M.E. STRUCTURAL ENGINEERING

OBJECTIVES

- To make the students know the concepts of analysis and design of structures like Reinforced Concrete, Prestressed Concrete and Steel Structures.
- To make the students to understand the effect of dynamic forces like earthquake, wind and cyclone in the structures and the method of detailing of the structures against these forces.
- To enrich students with sound knowledge on the behaviour of materials both in the elastic as well as in the plastic stages.
- To make the students to have field knowledge in the practical aspects of analysis, design and construction of various structures.
- To continually work with industry to enhance the programme’s effectiveness and the opportunities for innovation.
- To conduct research to develop advanced technologies in Civil Engineering.

OUTCOME:

On successful completion of the programme, the students will

- Have the ability to apply knowledge of mathematics, science and engineering to solve problems related to structural engineering.
- Be able to apply knowledge and skill in the analysis and design of structural components and systems using appropriate standards and codes.
- Have the ability to apply modern engineering techniques, skills, and computing tools necessary for structural engineering practice.
- Have the capability to undertake real time research projects in the field of structural engineering.
### SEMESTER I

<table>
<thead>
<tr>
<th>SL. No.</th>
<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></td>
<td></td>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ST8101</td>
<td>Dynamics of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>ST8102</td>
<td>Concrete Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ST8103</td>
<td>Theory of Elasticity and Plasticity</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>MA8165</td>
<td>Advanced Mathematical Methods</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Elective I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Elective II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td>18</td>
<td>1</td>
<td>0</td>
<td>19</td>
</tr>
</tbody>
</table>

### SEMESTER II

<table>
<thead>
<tr>
<th>SL. No.</th>
<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></td>
<td></td>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ST8201</td>
<td>Earthquake Analysis and Design of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>ST8202</td>
<td>Experimental Techniques and Instrumentation</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ST8203</td>
<td>Finite Element Analysis</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>ST8204</td>
<td>Steel Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Elective III</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Elective IV</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>
</tr>
<tr>
<td>7</td>
<td>ST8211</td>
<td>Advanced Structural Engineering Laboratory</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>17</td>
<td>0</td>
<td>6</td>
<td>20</td>
</tr>
</tbody>
</table>

### SEMESTER III

<table>
<thead>
<tr>
<th>SL. No.</th>
<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></td>
<td></td>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Elective V</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Elective VI</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Elective VII</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>
</tr>
<tr>
<td>4</td>
<td>ST8311</td>
<td>Practical Training</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>ST8312</td>
<td>Project Work Phase I</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>ST8313</td>
<td>Seminar</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>9</td>
<td>0</td>
<td>14</td>
<td>17</td>
</tr>
</tbody>
</table>

---

UNIVERSITY DEPARTMENTS
ANNA UNIVERSITY :: CHENNAI 600 025
REGULATION 2013
M.E. STRUCTURAL ENGINEERING
CURRICULUM AND SYLLABUS I TO IV SEMESTERS (FULL TIME)

Attested

[Signature]

DIRECTOR
Centre For Academic Courses
Anna University, Chennai-600 025
### SEMESTER IV

<table>
<thead>
<tr>
<th>SL. No.</th>
<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>1</td>
<td>ST8411</td>
<td>Project Work Phase II</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
<td><strong>24</strong></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

**TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 68**

### ELECTIVES FOR M.E. STRUCTURAL ENGINEERING

<table>
<thead>
<tr>
<th>SL. No.</th>
<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>1</td>
<td>ST8001</td>
<td>Analysis and Design of Tall Buildings</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>ST8002</td>
<td>Design of Bridges</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ST8003</td>
<td>Design of Shell and Spatial Structures</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>ST8004</td>
<td>Design of Steel Concrete Composite Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>ST8005</td>
<td>Design of Sub Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>ST8006</td>
<td>Industrial Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>ST8007</td>
<td>Maintenance and Rehabilitation of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>ST8008</td>
<td>Mechanics of Composite Materials</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>ST8009</td>
<td>Nonlinear Analysis of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>ST8010</td>
<td>Offshore Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>ST8011</td>
<td>Optimization of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>ST8012</td>
<td>Pre-stressed Concrete</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>ST8013</td>
<td>Prefabricated Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>ST8014</td>
<td>Stability of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>ST8015</td>
<td>Theory of Plates</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>ST8016</td>
<td>Wind and Cyclone Effects on Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>CN8071</td>
<td>Advanced Concrete Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
### SEMESTER I

<table>
<thead>
<tr>
<th>SL. No.</th>
<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>THEORY</td>
<td>MA8165</td>
<td>Advanced Mathematical Methods</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>ST8102</td>
<td>Concrete Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ST8103</td>
<td>Theory of Elasticity and Plasticity</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

### SEMESTER II

<table>
<thead>
<tr>
<th>SL. No.</th>
<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>THEORY</td>
<td>ST8203</td>
<td>Finite Element Analysis</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ST8202</td>
<td>Experimental Techniques and Instrumentation</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ST8201</td>
<td>Elective I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td>8</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>

### SEMESTER III

<table>
<thead>
<tr>
<th>SL. No.</th>
<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>THEORY</td>
<td>ST8101</td>
<td>Dynamics of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ST8201</td>
<td>Elective II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ST8203</td>
<td>Elective III</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>

### SEMESTER IV

<table>
<thead>
<tr>
<th>SL. No.</th>
<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>THEORY</td>
<td>ST8204</td>
<td>Steel Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ST8201</td>
<td>Earthquake Analysis and Design of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ST8203</td>
<td>Elective IV</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td>ST8211</td>
<td>Advanced Structural Engineering Laboratory</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>9</td>
<td>0</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>
### SEMESTER V

<table>
<thead>
<tr>
<th>SL. No.</th>
<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></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Elective V</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Elective VI</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Elective VII</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>
</tr>
<tr>
<td>4</td>
<td>ST8311</td>
<td>Practical Training</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>ST8312</td>
<td>Project Work Phase I</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>ST8313</td>
<td>Seminar</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>9</td>
<td>0</td>
<td>14</td>
<td>17</td>
</tr>
</tbody>
</table>

### SEMESTER VI

<table>
<thead>
<tr>
<th>SL. No.</th>
<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></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ST8411</td>
<td>Project Work Phase II</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
</tbody>
</table>

**TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 68**

### ELECTIVES FOR M.E. STRUCTURAL ENGINEERING

<table>
<thead>
<tr>
<th>SL. No.</th>
<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>1</td>
<td>ST8001</td>
<td>Analysis and Design of Tall Buildings</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>ST8002</td>
<td>Design of Bridges</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ST8003</td>
<td>Design of Shell and Spatial Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>ST8004</td>
<td>Design of Steel Concrete Composite Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>ST8005</td>
<td>Design of Sub Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>ST8006</td>
<td>Industrial Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>ST8007</td>
<td>Maintenance and Rehabilitation of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>ST8008</td>
<td>Mechanics of Composite Materials</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>ST8009</td>
<td>Nonlinear Analysis of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>ST8010</td>
<td>Offshore Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>ST8011</td>
<td>Optimization of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>ST8012</td>
<td>Pre-stressed Concrete</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>ST8013</td>
<td>Prefabricated Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>ST8014</td>
<td>Stability of Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>ST8015</td>
<td>Theory of Plates</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>ST8016</td>
<td>Wind and Cyclone Effects on Structures</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>CN8071</td>
<td>Advanced Concrete Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
**OBJECTIVE:**
- To expose the students the principles and methods of dynamic analysis of structures and to prepare them for designing the structures for wind, earthquake and other dynamic loads.

**UNIT I**  
**PRINCIPLES OF VIBRATION ANALYSIS**  
Mathematical models of single degree of freedom systems - Free and forced vibration of SDOF systems, Response of SDOF to special forms of excitation, Effect of damping, Transmissibility.

**UNIT II**  
**DYNAMIC RESPONSE OF TWO DEGREE OF FREEDOM SYSTEMS**  
Mathematical models of two degree of freedom systems, free and forced vibrations of two degree of freedom systems, normal modes of vibration, applications.

**UNIT III**  
**DYNAMIC RESPONSE OF MULTI-DEGREE OF FREEDOM SYSTEMS**  
Mathematical models of Multi-degree of freedom systems, orthogonality of normal modes, free and forced vibrations of multi degree of freedom systems Mode superposition technique, Applications.

**UNIT IV**  
**DYNAMIC RESPONSE OF CONTINUOUS SYSTEMS**  

**UNIT V**  
**DIRECT INTEGRATION METHODS FOR DYNAMIC RESPONSE**  
Damping in MDOF systems, Nonlinear MDOF systems, step-by-step numerical integration algorithms, substructure technique.

**OUTCOME:**
- After completion of the course the students will have the knowledge of vibration analysis of systems/structures with different degrees of freedom and they know the method of damping the systems.

**REFERENCES:**

---

**ST8102**  
**CONCRETE STRUCTURES**  
**OBJECTIVES:**
- To make the students be familiar with the limit state design of RCC beams and columns
- To design special structures such as Deep beams, Corbels, Deep beams, and Grid floors
- The students will have confident to design the flat slab as per Indian standard, yield line theory and strip method.
- To design the beams based on limit analysis and detail the beams, columns and joints for ductility

**UNIT I**  
**DESIGN PHILOSOPHY**  
Limit state design - beams, slabs and columns according to IS Codes. Calculation of deflection and crack width according to IS Code.
UNIT II DESIGN OF SPECIAL RC ELEMENTS 9

UNIT III FLAT SLABS AND YIELD LINE BASED DESIGN 9
Design of flat slabs and flat plates according to IS method – Check for shear - Design of spandrel beams - Yield line theory and Hillerborg’s strip method of design of slabs.

UNIT IV INELASTIC BEHAVIOUR OF CONCRETE STRUCTURES 9
Inelastic behaviour of concrete beams and frames, moment - rotation curves,

UNIT V DUCTILE DETAILING 9

TOTAL: 45 PERIODS

OUTCOME:
- On completion of this course the students will have the confidence to design various concrete structures and structural elements by limit state design and detail the same for ductility as per codal requirements.

REFERENCES:

ST8103 THEORY OF ELASTICITY AND PLASTICITY  L T P C 3 0 0 3

OBJECTIVE:
- To understand the concept of 3D stress, strain analysis and its applications to simple problems.

UNIT I ELASTICITY 9

UNIT II ELASTICITY SOLUTION 9
Plane stress and plane strain - Simple two dimensional problems in Cartesian and polar co-ordinates.

UNIT III TORSION OF NON-CIRCULAR SECTION 9
St.venant’s approach - Prandtl's approach – Membrane analogy - Torsion of thin walled open and closed sections.

UNIT IV BEAMS ON ELASTIC FOUNDATIONS 9

UNIT V PLASTICITY 9

TOTAL: 45 PERIODS
OUTCOMES:
- On completion of this course the students will be familiar to the concept of elastic analysis of plane stress and plane strain problems, beams on elastic foundation and torsion on non-circular section.
- They also have sufficient knowledge in various theories of failure and plasticity.

REFERENCES:

MA8165 ADVANCED MATHEMATICAL METHODS L T P C 3 1 0 4

OBJECTIVES:
- To familiarize the students in the field of differential equations to solve boundary value problems associated with engineering applications.
- To expose the students to variational formulation and conformal mapping and their applications to obtain solutions for buckling, dynamic response, heat and flow problems of one and two dimensional conditions.

UNIT I LAPLACE TRANSFORM TECHNIQUES FOR PARTIAL DIFFERENTIAL EQUATIONS 9+3
Laplace transform, Definitions, properties – Transform error function, Bessel's function, Dirac Delta function, Unit Step functions – Convolution theorem – Inverse Laplace Transform: Complex inversion formula – Solutions to partial differential equations: Heat equation, Wave equation.

UNIT II FOURIER TRANSFORM TECHNIQUES FOR PARTIAL DIFFERENTIAL EQUATIONS 9+3

UNIT III CALCULUS OF VARIATIONS 9+3
Concept of variation and its properties – Euler’s equation – Functional dependant on first and higher order derivatives – Functionals dependant on functions of several independent variables – Variational problems with moving boundaries – Problems with constraints – Direct methods – Ritz and Kantorovich methods.

UNIT IV CONFORMAL MAPPING AND APPLICATIONS 9+3

UNIT V TENSOR ANALYSIS 9+3
Summation convention – Contravariant and covariaint vectors – Contraction of tensors – Innerproduct – Quotient law – Metric tensor – Chirstoffel symbols – Covariant differentiation – Gradient, divergence and curl.

TOTAL (L: 45 +T: 15): 60 PERIODS
OUTCOME:
- On completion of the course the students will enable to solve boundary value problems using Laplace and Fourier transform techniques. They will also solve Fluid flow and heat flow problems using conformal mapping.

REFERENCES:

ST8201 EARTHQUAKE ANALYSIS AND DESIGN OF STRUCTURES L T P C
3 0 0 3

OBJECTIVE:
- To study the effect of earthquakes, analysis and design of earthquake resistant Structures.

UNIT I EARTHQUAKES AND GROUND MOTION
Engineering Seismology (Definitions, Introduction to Seismic hazard, Earthquake Phenomenon), Seismotectonics and Seismic Zoning of India, Earthquake Monitoring and Seismic Instrumentation, Characteristics of Strong Earthquake Motion, Estimation of Earthquake Parameters, Microzonation.

UNIT II EFFECTS OF EARTHQUAKE ON STRUCTURES
Dynamics of Structures (SDOFs/ MDOFS), Response Spectra - Evaluation of Earthquake Forces as per codal provisions - Effect of Earthquake on Different Types of Structures - Lessons Learnt From Past Earthquakes

UNIT III EARTHQUAKE RESISTANT DESIGN OF MASONRY STRUCTURES

UNIT IV EARTHQUAKE RESISTANT DESIGN OF RC STRUCTURES

UNIT V VIBRATION CONTROL TECHNIQUES
Vibration Control - Tuned Mass Dampers – Principles and application, Basic Concept of Seismic Base Isolation – various Systems- Case Studies, Important structures.

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of this course the students will be able to understand the causes and effect of earthquake.
- They will able to design masonry and RC structures to the earthquake forces as per the recommendations of IS codes of practice.

REFERENCES:
ST8202 EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION  

OBJECTIVE:
- To learn the principles of measurements of static and dynamic response of structures and carryout the analysis of results.

UNIT I FORCES AND STRAIN MEASUREMENT  

UNIT II MEASUREMENT OF VIBRATION AND WIND FLOW  

UNIT III DISTRESS MEASUREMENTS AND CONTROL  

UNIT IV NON DESTRUCTIVE TESTING METHODS  

OUTCOMES:
- At the end of this course students will know about measurement of strain, vibrations and wind blow.
- They will be able to analyze the structure by non-destructive testing methods and model analysis.

REFERENCES:
ST8203  FINITE ELEMENT ANALYSIS  L T P C  3 0 0 3

OBJECTIVE:
- To study the basics of the Finite Element Technique, a numerical tool for the solution of different classes of problems.

UNIT I  INTRODUCTION

UNIT II  APPLICATION : AXIAL DEFORMATION OF BARS, AXIAL SPRING ELEMENT

UNIT III  ANALYSIS OF FRAMED STRUCTURES

UNIT IV  PLATES AND SHELLS
Introduction to Plate Bending Problems - Finite Element Analysis of Thin Plate - Finite Element Analysis of Thick Plate - Finite Element Analysis of Skew Plate - Introduction to Finite Strip Method - Finite Element Analysis of Shell.

UNIT V  APPLICATIONS

OUTCOME:
- On completion of this course, the students will know the concept of finite analysis and enable to analyze framed structure, Plate and Shells and modify using recent softwares.

REFERENCES:

ST8204  STEEL STRUCTURES  L T P C  3 0 0 3

OBJECTIVE:
- To study the behaviour of members and connections, analysis and design of Industrial buildings and roofs, chimneys. Study the design of with cold formed steel and plastic analysis of structures.
UNIT I          GENERAL
Design of members subjected to combined forces – Design of Purlins, Louver rails, Gable column and Gable wind girder – Design of simple bases, Gusseted bases and Moment Resisting Base Plates.

UNIT II         DESIGN OF CONNECTIONS

UNIT III        ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS
Analysis and design of different types of Live pan, Pratt and north light trusses roofs – Analysis and design of industrial buildings – Sway and non sway frames – Aseismic design of steel buildings.

UNIT IV         PLASTIC ANALYSIS OF STRUCTURES

UNIT V          DESIGN OF LIGHT GAUGE STEEL STRUCTURES

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of this course students will be in a position to design bolted and welded connections in industrial structures.
- They also know the plastic analysis and design of light gauge steel structures.

REFERENCES:

ST8211        ADVANCED STRUCTURAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS
1. Fabrication, casting and testing of simply supported reinforced concrete beam for strength and deflection behaviour.
2. Testing of simply supported steel beam for strength and deflection behaviour.
3. Fabrication, casting and testing of reinforced concrete column subjected to concentric and eccentric loading.
4. Dynamic testing of cantilever steel beam
   a. To determine the damping coefficients from free vibrations.
   b. To evaluate the mode shapes.
5. Static cyclic testing of single bay two storied steel frames and evaluate
   a. Drift of the frame.
   b. Stiffness of the frame.
   c. Energy dissipation capacity of the frame.
6. Determination of in-situ strength and quality of concrete using
   i) rebound hammer and ii) Ultrasonic Pulse Velocity Tester.

TOTAL: 60 PERIODS
LABORATORY EQUIPMENTS REQUIREMENTS
1. Strong Floor
2. Loading Frame
3. Hydraulic Jack
4. Load Cell
5. Proving Ring
6. Demec Gauge
7. Electrical Strain Gauge with indicator
8. Rebound hammer
9. Ultrasonic Pulse Velocity Tester
10. Dial Gauges
11. Clinometer
12. Vibration Exciter
13. Vibration Meter
14. FFT Analyser

OUTCOMES:
- On completion of this laboratory course students will be able to cast and test RC beams for strength and deformation behaviour.
- They will be able to test dynamic testing on steel beams, static cyclic load testing of RC frames and non-destruction testing on concrete.

REFERENCES:

ST8311 PRACTICAL TRAINING  L T P C  0 0 0 1

OBJECTIVES:
- To train the students in the field work so as to have a firsthand knowledge of practical problems related to Structural Engineering in carrying out engineering tasks.
- To develop skills in facing and solving the field problems.

SYLLABUS:
The students individually undertake training in reputed Structural Engineering Companies during the summer vacation for a specified period of four weeks. At the end of training, a detailed report on the work done should be submitted within ten days from the commencement of the semester. The students will be evaluated through a viva-voce examination by a team of internal staff.

OUTCOME:
- They are trained in tackling a practical field/industry orientated problem related to Structural Engineering.

ST8312 PROJECT WORK PHASE I  L T P C  0 0 1 2 6

OBJECTIVES:
- To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To develop the methodology to solve the identified problem.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

SYLLABUS:
The student individually works on a specific topic approved by faculty member who is familiar in this area of interest. The student can select any topic which is relevant to his/her specialization of the programme. The topic may be experimental or analytical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition.
of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

TOTAL: 180 PERIODS

OUTCOME:
- At the end of the course the students will have a clear idea of his/her area of work and they are in a position to carry out the remaining phase II work in a systematic way.

ST8313 SEMINAR

OBJECTIVES:
- To work on a specific technical topic in Structural Engineering and acquire the skills of written and oral presentation.
- To acquire writing abilities for seminars and conferences.

SYLLABUS:
The students will work for two hours per week guided by a group of staff members. They will be asked to give a presentation on any topic of their choice related to Structural Engineering and to engage in discussion with the audience. A brief copy of their presentation also should be submitted. Similarly, the students will have to present a seminar of not less than fifteen minutes and not more than thirty minutes on the technical topic. They will defend their presentation. Evaluation will be based on the technical presentation and the report and also on the interaction shown during the seminar.

TOTAL: 30 PERIODS

OUTCOME:
- The students will be trained to face an audience and to tackle any problem during group discussion in the Interviews.

ST8411 PROJECT WORK PHASE II

OBJECTIVES:
- To solve the identified problem based on the formulated methodology.
- To develop skills to analyze and discuss the test results, and make conclusions.

SYLLABUS:
The student should continue the phase I work on the selected topic as per the formulated methodology. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners including one external examiner.

TOTAL: 360 PERIODS

OUTCOME:
- On completion of the project work students will be in a position to take up any challenging practical problem and find better solutions.

ST8001 ANALYSIS AND DESIGN OF TALL BUILDINGS

OBJECTIVE:
- To study the behaviour, analysis and design of tall structures.
UNITI  LOADING AND DESIGN PRINCIPLES  9
Loading- sequential loading, Gravity loading, Wind loading, Earthquake loading, - Equivalent lateral force, modal analysis - combination of loading, – Static and Dynamic approach - Analytical and wind tunnel experimental methods - Design philosophy - working stress method, limit state method and plastic design.

UNIT II  BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS  9
Factors affecting growth, height and structural form. High rise behaviour, Rigid frames, braced frames, In filled frames, shear walls, coupled shear walls, wall-frames, tubulars, cores, outrigger - braced and hybrid mega systems.

UNIT III  ANALYSIS AND DESIGN  9
Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist - Computerized three dimensional analysis – Assumptions in 3D analysis – Simplified 2D analysis.

UNIT IV  STRUCTURAL ELEMENTS  9
Sectional shapes, properties and resisting capacity, design, deflection, cracking, prestressing, shear flow, Design for differential movement, creep and shrinkage effects, temperature effects and fire resistance.

UNIT V  STABILITY OF TALL BUILDINGS  9
Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

TOTAL: 45 PERIODS
OUTCOMES:
- On completion of this course students will be able to know the behavior of tall buildings due to various types of loads.
- They will be able to analyze and design such buildings by approximate, accurate and simplified methods.

REFERENCES:

ST8002  DESIGN OF BRIDGES  L T P C  3 0 0 3
OBJECTIVE:
- To study the loads, forces on bridges and design of several types of bridges.

UNIT I  SHORT SPAN RC BRIDGES  9
Types of bridges and loading standards - Choice of type - I.R.C. specifications for road bridges – Design of RCC solid slab bridges -analysis and design of slab culverts , Tee beam and slab bridges.
UNIT II  LONG SPAN RC BRIDGES  9
Design principles of continuous girder bridges, box girder bridges, balanced cantilever bridges – Arch bridges – Box culverts.

UNIT III  PRESTRESSED CONCRETE BRIDGES  9

UNIT IV  STEEL BRIDGES  9

UNIT V  BEARINGS AND SUBSTRUCTURES  9

TOTAL: 45 PERIODS

OUTCOME:
• At the end of this course students will be able to design different types of RCC bridges, Steel bridges and pre-stressed concrete bridges with the bearings and substructures.

REFERENCES:

ST8003  DESIGN OF SHELL AND SPATIAL STRUCTURES  L T P C
2 0 2 3

OBJECTIVE:
• Study the behaviour and design of shells, folded plates, space frames and application of FORMIAN software.

UNIT I  CLASSIFICATION OF SHELLS  6+6

UNIT II  FOLDED PLATES  6+6
Folded Plate structures, structural behaviour, types, design by ACI - ASCE Task Committee method – pyramidal roof.

UNIT III  INTRODUCTION TO SPACE FRAME  6+6
Space frames - configuration - types of nodes - general principles of design Philosophy - Behaviour.

UNIT IV  ANALYSIS AND DESIGN  6+6
Analysis of space frames – detailed design of Space frames – Introduction to Computer Aided Design and Software Packages.

UNIT V  SPECIAL METHODS  6+6
Application of Formex Algebra, FORMIAN for generation of configuration.

TOTAL (L:30 + P:30) : 60 PERIODS
OUTCOME:
- On completion of this course students will be able to analyze and design various types of shells, folded plates and space frames manually and also using computer Aided design and software packages.

REFERENCES:

ST8004 DESIGN OF STEEL CONCRETE COMPOSITE STRUCTURES L T P C 3 0 0 3

OBJECTIVE:
- To develop an understanding of the behaviour and design study of Steel concrete composite elements and structures.

UNIT I INTRODUCTION 9

UNIT II DESIGN OF CONNECTIONS 9
Shear connectors – Types – Design of connections in composite structures – Degree of shear connection – Partial shear interaction

UNIT III DESIGN OF COMPOSITE MEMBERS 9
Design of composite beams, slabs, columns, beam – columns - design of composite trusses.

UNIT IV COMPOSITE BOX GIRDER BRIDGES 9
Introduction - behaviour of box girder bridges - design concepts.

UNIT V CASE STUDIES 9
Case studies on steel-concrete composite construction in buildings - seismic behaviour of composite structures.

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of this course students will be in a position to design composite beams, columns, trusses and box-girder bridges including the related connections.
- They will get exposure on case studies related to steel-concrete constructions of buildings.

REFERENCES:
OBJECTIVES:
- To gain familiarity with different types of foundation.
- To explore the students to the design of shallow foundations and deep foundations.
- To understand the concept of designing well, machine and special foundations.

UNIT I   SHALLOW FOUNDATIONS  

UNIT II  PILE FOUNDATIONS  

UNIT III  WELL FOUNDATIONS  

UNIT IV  MACHINE FOUNDATIONS  

UNIT V  SPECIAL FOUNDATIONS  

OUTCOMES:
- On completion of this course students will enable to select appropriate foundations type based on available soil conditions.
- They will be a position to determine the load carrying capacity of each type of foundation.
- They will be through knowledge about the design of reinforced concrete shallow foundations, pile foundations, well foundations, and machine foundations.

REFERENCES:
UNIT II  INDUSTRIAL BUILDINGS  9
Steel and RCC - Gantry Girder, Crane Girders - Design of Corbels and Nibs – Design of Staircase.

UNIT III  POWER PLANT STRUCTURES  9
Types of power plants – Containment structures - Cooling Towers - Bunkers and Silos - Pipe supporting structures

UNIT IV  TRANSMISSION LINE STRUCTURES AND CHIMNEYS  9
Analysis and design of transmission line towers - Saj and Tension calculations, Testing of towers – Design of self supporting chimney, Design of Chimney bases.

UNIT V  FOUNDATION  9

TOTAL: 45 PERIODS

OUTCOMES:
• On completion of this course student will be able to plan industrial structures for functional requirements.
• They will be able to design various structures such as Bunkers, Silos, Cooling Towers, Chimneys, and Transmission Towers with required foundations.

REFERENCES:

ST8007  MAINTENANCE AND REHABILITATION OF STRUCTURES  L T P C
3 0 0 3

OBJECTIVE:
• To study the damages, repair and rehabilitation of structures.

UNIT I  INTRODUCTION  9

UNIT II  BUILDING CRACKS  9

UNIT III  MOISTURE PENETRATION  9

UNIT IV  DISTRESSES AND REMEDIES  9
Masonry Structures: Discoloration and weakening of stones – Biotical treatments – Preservation – Chemical preservatives – Brick masonry structures – Distresses and remedial measures.

UNIT V STRENGTHENING OF EXISTING STRUCTURES


TOTAL: 45 PERIODS

OUTCOME:
- At the end of this course students will be in a position to point out the causes of distress in concrete, masonry and steel structures and also they will be able to suggest the remedial measures.

REFERENCES:

ST8008 MECHANICS OF COMPOSITE MATERIALS

OBJECTIVE:
- To study the behaviour of composite materials and to investigate the failure and fracture characteristics.

UNIT I INTRODUCTION
Introduction to Composites, Classifying composite materials, commonly used fiber and matrix constituents, Composite Construction, Properties of Unidirectional Long Fiber Composites and Short Fiber Composites.

UNIT II STRESS STRAIN RELATIONS
Concepts in solid mechanics, Hooke’s law for orthotropic and anisotropic materials, Linear Elasticity for Anisotropic Materials, Rotations of Stresses, Strains, Residual Stresses

UNIT III ANALYSIS OF LAMINATED COMPOSITES

UNIT IV FAILURE AND FRACTURE OF COMPOSITES
Netting Analysis, Failure Criterion, Maximum Stress, Maximum Strain, Fracture Mechanics of Composites, Sandwich Construction.

UNIT V APPLICATIONS AND DESIGN
Metal and Ceramic Matrix Composites, Applications of Composites, Composite Joints, Design with Composites, Review, Environmental Issues

TOTAL: 45 PERIODS
OUTCOME:
- On completion of this course students will have sufficient knowledge on behavior of various composite materials and they have an idea of failure and fracture mechanisms.

REFERENCES:

ST8009 NONLINEAR ANALYSIS OF STRUCTURES

OBJECTIVE:
- To study the concept of nonlinear behaviour and analysis of elements and simple structures.

UNIT I INTRODUCTION TO NONLINEAR ANALYSIS
Material nonlinearity, geometric nonlinearity; statically determinate and statically indeterminate flexible bars of uniform and variable thickness.

UNIT II INELASTIC ANALYSIS OF FLEXURAL MEMBERS
Inelastic analysis of uniform and variable thickness members subjected to small deformations; inelastic analysis of flexible bars of uniform and variable stiffness members with and without axial restraints.

UNIT III VIBRATION THEORY AND ANALYSIS OF FLEXURAL MEMBERS
Vibration theory and analysis of flexible members; hysteretic models and analysis of uniform and variable stiffness members under cyclic loading.

UNIT IV ELASTIC AND INELASTIC ANALYSIS OF PLATES
Elastic and inelastic analysis of uniform and variable thickness plates.

UNIT V NONLINEAR VIBRATION AND INSTABILITY
Nonlinear vibration and Instabilities of elastically supported beams.

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of this course student will have enough knowledge on inelastic and vibration analysis of Flexural members.
- Also they will know the difference between elastic and inelastic analysis of plates and Instabilities of elastically supported beams.

REFERENCES:
ST8010 OFFSHORE STRUCTURES

OBJECTIVE:
- To study the concept of wave theories, forces and design of jacket towers, pipes and cables.

UNIT I WAVE THEORIES 9
Wave generation process, small, finite amplitude and nonlinear wave theories.

UNIT II FORCES OF OFFSHORE STRUCTURES 9
Wind forces, wave forces on small bodies and large bodies - current forces and use of Morison equation.

UNIT III OFFSHORE SOIL AND STRUCTURE MODELLING 9
Different types of offshore structures, foundation modeling, fixed jacket platform structural modeling.

UNIT IV ANALYSIS OF OFFSHORE STRUCTURES 9
Static method of analysis, foundation analysis and dynamics of offshore structures.

UNIT V DESIGN OF OFFSHORE STRUCTURES 9
Design of platforms, helipads, Jacket tower, analysis and design of mooring cables and pipe lines.

TOTAL: 45 PERIODS

OUTCOME:
- On completion of this course students will be able to determine the forces due to ocean waves and analyze and design offshore structures like platform, helipads, jackets, towers etc.,

REFERENCES:

ST8011 OPTIMIZATION OF STRUCTURES

OBJECTIVE:
- To study the optimization methodologies applied to structural engineering

UNIT I BASIC PRINCIPLES AND CLASSICAL OPTIMIZATION TECHNIQUES 9
UNIT II LINEAR AND NON-LINEAR PROGRAMMING 9


UNIT III GEOMETRIC PROGRAMMING 9
Posynomial - degree of difficulty - reducing G.P.P to a set of simultaneous equations - Unconstrained and constrained problems with zero difficulty - Concept of solving problems with one degree of difficulty.

UNIT IV DYNAMIC PROGRAMMING 9
Bellman’s principle of optimality - Representation of a multistage decision problem - concept of sub-optimization problems using classical and tabular methods.

UNIT V STRUCTURAL APPLICATIONS 9
Methods for optimal design of structural elements, continuous beams and single storied frames using plastic theory - Minimum weight design for truss members - Fully stressed design - Optimization principles to design of R.C. structures such as multistorey buildings, water tanks and bridges.

TOTAL: 45 PERIODS

OUTCOME:
• On completion of this course students will have sufficient knowledge on various optimization techniques like linear programming, non-linear programming, geometric and dynamic programming and they will also in a position to design various structural elements for minimum weight.

REFERENCES:

ST8012 PRE-STRESSED CONCRETE 3 0 0 3

OBJECTIVE:
• Principle of prestressing, analysis and design of prestressed concrete structures.

UNIT I PRINCIPLES OF PRESTRESSING 9
Basic concepts of Prestressing - Types and systems of prestressing - Need for High Strength materials, Analysis methods, losses of prestress – Short and Long term deflections – Cable layouts.

UNIT II DESIGN OF FLEXURAL MEMBERS 9
Behaviour of flexural members, determination of ultimate flexural strength – Various Codal provisions - Design of flexural members, Design for shear, bond and torsion. Transfer of prestress. Block design and cantilever beams.
UNIT III DESIGN OF CONTINUOUS AND CANTILEVER BEAMS 9
Analysis and design of continuous beams - Methods of achieving continuity - concept of linear transformations, concordant cable profile and gap cables – Analysis and design of cantilever beams.

UNIT IV DESIGN OF TENSION AND COMPRESSION MEMBERS 9
Design of tension members - application in the design of prestressed pipes and prestressed concrete cylindrical water tanks - Design of compression members with and without flexure - its application in the design piles, flag masts and similar structures.

UNIT V DESIGN OF COMPOSITE MEMBERS 9
Composite beams - analysis and design, ultimate strength - their applications. Partial prestressing - its advantages and applications.

TOTAL: 45 PERIODS

OUTCOMES:
- On completion of this course students will have sufficient knowledge on various methods of prestressing and the concepts of partial pre-stressing.
- They will be in a position to design beams, pipes, water tanks, posts and similar structures.

REFERENCES:

ST8013 PREFABRICATED STRUCTURES LT P C 3 0 0 3

OBJECTIVE:
- To Study the design principles, analysis and design of elements.

UNIT I DESIGN PRINCIPLES 9
General Civil Engineering requirements, specific requirements for planning and layout of prefabrication plant. IS Code specifications. Modular co-ordination, standardization, Disuniting of Prefabricates, production, transportation, erection, stages of loading and code provisions, safety factors, material properties, Deflection control, Lateral load resistance, Location and types of shear walls.

UNIT II REINFORCED CONCRETE 9
Prefabricated structures - Long wall and cross-wall large panel buildings, one way and two way prefabricated slabs, Framed buildings with partial and curtain walls, -Connections – Beam to column and column to column.

UNIT III FLOORS, STAIRS AND ROOFS 9
Types of floor slabs, analysis and design example of cored and panel types and two-way systems, staircase slab design, types of roof slabs and insulation requirements, Description of joints, their behaviour and reinforcement requirements, Deflection control for short term and long term loads, Ultimate strength calculations in shear and flexure.

UNIT IV WALLS 9
Types of wall panels, Blocks and large panels, Curtain, Partition and load bearing walls, load transfer from floor to wall panels, vertical loads, Eccentricity and stability of wall panels, Design Curves, types of wall joints, their behaviour and design, Leak prevention, joint sealants, sandwich wall panels, approximate design of shear walls.
UNIT V  INDUSTRIAL BUILDINGS AND SHELL ROOFS  
Components of single-storey industrial sheds with crane gantry systems, R.C. Roof Trusses, Roof Panels, corbels and columns, wind bracing design. Cylindrical, Folded plate and hyper-prefabricated shells, Erection and jointing, joint design, hand book based design.  

TOTAL: 45 PERIODS  

OUTCOMES:  
• At the end of this course student will have good knowledge about the prefabricated elements and the technologies used in fabrication and erection.  
• They will be in a position to design floors, stairs, roofs, walls and industrial buildings, and various joints for the connections.  

REFERENCES:  

ST8014  STABILITY OF STRUCTURES  

OBJECTIVE:  
• To study the concept of buckling and analysis of structural elements.  

UNIT I  BUCKLING OF COLUMNS  

UNIT II  BUCKLING OF BEAM-COLUMNS AND FRAMES  
Theory of beam column - Stability analysis of beam column with single and several concentrated loads, distributed load and end couples Analysis of rigid jointed frames with and without sway – Use of stability function to determine the critical load.  

UNIT III  TORSIONAL AND LATERAL BUCKLING  

UNIT IV  BUCKLING OF PLATES  
Governing differential equation - Buckling of thin plates, various edge conditions -Analysis by equilibrium and energy approach – Finite difference method.  

UNIT V  INELASTIC BUCKLING  
Double modulus theory - Tangent modulus theory - Shanley’s model - Eccentrically loaded inelastic column. Inelastic buckling of plates - Post buckling behaviour of plates.  

TOTAL: 45 PERIODS  

ST8014  STABILITY OF STRUCTURES  

OBJECTIVE:  
• To study the concept of buckling and analysis of structural elements.  

UNIT I  BUCKLING OF COLUMNS  

UNIT II  BUCKLING OF BEAM-COLUMNS AND FRAMES  
Theory of beam column - Stability analysis of beam column with single and several concentrated loads, distributed load and end couples Analysis of rigid jointed frames with and without sway – Use of stability function to determine the critical load.  

UNIT III  TORSIONAL AND LATERAL BUCKLING  

UNIT IV  BUCKLING OF PLATES  
Governing differential equation - Buckling of thin plates, various edge conditions -Analysis by equilibrium and energy approach – Finite difference method.  

UNIT V  INELASTIC BUCKLING  
Double modulus theory - Tangent modulus theory - Shanley’s model - Eccentrically loaded inelastic column. Inelastic buckling of plates - Post buckling behaviour of plates.  

TOTAL: 45 PERIODS
OUTCOME:
- On completion of this course student will know the phenomenon of buckling and they are in a position to calculate the buckling load on column, beam – column, frames and plates using classical and approximate methods.

REFERENCES:

ST8015 THEORY OF PLATES LT P C 3 0 0 3

OBJECTIVE:
- To study the behaviour and analysis of thin plates and the behaviour of anisotropic and thick plates.

UNIT I INTRODUCTION TO PLATES THEORY 9
Thin Plates with small deflection. Laterally loaded thin plates, governing differential equation, various boundary conditions.

UNIT II RECTANGULAR PLATES 9
Rectangular plates. Simply supported rectangular plates, Navier solution and Levy’s method, Rectangular plates with various edge conditions, plates on elastic foundation.

UNIT III CIRCULAR PLATES 9
Symmetrical bending of circular plates.

UNIT IV SPECIAL AND APPROXIMATE METHODS. 9
Energy methods, Finite difference and Finite element methods.

UNIT V ANISOTROPIC PLATES AND THICK PLATES 9
Orthotropic plates and grids, moderately thick plates.

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of this course students will be able to analyze different types of plates (rectangular and circular) under different boundary connections by various classical methods and approximate methods.
- They will also know behavior of orthotropic and thick plates and grids.

REFERENCES:
OBJECTIVE:
- To study the concept of wind and cyclone effects for the analysis and design of structures.

UNIT I  INTRODUCTION

UNIT II  WIND TUNNEL STUDIES
Wind Tunnel Studies, Types of tunnels, - Prediction of acceleration – Load combination factors – Wind tunnel data analysis – Calculation of Period and damping value for wind design - Modeling requirements, Aero dynamic and Aero-elastic models.

UNIT III  EFFECT OF WIND ON STRUCTURES
Classification of structures – Rigid and Flexible – Effect of wind on structures - Static and dynamic effects on Tall buildings – Chimneys.

UNIT IV  DESIGN OF SPECIAL STRUCTURES
Design of Structures for wind loading – as per IS, ASCE and NBC code provisions – design of Tall Buildings – Chimneys – Transmission towers – Industrial sheds

UNIT V  CYCLONE EFFECTS

TOTAL: 45 PERIODS

OUTCOMES:
- On completion of this course, students will be able to design high rise structures subjected to wind load, even structures exposed to cyclone.
- Students will be conversant with various code provisions for the design of structures for wind load.

REFERENCES:

OBJECTIVE :
- To study the properties of concrete making materials, tests, mix design, special concretes and various methods for making concrete.

UNIT I  CONCRETE MAKING MATERIALS
UNIT II TESTS ON CONCRETE

UNIT III MIX DESIGN

UNIT IV SPECIAL CONCRETE

UNIT V CONCRETING METHODS

TOTAL: 45 PERIODS

OUTCOME:
• On completion of this course the students will know various tests on fresh, hardened concrete, special concrete and the methods of manufacturing of concrete.

REFERENCES: