system, drinking water system, fire main system.

UNIT II VALVES, COCKS, PACKING, JOINTS, FILTERS AND STAINERS

Straight way cocks, right angled cock, ‘T’ cock, spherical cock, Boiler gauge glass cock (cylindrical cock). Globe valves, SDNR valve, swing check valve (storm valve), gate valves, butterfly valves, relief valves, quick closing valves, pressure reducing valves, control valves, change over valve chests, fuel oil transfer chest, valve actuators, steam traps.

Packings, Insulation of materials, Types,- Various applications. Seals – purpose of bearing seal, description and application of non rubbing seals and rubbing seals, simple felt seal, seals suitable for various peripheral speeds, V-ring seals, Lip seals.

Filtration, filter elements basket strainers, duplex strainers, edge type strainers, auto-kleen strainers, back flushing strainers, magnetic filter, rotary filters, fine filters.

UNIT III PUMPS

Types of pumps for various requirements – their characteristics, performance and application in ships – centrifugal pumps – gear pumps – screw pumps and reciprocating pumps – care and maintenance of pumps, operation of all pumping systems on board such as bilge, ballast and cargo pumping operations.
UNIT IV HEAT EXCHANGERS, EVAPORATORS AND DISTILLERS

Principle of surface heat transfer – description, contact heat transfer, construction of shell and tube type – flat plate type, single and double pass – lubricating oil coolers, fuel oil heaters, fresh water coolers, compressed air coolers, Main Engine charge air cooler, Fresh water heaters, steam condensers, evaporators and condensers in refrigeration system – materials used in all the above heat exchangers, expansion allowance – temperature controls effect of air in the system – maintenance.

Distillation of water, distilling equipment, problem of scale formation and method of controlling, methods of distillation, single effect and double effect shell type evaporator, low pressure vacuum type evaporator, flash evaporators, multiple effect evaporators- construction and operation salt water leaks and detection, reverse osmosis desalination plant, membranes, drinking water and treatment.

UNIT V STEERING SYSTEM


OUTCOMES:
- Ship’s Engine Room Layout, Piping systems and fittings.
- Various types of Pumps and its applications.
- Construction details of Heat exchangers, Evaporators
- Fresh water Generators
- Ship’s steering systems.

TEXT BOOKS:

REFERENCE:
OBJECTIVE:

- To make the students learn the concept and working of Marine Diesel Engines.

UNIT I / FUEL PUMPS AND METERING DEVICES / 9

- Incorporation of FQSL along with the V.I.T. system on the engine.

UNIT II / MANOUVERING SYSTEMS, INDICATOR DIAGRAMS AND POWER CALCULATIONS / 9

- Starting and reversing systems of different Marine diesel engines with safety provisions. Including Main Engine auto slowdown and shutdown. Restoration of operations.
- Constructional details of indicator instrument, significance of diagram, theoretical knowledge of power calculations, fault detection, simple draw cards and out of phase diagrams, power balancing, performance characteristic curves, test bed and sea trials of diesel engines.

UNIT III / MEDIUM SPEED ENGINES / 9

- Different types of medium speed marine diesel engines, couplings and reduction gear used in conjunction with medium speed engine, development in exhaust valve design, V type engine details, crankcase inspection., Depth gauge and crankshaft deflection.

UNIT IV / FORCES AND STRESSES / 9

- Balancing, overloading, different types of vibration & its effects, forces and stresses acting on various components of I.C. Engine parts.

UNIT V / TYPE OF ENGINES / 9


OUTCOMES:

- Marine fuel injection pumps and its applications.
- Manouvering systems of various marine diesel engines.
- Forces and stresses in slow speed and medium speed engines.
- Construction and operation of various Marine slow speed engines.

TEXT BOOKS:

REFERENCES

MV 8503 STABILITY OF SHIPS

OBJECTIVE:
To impart the Knowledge on the Basic Hydrostatics and Stability Calculations of Ship.

UNIT I HYDROSTATICS 12
Density, relative density, pressure exerted by a liquid on an immersed plane, centre of pressure, load on immersed plane, load diagram, shearing forces on bulk head stiffeners—problems.

UNIT II GEOMETRY AND SHIP FORM CALCULATION 12
Archimedes principle, Laws of floatation, displacement, tonne per cm immersion. Coefficients of form, wetted surface area, similar figures, shearing force and bending moment — problems.

UNIT III CALCULATION OF AREA, VOLUME, FIRST AND SECOND MOMENTS 12
Simpson’s first rule and second rule, application to area and volume, use of intermediate ordinate rule, trapezoidal rule, mean and mid—ordinate rule, application of 5,8,–1 Rule for area, application of simpson rule to first and second moments of area — Centre of gravity, effect of addition of mass, effect of movement of mass, effect of suspended mass — problems.

UNIT IV TRANSVERSE STABILITY AND HEEL 12
Static stability at small angles of heel, calculation of BM and meta centric height, meta centric diagram, inclining experiment, free surface effect, stability at large angles of heel, curves of static stability, dynamic stability, angle of loll, stability of a wall sided ship — inclining experiment, problems. IMO recommendations concerning ship stability.

UNIT V LONGITUDINAL STABILITY 12
Longitudinal BM – MCT1 cm – Change of trim, change of LCB with change of trim, alteration of trim by adding or removing weights, mean draft, change in mean and end draft due to density and bilging – flooding calculation – floodable length – factor of sub division – loss of stability due to grounding – problems- Knowledge of Trim and stress tables and equipments.

TOTAL: 60 PERIODS
OUTCOMES:
- Basic hydrostatics, Geometry of Ships
- Calculations of Ship Forms and various coefficients,
- Calculating the Area of wetted Surface, Volume etc., and Usage of Simpson rule
- Transverse and Longitudinal Stability and Heel etc.,

TEXT BOOKS:

REFERENCES

MV 8504 SHIP CONSTRUCTION

OBJECTIVE:
- To impart knowledge to the students on Construction of ships.

UNIT I SHIP TERMS
Various terms used in ship construction with reference to ship’s parameter e.g. L.B.P.-Moulded Depth - Moulded draught etc. - General classification of ships.
Stresses in Ship’s structure: Hogging – Sagging – Racking – Pounding – Panting etc., and Strength members to counteract the same.
Sections And Materials Use: Type of sections like angles – Bulb plates flanged beams used in ship construction – Process of welding. Riveting & Welding testing of welds – Fabricated components.

UNIT II BOTTOM & SIDE FRAMING
Double bottoms, watertight floors solid and bracket floors – Longitudinal framing keels – side framing like tank side brackets – Beam knee – Web frame etc.,

Bulk Heads & Deep Tanks: water tight bulkheads – Arrangement of plating and stiffeners – water tight sliding doors – Water tight openings through bulkheads for electric cables pipes and shafting – Deep tank for oil fuel or oil cargo corrugated bulk heads.
UNIT III  FORE & AFT END ARRANGEMENTS
Fore end arrangement, arrangements to resist pounding bulbous bow – Types of sterns stern frame and rudder – Types of rudder – Supporting of rudder – Locking pintle – Bearing pintle – Pallister, bearing shaft tunnel – Tunnel bearings.

UNIT IV  FREE BOARD AND TONNAGE

UNIT V  OFFSHORE TECHNOLOGY

TOTAL: 45 PERIODS

OUTCOMES:
- Ships terms and stresses in ships.
- Primary and Secondary girders used in ships.
- Fore-end and After-end arrangements.
- Free board and Tonnage of ships
- Off shore Technology

TEXT BOOKS:

REFERENCES
MV 8505  MECHANICS OF MARINE MACHINES  L  T  P  C
3  2  0  4

OBJECTIVE:
• To impart theoretical knowledge about mechanism of machinery, balancing and Vibration of machines and associated system components and equipment,

UNIT I  MECHANISMS  9+6
Introduction – science of mechanisms – terms and definitions  kinematic inversion – slider crank chain inversions – four bar chain inversions – Grashoff’s law – Determination of velocities and acceleration in mechanisms – relative motion method (graphical) for mechanisms having turning, sliding and rolling pair – Coriolis acceleration

UNIT II  THEORY OF GEARING  9+6
Classification of gears, law of gearing, nomenclature – involutes as a gear tooth profile – lay out of an involute gear, producing gear tooth – interference and undercutting – minimum number of teeth to avoid interference, contact ratio, internal gears – cycloid tooth profiles – comparison of involutes and cycloidal tooth forms, Backlash of Marine Gearing. Self Shift Synchronous Gears

UNIT III  CONTROL MECHANISMS  9+6
Governors – gravity controlled and spring controlled – governor characteristics – governor effort and power - Gyroscopes – gyroscopic forces and couple – forces on bearing due to gyroscopic action – gyroscopic effects on the movement of air planes and ships, stability of two wheel drive and four wheel drive

UNIT IV  BALANCING  9+6

UNIT V  VIBRATION  9+6
Periodic motion – non harmonic periodic motion – undamped free vibration – linear and torsion solution – natural frequency of single degree freedom system — Free vibrations with viscous damping of single degree freedom system and solution – logarithmic decrement.
Forced vibration of single degree freedom system with damping – reciprocating and rotating unbalance – vibration isolation and transmissibility
System with two degrees of freedom – shaft with two rotors, system with many degrees of freedom – three rotor system – geared system- torsional vibration of major components in Ships - problems.

TOTAL :  75  PERIODS

OUTCOMES:
• Velocity and acceleration of various kinematic linkages
• Four bar and slider crank mechanisms using analytical and graphical methods.
• Force analysis of Mechanisms and turning moment diagrams and flywheel.
• Various parameters of gears and gear trains.
• Governors and gyroscopes.
• Concept of balancing.
• Free and Forced Vibration of Single degree of freedom systems. Two and Multi Degree Freedom Systems.
TEXT BOOKS:

REFERENCES

MV 8506 SEAMANSHIP, ELEMENTARY NAVIGATION AND SURVIVAL AT SEA

OBJECTIVES:
• To develop skill and knowledge about Navigation and Operation of ship.
• To develop self confidence and skillness for survival at sea.

UNIT I SEAMAN & THEIR DUTIES
Ship’s Department, General ship knowledge ad nautical terms like poop-deck forecastle, bridge etc. deck equipment: winces, windlass, derricks cranes, gypsy, capstan, hatches and function. navigation lights and signals: port and starboard, forward and aft mast lights, colors and location. look out, precautions and bad weather, flags used on ships, flag etiquette, sound signals.

UNIT II ROPE KNOTS AND MOORINGS
Types of knots. practice of knot formation, materials of ropes, strength, care and maintenance, use of mooring line, heaving line, rat guards, canvas and its use. anchors: their use, drooping and weighing anchor, cable stopper.

UNIT III NAVIGATION
General knowledge of principal stars. Sextant, Navigation compasses, echo sounder, Gps, Glonass, log and uses, barometer and weather classification, G.M.T and Zonal time, wireless Navigational Instruments, radar satellite navigation etc.
UNIT IV  LIFE BOATS & LIFE RAFTS 9

UNIT V  SURVIVAL AT SEA 9
Survival difficulties and factors, equipment available, duties of crew members, Initial action on boarding, Maintaining the craft, Practical: Knots, bends and hitches, Ropes splice, donning of life jackets, life boat drills. Lowering & hoisting of life boats (model).

TOTAL : 45 PERIODS

OUTCOMES:
• Have learnt operation of various deck machinery and Navigation equipment
• Have sound knowledge of Navigation.
• Have learnt survival techniques at sea.
• Have learnt operation of life boats and life rafts.

TEXT BOOKS:

REFERENCES

MV 8511  ELECTRICAL ENGINEERING, ELECTRONICS AND MICRO PROCESSOR LABORATORY 0 0 4 2

OBJECTIVE:
• To impart Practical knowledge in operation and maintenance of Electrical Machines and electronic equipments

ELECTRICAL ENGG. LABORATORY

LIST OF EXPERIMENTS
1. Load Test on D.C. Shunt Motor
2. Load Test on D.C.Series Motor
4. Parallel operation of D.C.Shunt Generator
5. Speed control of D.C.Shunt Motor.
7. Parallel operation of single-phase transformers.
8. To connect similar single-phase transformers in the following ways.
10. Load Test on Squirrel cage induction motor
11. Load Test on Slip ring induction motor
12. Pole changing motor for various speeds.
14. Trouble shooting in Electric Motors and Transformers.
15. Exercises in Power Wiring and earthing.

**ELECTRONICS / MICROPROCESSOR LABORATORY**

1. To study the volt-ampere characteristics of a high current semiconductor diode.
2. To study the volt-ampere characteristics of a diode and Zener diode.
3. To study the half wave and full wave rectification circuit without and with filter circuit.
4. To study the volt-ampere characteristics of a Transistor.
5. To study the volt-ampere characteristics of Field Effect Transistor.
6. To study the characteristics of Silicon Control Rectifier.
7. To study the Transistor Feed Back Amplifier.
8. To study the Integrated Circuit operational amplifier.
9. To study the logic training board.
10. To study the speed control of D.C. motor using Thyristor.
11. Arithmetic operations using 8085
12. Logical operations using 8085
13. Array operations using 8085
14. Speed & Direction Control of Stepper motor using 8085.

TOTAL: 60 PERIODS

**OUTCOMES:**

Upon Completion of the course, the students will be able to:
- Conducting all types of tests on the Shunt and Series Motors,
- Load tests on the Transformers, parallel operation of single phase Transformers
- Synchronizing three phase Alternators
- Understanding the volt-ampere characteristics of Semiconductors, Diodes, Transistors, Field Effect transistor
- Operation of Operational Amplifier, Thyristor
- Using the 8085 Micro processor

**LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS**

**ELECTRICAL ENGINEERING LAB**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>D. C. Motor Generator Set</td>
<td>02</td>
</tr>
<tr>
<td>02</td>
<td>D.C. Compound Motor</td>
<td>04</td>
</tr>
<tr>
<td>03</td>
<td>Single Phase Transformer</td>
<td>04</td>
</tr>
<tr>
<td>04</td>
<td>Three Phase Squirrel cage and Slip ring Induction Motor</td>
<td>02</td>
</tr>
<tr>
<td>05</td>
<td>Single Phase Induction Motor</td>
<td>02</td>
</tr>
<tr>
<td>06</td>
<td>Three Phase Alternator Set</td>
<td>02</td>
</tr>
<tr>
<td>07</td>
<td>Ammeter A.C and D.C</td>
<td>20</td>
</tr>
<tr>
<td>08</td>
<td>Voltmeters A.C and D.C</td>
<td>20</td>
</tr>
<tr>
<td>09</td>
<td>Watt meters LPF and UPF</td>
<td>12</td>
</tr>
<tr>
<td>10</td>
<td>Resistors &amp; Breadboards</td>
<td>1 set</td>
</tr>
</tbody>
</table>
OBJECTIVES:
The course aims to:
- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I
Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II
Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III
Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic — questioning and clarifying —GD strategies- activities to improve GD skills

UNIT IV
Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews
UNIT V
Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

OUTCOMES: At the end of the course Learners will be able to:
- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

TOTAL : 30 PERIODS

REFERENCES:

MV 8611  MARINE WORKSHOP PRACTICAL AND AFLOAT TRAINING  L T P C
0 0 48 12

OBJECTIVE:
To impart knowledge, skill and to train the students to be able to perform as Engineer officer on board ships

The students are required to undergo Marine Workshop Training in DG Shipping approved Marine Engineering Workshop for a duration of 6 months. The training should be as per the Merchant Shipping (Standard of Training Certification and Watch keeping for Seafarers) Rule 1998.

Competency on - use of hand tools used for marine equipments for dismantling, maintenance, repair and reassembly of shipboard equipments. 100 hrs.

Competency on - use of hand tools used for electrical and electronic equipments, measuring and test equipment’s for locating and repairing faults and malfunctions. 100 hrs.

Competency on - Operation of Main and Auxillary machinery and associated control systems. 30 hrs.

Competency on - Operating pumping systems & associated control systems. 90 hrs.

Competency on - Operating alternators , generators & control systems. 100 hrs.
Competency on - Maintaining alternators, generators and Control systems.  

20 hrs.

Competency on - Maintaining Marine Engineering system including control systems (overhauling and maintenance of Marine Diesel Engines, air compressors, heat exchangers, oil separators etc.,)  

700 hrs.

Competency on - Controlling and fighting fire onboard.  

6 hrs.

Competency on - Operation of life saving appliances.  

6 hrs.

-------------------------------

Total hrs. of Training: 1152 hrs.

-------------------------------

The competency of the students are evaluated by the Marine Engineering Workshop and a report is sent to the college. During the training the students have to maintain a work dairy. After completion of this training the students will be examined as follows:

a) Assessment on work diary (Internal)  
200 Marks.

b) *(i) Written test for 1 hour. 10 questions  
10 X 10 = 100 Marks

(ii) Viva voce  
200 Marks

Total 500 Marks

* Valuation by both Internal and External Examiners.

OUTCOMES:

On completion of the workshop training the students are expected to have acquired the sufficient knowledge

- In operation, maintenance, repair and refit of Marine machines viz. main engine, auxiliary engines,
- In operation, maintenance, repair and refit of Auxiliaries such as Compressors, Pumps, Steering gear, distillation plant, incinerator, sewage treatment plant etc.,
- In using hand tools, electrical and electronic equipments,
- In using Measuring and Testing Equipments for locating faults, malfunctions
- In repairing faults and malfunctions
- In operation, maintenance, repair and refit of Marine Electrical machines such as Alternators, Generators, Motors, Stabilizers
- Overhauling and maintenance of heat exchangers, oil separators, filters etc
- Of Fire fighting and Life saving Methods
- On maintenance of systems and controls

REFERENCES:

1. Original Equipment Manufacturers Manuals For On Board Equipments

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV 8701</td>
<td>MARINE MACHINERY AND SYSTEMS DESIGN</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**OBJECTIVE:**
- To impart training and knowledge to the students about Marine Machinery system and Design.

**UNIT I**  
**SLIDING AND ROLLING CONTACT BEARINGS**  
Journal bearings, thrust bearings, friction in journal bearings, bearing loads, bearing design using various equations. Thermal Equilibrium.  
Rolling bearing -Load ratings, types of radial ball bearings, selection of bearings, lubrication of ball and roller bearings, methods of failure.

**UNIT II**  
**SPUR , HELICAL BEVEL AND WORM GEARS**  
Basic design principles of spur gears, helical gears, dynamic tooth loads, design for strength and wear. Lewis and Buckingham equations.  
Basic design principles of bevel gears and worm gears, Lewis formula, thermal rating of worm gears.

**UNIT III**  
**IC ENGINE PARTS**  
Piston, connecting rod with bearings, crankshaft, flywheel and rocker arms
UNIT IV  VALVES & LIFTING DEVICES  9
Valves, safety valves and reducing valves - crane hooks, lifting chains, chain blocks, E.O.T. Crane.

UNIT V  DESIGN CRITERIA FOR MARINE SYSTEMS  9

OUTCOMES:
• Using Different types of Bearings.
• Design of IC Engine parts and gears.
• Design of Marine Machinery systems.

TEXT BOOKS:

REFERENCES

MV 8702  MARINE ELECTRICAL TECHNOLOGY  L T P C
4 0 0 4

OBJECTIVE:
• To develop skills of students in Marine Electrical Technology. The students will be imparted training in handling various electrical instruments to find out faults on various electrical equipments onboard ships and rectify such faults.
UNIT I  POWER DISTRIBUTION AND REGULATIONS

UNIT II  INSTRUMENTATION AND SWITCHGEAR

UNIT III  CABLES AND LIGHTING SYSTEMS

UNIT IV  PROPULSION AND STEERING SYSTEMS


UNIT V  AUXILLARIES AND MAINTENANCE


TOTAL : 60 PERIODS

OUTCOMES:
- Different Types of Electrical distribution Systems
- Regulations observed onboard ships regarding electrical equipments
- Different types of electrical Instruments and Switch Gear used on board Ship
- using electrical instruments, to find out and rectify various kinds of faults onboard ships.
- Specification of cables and Type of Lighting systems fitted on board
- Steering systems
- maintenance of electrical equipments, instruments, system components etc.,

TEXT BOOKS:

REFERENCES
OBJECTIVE:
- To provide knowledge about Automation and Controls fitted in ships.

UNIT I  CONTROL SYSTEM
Introduction to control terms, Block diagrams for control systems, open loop and closed feedback control, comparison of closed and open loop, feed forward control. Feed forward modification. ON-OFF control, sequential control, Proportional plus integral plus derivative controls. Use of various control modes, Mathematical Model: Developing Mathematical Models for Mechanical, Hydraulic, Pneumatic, Thermal, Electrical and Electro mechanical Systems

UNIT II  GRAPHICAL REPRESENTATION OF SIGNALS
Inputs of step, Ramp, Sinusoid, Pulse and Impulse, Exponential Function etc Error Detector, Controller output elements. Dynamics of a simple servomechanism for Angular position Control: Torque Proportional to error, Different responses of servomechanism.

UNIT III  PROCESS CONTROL SYSTEMS

UNIT IV  TRANSMISSION
Pneumatic and electric transmission - suitability for marine use. Pneumatic and types of controllers hydraulic, electric and electronic controllers for generation of control action Time function controllers.
Correcting Units- Diaphragm actuators, Valve positioners, piston actuators, and Electro pneumatic transducers. Electro- hydraulic actuators and Electric actuator control valves.

UNIT V  APPLICATION OF CONTROLS ON SHIPS
Marine Boiler - Automatic Combustion control, Air - Fuel ratio control, feed water control single, two and three-element type, steam pressure control, fuel oil temperature control, Control in Main Machinery units for temperature of lubricating oil, jacket cooling water, fuel valve cooling water, piston cooling water and scavenge air, fuel oil viscosity control. Bridge control of main machinery, Instruments for UMS classification.

OUTCOMES:
- Basics of Control systems.
- Graphical representation of signals.
- Electrical, Electronics, Pneumatic and Hydraulic control systems.
- Design aspects of control systems on board ships.

TEXT BOOKS:
REFERENCES

MV 8704 MARINE AUXILIARY MACHINERY – II

OBJECTIVE:
- To impart knowledge on the Working Principle of Marine Auxiliary Machineries

UNIT I OPERATION & MAINTENANCE
9
Prevention of oil, garbage, sewage, air pollution and IMO requirement as per MARPOL act. Operation, construction, maintenance of oil water separator both manual and automatic versions. Construction, operation, maintenance of incinerator and the of sewage plant.

UNIT II THEORY OF OIL PURIFICATION/AIR COMPRESSOR
9
Construction, operation, maintenance of fuel oil and lub oil purifiers, clarifiers together with self de sludge operation. Theory of air compression and uses of compressed air on board. Construction, operation, maintenance of main air compress and emergency air compressors. Types of bow thrusters, operation, maintenance of the same and Deck machinery, operation, maintenance of cargo winches, windless mooring winches.

UNIT III METHODS OF SHAFT ALIGNMENT
9
Construction, operation, maintenance of - thrust block. - intermediate shaft. Construction, operation, maintenance stern tube and stern tube bearing both water cooled and oil cooled together with sealing glands. Stresses in shafting, i.e. intermediate shaft, thrust shaft and screw shaft.

UNIT IV DRY DOCKING
9
Preparation and procedure to dry docking vessel. Maintenance of hull, underwater fittings and machine maintenance and repairs during dry dock Removal and maintenance of rudder and propeller. Removal and maintenance of tail shaft and stern tube bearing.

UNIT V MAINTAINENCE AND REPAIR AT MANAGEMENT LEVEL, LEADERSHIP AND MANAGERIAL SKILLS
9
A) Theory of marine eng. Practice and maintenance of machinery, dealing with wear and tear, both electrical and mechanical, Alignment of components, temporary and permanent repairs. Detection of machinery malfunction and action to prevent damage.
B) Planned maintenance, preventive maintenance, condition monitoring, Principles of tribology, dry docking, risk assessment, trials and safe working practices.

TOTAL: 45 PERIODS
OUTCOMES:
- The Construction, operation, maintenance of incinerator and sewage plant.
- The Construction, operation, maintenance of Oily water Separator and Purifiers
- The Construction operation, maintenance of sewage plant.
- Alignment of shafting system
- Dry docking of ships
- Maintenance and repair of Equipments, Machinery fitted in ships

TEXT BOOKS:

REFERENCES
4. “Pumping and Piping systems, Publisher, Sea Fish Industry Authority, 2012

MV 8705 SHIP’S FIRE PREVENTION AND CONTROL

OBJECTIVE:
- To provide knowledge and understanding of advanced Fire Prevention and Control to the students.

UNIT I FIRE PROTECTION BUILT IN SHIPS
SOLAS convention, requirements in respect of materials of construction and design of ships, (class A, B, type BHDS), fire detection systems, fire test, escape means, electrical installations, ventilation system and venting system for tankers. Statutory requirements for fire fighting systems and equipments on different vessels, fire doors & fire zones.

UNIT II DETECTION AND SAFETY SYSTEMS
Fire safety precautions on cargo ships, tankers and passenger ships during working. Types of detectors, selection of fire detectors and alarm systems and their operational limits. Commissioning and periodic testing of sensors and detection system. Description of various systems fitted on ships including micromist and extinguishing system.

UNIT III FIRE FIGHTING EQUIPMENT
Fire pumps, hydrants and hoses, couplings, nozzles and international shore connection, construction, operation and merits of different types of portable, non-portable and fixed fire extinguishers installations for ships, properties of chemicals used, water-mist fire suppression system. Advantages of various fire extinguishing agents including vaporizing fluids and their suitability for ship’s use. Control of class A, C & class D fires, Combustion products & their effects on life safety.
UNIT IV    FIRE CONTROL

UNIT V    SAFETY MEASURES
Special safety measures for preventing, fighting fire in tankers, chemical carriers, oil rigs, supply vessels, and fire fighting ships - Safe working practice with respect to fire on board ships and first aid for hazards arising from fire in ships.

TOTAL: 45 PERIODS

OUTCOMES:
- Fire protection, Detection and Safety systems in ships.
- Construction, Operation and Maintenance of Fixed and portable Fire Extinguishers in ships.
- Fire prevention and control in oil tankers, LPG / LNG carriers, Chemical tankers, oil rigs, supply vessels
- Operation of Fire fighting ships

TEXT BOOKS:

MV 8711    FIRE FIGHTING, CONTROLS AND SIMULATOR LABORATORY

OBJECTIVE:
- To impart Practical knowledge of fire fighting, control systems on board. To train the students in simulator so as to have knowledge of correct operation of Engines, machinery, Equipments fitted on board ships

MARINE ENGINEERING FIRE FIGHTING LABORATORY

LIST OF EXPERIMENTS
1. Fire hazard aboard ships – inflammability, fire extinguishing use. Control of class A, B & C fires.
2. Fire protection built in ships, extinction systems, and escape means.
3. System for tankers, statutory requirements for fire fighting systems and equipments on different vessels.
4. Fire fighting equipment: fire pumps, hydrants and hoses, couplings, nozzles and International shore connection, Construction, Operation and merits of different types of portable extinguishers.
5. Non-portable and fixed fire extinguishers, installation for ships. Properties of chemical used, bulk carbon-di-oxide, and inert gas systems.
6. Firemen outfit its use and care, maintenance, testing and recharging of appliances, preparation, and fire appliance survey.
7. Fire Control: Action required and practical techniques adopted for extinguishing fires in accommodation, machinery spaces, boiler rooms, Cargo holds, galley etc.,
8. Fire fighting in port and dry dock. Procedure for re-entry after putting off fire, rescue operations from affected compartments.
10. Fire drill.

TOTAL: 60 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Operating Different types of fixed and portable type of fire extinguishers
- Fighting different types of fire on board ships
- Refilling all types of fire extinguishers
- operating different types of fire fighting equipments Viz. fire pumps, hydrants and hoses, couplings, nozzles and International shore connection,
- First aid
- Operating Hydraulic and Pneumatic control equipment , systems and components
- Starting ,Operating , watch keeping, Keeping the machinery with in the operating parameters by controlling the system components and equipments, corrective action during fault , malfunction, and stopping of all machinery and Engines.

REFERENCES:
1. Laboratory Manual

PNEUMATIC AND HYDRAULIC CONTROL LABORATORY

1. Symbols of Hydraulics
2. Hydraulic Power Pack
3. Double acting Cylinder Operation 4/3 Direct Control valve
4. Pilot operated check valve.
5. Speed control of cylinder with throttle valve.
6. To study the cracking pressure pilot operated check valve.
8. Meter - Out-Circuit
9. Bleed of Circuit
10. Direct operated relief valve.
11. Hydraulic motor operation.
12. Speed variation of hydraulic motor.
13. Sequence Circuit.
16. Quick exhaust Valve.
17. Time Delay circuit.
18. Impulse operation of single acting cylinder
19. Impulse operation of double acting cylinder
20. Pressure switch operation pneumatic system
21. Series connection of electro pneumatic Contacts
22. Parallel connection of electro pneumatic Contacts

REFERENCES:
1. Laboratory manual
2. Shanmuga Sundram, “Hydraulics and Pneumatics Controls”, S. Chand group, 2010

SIMULATOR LAB. EXPERIMENTS

1. Description of basic engine functions and their simulation.
3. Engine operation from Remote stations – i.e. engine control room and Navigation Bridge.
5. Electronic logic circuits in remote control stations.
7. Study and adjustments of Logic circuits for remote control operation of main engine

REFERENCES:
1. Laboratory Manual
2. Original Equipment (Simulator) Manufacturers manual

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

MARINE FIRE FIGHTING LABORATORY

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Fixed CO₂ fire fighting system</td>
<td>01</td>
</tr>
<tr>
<td>02</td>
<td>Smoke Detection Unit</td>
<td>01</td>
</tr>
<tr>
<td>03</td>
<td>Fire main system</td>
<td>01</td>
</tr>
<tr>
<td>04</td>
<td>Fire call point &amp; Gong Bell</td>
<td>01</td>
</tr>
<tr>
<td>05</td>
<td>Portable extinguishers (Water, CO₂, dry powder, mechanical type extinguishers)</td>
<td>01</td>
</tr>
<tr>
<td>06</td>
<td>Non-Portable Extinguisher – Mechanical Extinguisher</td>
<td>01</td>
</tr>
<tr>
<td>07</td>
<td>Smoke &amp; Heat detectors</td>
<td>01</td>
</tr>
<tr>
<td>08</td>
<td>C.A.B.A</td>
<td>01</td>
</tr>
<tr>
<td>09</td>
<td>Bellow type foot pump</td>
<td>01</td>
</tr>
<tr>
<td>10</td>
<td>First aid kit and stretcher</td>
<td>01</td>
</tr>
</tbody>
</table>
### MARINE CONTROLS LABORATORY

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Transparent Hydraulic Trainer</td>
<td>01</td>
</tr>
<tr>
<td>02</td>
<td>Transparent Pneumatic Trainer</td>
<td>01</td>
</tr>
<tr>
<td>03</td>
<td>Electro Hydraulic and Pneumatic Trainer</td>
<td>01</td>
</tr>
<tr>
<td>04</td>
<td>PID Trainer – Hydraulic</td>
<td>01</td>
</tr>
<tr>
<td>05</td>
<td>PID Trainer – Pneumatic</td>
<td>01</td>
</tr>
<tr>
<td>06</td>
<td>PC Interface</td>
<td>01</td>
</tr>
<tr>
<td>07</td>
<td>Air Compressor Suitable for above system</td>
<td>01</td>
</tr>
</tbody>
</table>

### MARINE SIMULATOR LABORATORY

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Engine Room Simulation Master Panel</td>
<td>01</td>
</tr>
<tr>
<td>02</td>
<td>Engine Room Simulation Trainee Panels</td>
<td>04</td>
</tr>
</tbody>
</table>

### MV 8712 - MARINE PROPULSION AND AUXILIARY MACHINERY

OVERHAULING LABORATORY

#### OBJECTIVE:
- To impart knowledge about the overhauling of equipments associated with Main Engines, Auxiliary engines and auxiliary machines

#### MARINE ENGINE

#### LIST OF EXPERIMENTS
1. Study of Lubricating oil cooler
2. Study of Jacket water cooler
3. Study of Scavenge Air cooler
4. Study of crank case inspection and bearing clearances
5. Fuel injection valve and pump
6. Starting air valve
7. Cylinder relief valve and indicator cock

#### AUXILIARY ENGINE
8. Study of Turbo charger
9. Study of Cylinder Head and fittings
10. Study of Fuel Injection pump

#### AUXILIARY MACHINES
11. Study of Lubricating oil screw pump
12. Study of S.W. Centrifugal pump
13. Reciprocating Bilge pump
14. Study of Boiler safety valve and water level gauge glass
15. Study of 2 RAM hydraulic steering gear
16. Study of various types of values, filters, oil separators, Incinerator, Heat Exchange etc.
17. Study of boilers, cargo oil pump, F.W. Generator.

**TOTAL: 30 PERIODS**
OUTCOME:
Upon Completion of the course, the students will be able to:

- To open, clean, repair and refit all the equipments associated with Main Engines, Auxiliary engines and auxiliary machines

REFERENCES

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS
MARINE PROPULSION LABORATORY

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Fuel Oil Separator</td>
<td>01</td>
</tr>
<tr>
<td>02</td>
<td>Lub Oil Separator</td>
<td>01</td>
</tr>
<tr>
<td>03</td>
<td>Bilge Pump</td>
<td>01</td>
</tr>
<tr>
<td>04</td>
<td>Ballast Pump 130 cu.m/hr</td>
<td>01</td>
</tr>
<tr>
<td>05</td>
<td>Main Engine Sea Water Pump</td>
<td>01</td>
</tr>
<tr>
<td>06</td>
<td>Sludge Pump</td>
<td>01</td>
</tr>
<tr>
<td>07</td>
<td>Fuel Oil Transfer Pump</td>
<td>01</td>
</tr>
<tr>
<td>08</td>
<td>Ballast Pump 65 cu.m/hr</td>
<td>01</td>
</tr>
<tr>
<td>09</td>
<td>Lub Oil Filter</td>
<td>01</td>
</tr>
<tr>
<td>10</td>
<td>Fuel Oil Filter</td>
<td>01</td>
</tr>
<tr>
<td>11</td>
<td>Lub Oil Cooler</td>
<td>01</td>
</tr>
<tr>
<td>12</td>
<td>Sea Water Cooler</td>
<td>01</td>
</tr>
<tr>
<td>13</td>
<td>Main Engine</td>
<td>01</td>
</tr>
<tr>
<td>14</td>
<td>Air Compressor with bottle</td>
<td>01</td>
</tr>
<tr>
<td>15</td>
<td>Main Engine Lub Oil Pump</td>
<td>01</td>
</tr>
<tr>
<td>16</td>
<td>Portable Compressor</td>
<td>01</td>
</tr>
<tr>
<td>17</td>
<td>Diesel Generator 300 KW / 100 KW</td>
<td>01</td>
</tr>
</tbody>
</table>

MARINE AUXILIARY MACHINERY LABORATORY

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Air Compressor</td>
<td>01</td>
</tr>
<tr>
<td>02</td>
<td>Heat Exchanger</td>
<td>01</td>
</tr>
<tr>
<td>03</td>
<td>Incinerator</td>
<td>01</td>
</tr>
<tr>
<td>04</td>
<td>Oily Water Separator</td>
<td>01</td>
</tr>
<tr>
<td>05</td>
<td>Steering Gear</td>
<td>01</td>
</tr>
<tr>
<td>06</td>
<td>Cargo Turbine Oil Pump</td>
<td>01</td>
</tr>
<tr>
<td>07</td>
<td>Cargo Winch</td>
<td>01</td>
</tr>
<tr>
<td>08</td>
<td>Governor</td>
<td>01</td>
</tr>
<tr>
<td>09</td>
<td>Thermostat</td>
<td>01</td>
</tr>
<tr>
<td>10</td>
<td>Crankshaft</td>
<td>01</td>
</tr>
</tbody>
</table>
MARINE DISMANTLING AND ASSEMBLING LABORATORY

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Heleshaw Pump</td>
<td>01</td>
</tr>
<tr>
<td>02</td>
<td>Piston Pump</td>
<td>01</td>
</tr>
<tr>
<td>03</td>
<td>Centrifugal Pump</td>
<td>01</td>
</tr>
<tr>
<td>04</td>
<td>Gear Pump</td>
<td>01</td>
</tr>
<tr>
<td>05</td>
<td>Fire &amp; G.S Pump</td>
<td>01</td>
</tr>
<tr>
<td>06</td>
<td>Screw Displacement pump</td>
<td>01</td>
</tr>
<tr>
<td>07</td>
<td>Sewage Treatment Plant</td>
<td>01</td>
</tr>
<tr>
<td>08</td>
<td>Cargo Oil Pump</td>
<td>01</td>
</tr>
<tr>
<td>09</td>
<td>Different types of valves (quick closing valve,</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>non-return valve, butterfly valve)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Water gauge glass</td>
<td>01</td>
</tr>
</tbody>
</table>

MARINE BOILER WORKSHOP

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Auxillary Water Tube Boiler</td>
<td>01</td>
</tr>
<tr>
<td>02</td>
<td>Fresh Water Generator</td>
<td>01</td>
</tr>
</tbody>
</table>

MV 8713 MEASUREMENT AND INSTRUMENTATION LABORATORY

OBJECTIVE:
- To impart knowledge on the use of Measuring Techniques, Measuring equipments and Instruments and the Operation of Refrigeration plant

MEASUREMENT LABORATORY

LIST OF EXPERIMENTS
1. Use of precision measuring instruments like micrometer, vernier, height and depth gauges, surface plate, etc.
2. Checking dimensions of a part using slip gauge.
3. Use of sine bar for measuring angles and tapers.
5. Calibration of dial gauge.
6. Taper and bore measurement using spheres.
7. Fundamental dimension of a gear using contour projector.
8. Testing squareness of a try square using slip gauges.
10. Measurement of angles between centre lines of holes drilled radially on a shaft.
12. Use of pneumatic comparator and mechanical comparator.
INSTRUMENTATION LABORATORY
Pressure measuring devices—pressure and vacuum gauge calibration.
Temperature measuring devices like Platinum resistance thermometer, thermocouple, radiation pyrometer, etc.
Flow measuring devices like orifice meter, rotameter, etc.
Speed measuring devices like tachometer, stroboscope, etc.
Force measuring devices, load cells and proving rings.
Torque measuring devices
Power measurement using rope, prony brake, mechanical, hydraulic and electrical dynamometers.
Study and use of strain, displacement devices—strain gauge indicator, LVDT.
Study and use of velocity and acceleration—accelerometer.
Study and use of vibration devices—vibrometer.

TOTAL: 60 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- using the Different types of measuring equipments instruments
- Method of measurements using the instruments
- Power measurement using rope, prony brake, mechanical, hydraulic and electrical dynamometers.
- Measurement of Vibrations of Machines
- Operation and watch keeping duties of Refrigeration plant

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

MEASUREMENT LABORATORY

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of the Equipment</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Slip Gauge and Dial gauge</td>
<td>6 set</td>
</tr>
<tr>
<td>02</td>
<td>Sine Bar</td>
<td>2 nos</td>
</tr>
<tr>
<td>03</td>
<td>Four sphere &amp; Two sphere height gauge</td>
<td>2 nos</td>
</tr>
<tr>
<td>04</td>
<td>Bore Dial gauge</td>
<td>1</td>
</tr>
<tr>
<td>05</td>
<td>Sphere</td>
<td>2</td>
</tr>
<tr>
<td>06</td>
<td>Vernier caliper</td>
<td>12</td>
</tr>
<tr>
<td>07</td>
<td>Profile projector</td>
<td>1</td>
</tr>
<tr>
<td>08</td>
<td>Tri-square.</td>
<td>2</td>
</tr>
<tr>
<td>09</td>
<td>Bevel protractor</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Floating carriage Micrometer</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Pneumatic comparator</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Optical flat interferometer.</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Gear tester.</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Auto collimator</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Tool Maker’s Microscope</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>Surface test 301</td>
<td>1</td>
</tr>
</tbody>
</table>
## INSTRUMENTATION LABORATORY

<table>
<thead>
<tr>
<th>SL.NO</th>
<th>NAME OF THE EQUIPMENT</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>1. Dead weight type pressure gauge 0-2kgf/cm²</td>
<td>1</td>
</tr>
<tr>
<td>02</td>
<td>2. Bourdon type Pressure gauge 0-400kgf/cm²</td>
<td>1</td>
</tr>
<tr>
<td>03</td>
<td>Vacuum pressure gauge – McLeod gauge.</td>
<td>1</td>
</tr>
<tr>
<td>04</td>
<td>Thermocouple</td>
<td>4</td>
</tr>
<tr>
<td>05</td>
<td>Resistance Temperature Detector</td>
<td>2</td>
</tr>
<tr>
<td>06</td>
<td>Proving ring mechanical type</td>
<td>2</td>
</tr>
<tr>
<td>07</td>
<td>Speed stroboscope</td>
<td>1</td>
</tr>
<tr>
<td>08</td>
<td>Strain gauge</td>
<td>4</td>
</tr>
<tr>
<td>09</td>
<td>Linear Variable differential transformer 20mm</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Static torque meters</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Piezoelectric sensor analog</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Piezoelectric Crystal Sensor</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Orifice meter, Venturimeter, Rotameter</td>
<td>3</td>
</tr>
</tbody>
</table>

## MV 8801

**MARINE VEHICLES PERFORMANCE**

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### OBJECTIVE:
- To impart Knowledge to students about Marine Vehicle Performance while sailing

### UNIT I  RESISTANCE
Types of resistance, frictional, residuary - wave making, eddy and form resistances and total resistance, air, appendage, model testing, propeller tests in open water, admiralty coefficient, fuel coefficient and consumption, sea trials – Problems.

### UNIT II  PROPELLER THEORY
Types and theory of propellers, apparent slip, real slip, wake, thrust, relation between powers and speed, measurement of pitch, cavitations, built and solid propellers, interaction between the ship and propeller, hull efficiency over all propulsive efficiency – problems.

### UNIT III  RUDDER THEORY
Types of rudders, model experiments and manoeuvring trials, area and shape of rudder, position of rudder, bow rudders vs stern rudder, forces on rudder, torque on stock, angle of heel, due to force on rudder and angle of heel when turning – problems.

### UNIT IV  WAVE THEORY
Theory of waves, trochoidal waves, relationship between line of orbit centres and the undisturbed surface, sinusoidal wave, Irregular wave pattern, wave spectra, wave amplitudes, rolling in unresisting media, rolling in resisting media, practical aspects of rolling, Anti rolling devices, forces caused by rolling, pitching, heaving and yawing.
UNIT V  
SHIP VIBRATION & NOISE  
Hull vibration, Engine vibration, vibration of shafting system, engine noise reduction.

OUTCOMES:
- Ships Model Tests and Sea Trials.
- Various types of Propellers and Rudders.
- Wave motions and the Ships Vibrations.

TEXT BOOKS:

REFERENCES
2. Srikant Bhave, “Mechanical Vibrations”, Pearson, 2010

MV 8802  
SHIP OPERATIONAL MANAGEMENT AND IMO  
L T P C
REQUIREMENTS  3 0 0 3

OBJECTIVE:
- To teach the students about management of ships and impart knowledge on statutory regulations.

UNIT I  
STRUCTURE OF A SHIPPING COMPANY  
Structure of a shipping company and functioning of its various departments, ownership of vessels, registration of ships, flags of convenience, IMO identification number.. Maritime Declarations of Health and the requirements of the International Health Regulations.

UNIT II  
COMMERCIAL SHIPPING PRACTICE  
Planning sailing schedules and voyage estimates, liner and tramp shipping services, conference systems, chartering and charter parties, ship’s papers for arrival and departure, port procedures, role of agents, theory of freight rates, bills of lading, cargo surveys and note of protests, International labour organization (ILO) and Maritime Labour Convention, 2006, COLREG 1972

UNIT III  
MARINE INSURANCE  
Underwriting and loss adjusting principles applied to Marine cargo insurance, hull / machinery policy, particular average, general average, P & I Clubs – making claims.
UNIT IV  STATUTORY REGULATIONS
IMO Conventions, legislations, MARPOL acts and conventions, annexes I to VI, SOLAS 1974 and amendments, main objectives, overview of all chapters and articles with an emphasis on ISM and ISPS codes., Maritime security policy, security responsibilities, vessel security assessment, security equipment, threat identification vessel security actions and security administration. Load Lines Convention 1966, Tonnage Convention 1969. Responsibilities under International Instruments Affecting the Safety of the Ships, Passengers, Crew or Cargo, Ballast Water Management

UNIT V  STCW
International convention on STCW for seafarers 1978 with 1995 amendments, an overview of all sections, manning of ships, engagement and discharge of ship’s crew, ship’s articles, Merchant shipping act, Role of Maritime administration(DGS) and its functions: DGS Rules and MS Notices Port state control, PSC mandatory certificate check list, grounds for PSC inspection criteria for detention. Emergency Preparedness, drills and exercises, ERM(engine room resource management)

OUTCOMES:
- Structure and functioning of a shipping company.
- Planning and estimating of a voyage besides executing the same.
- Marine Insurance as applicable to ship, cargo and crew.
- Statutory regulations applicable to shipping industry.
- Manning of ships, STCW and Port state control.
- Security Training with designated Security Duties as per STCW 2010

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES
2. SOLAS – 1974 - International Maritime Organisation Publications
4. STCW -1978/95 - International Maritime Organisation Publications
OBJECTIVE:
- To impart knowledge to the students in Watch-keeping of Engine Room in various types of ships and to prepare for Class IV MOT Examination

UNIT I SAFE WATCH KEEPING
Definition of watch, operating principles, requirements of watch keeping, requirements of certification, duties of engineer officers – operation of engine room in general, log book writing – watch keeping under way – watch keeping at port – at unsheltered anchorage, fitness for duty, preparation of Diesel Engines for a long voyage – bad weather precautions, safe working practices – during overhauling at port, and during bad weather, change over from diesel oil to heavy oil and vice versa.

Trouble shooting during watch keeping: Emergency measures taken in case of –flooding of engine room, engine room bilge fire, general fire, In case of any system failure or breakage of pipe lines, etc.

UNIT II TROUBLE SHOOTING IN AUXILIARY MACHINERIES
Malfunctioning, partial or total failure of auxiliary machineries – such as, auxiliary engines, purifiers, heat exchangers, air compressors, reefer and air conditioning compressors and systems, boilers and accessories, fresh water generators, hydrophore tanks and systems, all pumps & systems.

Repairs and maintenance of propeller, rudder, drydocking methods, drydocking inspection and repair works.

UNIT III TROUBLE SHOOTING IN MAIN ENGINE
Trouble shooting related to various types of marine diesel engines and condition monitoring – causes, effects, remedies and prevention of engine not turning on Air and Fuel, knocking at TDC and BDC, black smoke in funnel, poor compression and combustion, early or advanced injection, turbocharger surging, scavenge fire, Air starting line explosion, crank case explosion, exhaust uptake fire, failure of bottom end bolts.

UNIT IV MAINTENANCE OF ENGINE COMPONENTS
Checking of holding down bolts, resin chocking – Tie-rods tensioning, checking and tightening of 2-stroke and 4-stroke bottom end bolts.

Inspection and maintenance of crankshaft and cam shaft, dismantle inspection and reassemble of main bearings, cross head bearings & bottom end bearings, connecting rod, piston and piston assembly, stuffing box, cylinder head and all mountings, governor and over speed trip – checking of all clearances, adjustments, effect of improper clearances, prevention and rectification.

Cylinder liner and cylinder lubrication, thrust bearing, running gears inspection, engine alignment, chains drive adjustment and tensioning.

UNIT V TROUBLE SHOOTING AND MAINTENANCE OF ELECTRICAL MACHINERIES
Circuit testing, shore supply arrangement, maintenance of circuit breakers, transformers, electrical motors, navigational lights, batteries, starters, electrical equipments, maintenance of switchboard. Maintenance of electrical equipments in oil tankers, LNG / LPG carriers.

TOTAL: 45 PERIODS
OUTCOMES:
- STCW standards of training, requirements of officers and ratings.
- Watch-keeping in various ships.
- Prevention, rectification and maintenance with respect to trouble shooting of machineries in the Engine Room.

TEXT BOOKS:

REFERENCES
1. IME Manuals and Ship’s Marine Manuals.
4. Manual De Maintenance & operation MAN type K.270 120E DMR.

MV8804

OFFSHORE TECHNOLOGY

L T P C
3 0 0 3

OBJECTIVES:
- To understand different type of offshore structure.
- To understand different design factor of offshore structure

UNIT I
INTRODUCTION OF OFFSHORE STRUCTURES

UNIT II
OCEAN ENVIRONMENTS
Discussion of Selected Innovative Field Development Concept:
UNIT III  LOADS AND RESPONSES

UNIT IV  FIXED OFFSHORE PLATFORM DESIGN FACTORS

UNIT V  FLOATING OFFSHORE PLATFORM DESIGN FACTORS

OUTCOME:
- At the end of the semester cadets will get the knowledge on ocean environments, design factors of fixed offshore & floating offshore plat form.

TEXT BOOKS:

MV 8001  ADVANCED MARINE HEAT ENGINES  L  T  P  C
3  0  0  3

OBJECTIVE:
To impart the knowledge of Latest Designed Marine Heat Engines

UNIT I  COMPLEX HEAT ENGINE PLANTS

UNIT II  COMBUSTION AND FLAME STABILISATION
UNIT III TURBO BLOWERS AND TURBO COMPRESSORS

UNIT IV HEAT EXCHANGER
Types – construction – design – applications.

UNIT V RECENT TRENDS
Diesel Engines using LNG vapour camless intelligent Engines, CRDI, NOx and SOx control by various types – Exhaust gas recirculation – water injection selective cat reduction – Emission variable injection timing.

TOTAL: 45 PERIODS

OUTCOMES:
- Knowledge on the co-generation plant engines
- Design Concept of Turbo blowers and compressors
- Design Concept of Heat Exchangers
- Recent trends in the design changes of IC Engines and Propulsion engines

TEXT BOOKS:
2. Gorla, “Turbomachinery” 1st Ed. Taylor & Francis, First Indian reprint 2011 (Yesdee Publishing)

REFERENCES
OBJECTIVE:
To ensure awareness regarding Environmental Protection at Sea and to impart aspect of commitment.

UNIT I  OIL POLLUTION PREVENTION  9
Pollution of the Marine environment while bunkering, loading/discharging oil cargo – tank cleaning – pumping out bilges etc., - knowledge of construction and operation of oil pollution prevention equipment in engine room and on tankers.

UNIT II LEGISLATIONS  9
MARPOL 73/78 and other country legislations like OPA-90 MARPOL equipment – Knowledge of Codes of Safety Working practices as published – Knowledge of type of information issued by D.G. Shipping with regard to safety at sea & safe working practices.

UNIT III SURVIVAL TECHNIQUES AND LIFE SAVING APPLIANCES ON SHIP  9

UNIT IV RULES & REGULATIONS  9
Knowledge of the appropriate statutes of concern to marine engineer officers: The administrative duties of a Chief Engineer – the organisation and training of staff for both normal and emergency duties. The various statutory certificates and documents to be carried onboard ships by all ships: Dangerous goods codes– Carrying more than 2000 tonnes of oil – Chemical tankers and Gas carriers.

UNIT V PERSONNEL MANAGEMENT  9
Organisation of Staff: Manning arrangements – Analysis of work – Allocation of staff – Organisation of safety and emergencies, staff duties, maintenances, Ship’s records, communication on the ship, meeting techniques.

TOTAL : 45 PERIODS

OUTCOMES:
• Learn precautions required for oil tanker operations.
• Learn about MARPOL 73/78 requirements and Safe Working Practices.
• Learn Life Saving and Survival at Sea techniques.
• Learn about IMO, its conventions and statutory certificates of ships.
• To understand Personnel Management, Training and Emergency drills of ships.
TEXT BOOK:
1. STCW – 1995 Hand Book

REFERENCES

MV 8003 PRESSURE VESSELS AND PIPING

OBJECTIVES:
- To apply the Mathematical knowledge gained in the design of pressure vessels and piping
- To carry out the stress analysis in pressure vessels and piping. To sensitize the Engineering students to various aspects of Human Rights.

UNIT I INTRODUCTION
Types of stresses, Methods for determining stresses – Terminology and Ligament Efficiency – Applications.

UNIT II STRESSES IN PRESSURE VESSELS

UNIT III DESIGN CRITERIA OF PRESSURE VESSELS
Design criteria of Tall cylindrical self supporting process columns – Supports for short vertical vessels – Stress concentration at a variable Thickness transition section in a cylindrical vessel, about a circular hole, elliptical openings. Theory of Reinforcement for Pressure Vessel Design.

UNIT IV BUCKLING AND FRACTURE ANALYSIS IN Pressure VESSELS
Buckling phenomenon – Elastic Buckling of circular ring and cylinders under external pressure – collapse of thick walled cylinders or tubes under external pressure – Effect of supports on Elastic Buckling of Cylinders – Buckling under combined External pressure and axial loading

UNIT V PIPING
Introduction – Flow diagram – piping layout and piping stress Analysis

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Apply the mathematical fundamentals for the design of pressure vessels and pipes.
- Analyse and design pressure vessels and piping
TEXT BOOKS:

REFERENCES

GE8074 HUMAN RIGHTS

OBJECTIVE:
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL : 45 PERIODS

OUTCOME:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:
GE8077  TOTAL QUALITY MANAGEMENT  L  T  P  C
3  0  0  3

OBJECTIVE:
- To facilitate the understanding of Quality Management principles and process.

UNIT I  INTRODUCTION

UNIT II  TQM PRINCIPLES
Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III  TQM TOOLS AND TECHNIQUES I
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV  TQM TOOLS AND TECHNIQUES II
Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V  QUALITY MANAGEMENT SYSTEM

TOTAL: 45 PERIODS

OUTCOME:
- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

REFERENCES:
4. ISO 9001-2015 standards
OBJECTIVES:
- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

UNIT I INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processesess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society.
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
• Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXT BOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005

MV 8004 SPECIAL DUTY VESSELS AND TYPE OF OPERATION

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

OBJECTIVE:
To impart knowledge to the students about special duty ships operation and classification society regulations.

UNIT I INTRODUCTION
Need for special duty vessels with reference to development of trade and necessities of the trade. Operation of Bulk carriers – Bulk Grain and ore etc., - Banana carriers – Coal Carriers – Forest Products carriers – Timber carriers – Container vessels.

UNIT II OIL TANKER CARGO OPERATIONS

UNIT III OIL TANKERS ROUTINE OPERATIONS

UNIT IV INTRINSICALLY DANGEROUS CARGOS
carriers – tank material and coatings – tank washing – cargo record book – equipment items precautions to be observed during cargo operations in port – fire protection – personnel protection.

UNIT V  RULES AND REGULATIONS

Classification societies for hull, equipment and machineries of Cargo ships and oil tankers – requirements of various types of surveys and certification of Merchant Ships.

OUTCOMES:
- History of trade of special duty vessels.
- Cargo Operations of Oil tankers.
- Cargo Operations of Chemical tankers, LPG / LNG vessels.
- About rules of classification societies for Cargo Ships and Tankers.

TEXT BOOKS:

REFERENCES

MV 8005  MARINE ROBOTICS  L  T  P  C
3  0  0  3

OBJECTIVES:
- To provide the students an advanced knowledge in various types of marine robots and its applications a relatively nascent field
- To impart knowledge in students in the areas of marine robotics design, development and deployment in the real world applications

UNIT I  MARINE ROBOTS
Types and classification of marine robots – robotic sailing – submersibles, applications of sailing robots and submersibles, Limitations in marine autonomy

UNIT II  ROBOTIC SAILING
History and recent developments in robotic sailing – miniature sailing robot platform (MOOP) – autonomous sailing vessel – design, development and deployment

UNIT III  SUBMERSIBLES
UNIT IV  AUTONOMOUS UNDERWATER VEHICLE (AUV)  9

UNIT V  UNDERWATER VEHICLE GUIDANCE AND CONTROL  9

TOTAL : 45 PERIODS

OUTCOMES:
• Students will have knowledge in various types of marine robots.
• Students should get an introduction about designing, developing and deploying marine robots in the field

TEXT BOOKS:
4 Thor I Fossen, “Guidance and control of ocean vehicles”, John wiley and Sons, 1999

REFERENCES

MV 8006  MARINE CORROSION AND PREVENTION  L T P C
3 0 0 3

OBJECTIVE:
• To impart knowledge on the Type of corrosion and how this is being controlled in marine environment

UNIT I  INTRODUCTION  9

UNIT II  HULL PLATE PREPARATION  9
UNIT III MODERN PAINT TYPES

UNIT IV CORROSION IN BOILER
Atoms & Ions, Ph value electrochemical corrosion, Direct chemical attack – Electro chemical attack – reason – remedial measures. Effect of salts & Grease in feed water. Effect of corrosion while boiler not in service – preservation to avoid corrosion.

CORROSION IN MARINE DIESEL ENGINES:

UNIT V CORROSION AND ITS PREVENTION

OUTCOMES:
- Causes of corrosion
- Method of prevention during operation and during construction
- Anti-corrosive paints
- Corrosion in BOILERS and IC ENGINES

TEXT BOOKS:
1. Lavery, H.I., “Shipboard operations” Institute of Marine Engineers Publication, 1990

REFERENCES

OBJECTIVE:
- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.
UNIT I                HUMAN VALUES

UNIT II               ENGINEERING ETHICS

UNIT III              ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV             SAFETY, RESPONSIBILITIES AND RIGHTS

UNIT V              GLOBAL ISSUES

TOTAL: 45 PERIODS

OUTCOME:
• Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

REFERENCES:

Web sources:
1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org
OBJECTIVE:
- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION
Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO – TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs
Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS

UNIT IV DIGITAL PRODUCTS AND LAW

UNIT V ENFORCEMENT OF IPRs
Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL : 45 PERIODS

OUTCOME:
- Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS

REFERENCES
OBJECTIVE:

- To learn about the basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION

Nanoscale Science and Technology - Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials - nanoparticles, quantum dots, nanowires, ultra-thin films, multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION

Bottom-up Synthesis - Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS

Nanoforms of Carbon - Buckminster fullerene, graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT) - methods of synthesis (arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications - Nanometal oxides-ZnO, TiO2, MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays - functionalization and applications - Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES


UNIT V APPLICATIONS


TOTAL: 45 PERIODS

OUTCOMES:

- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS:


REFERENCES:
