### Scheme of Teaching & Examination

**M.E. (Civil) with Specialization in Structural Engg.**

#### III SEMESTER

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Board of Study</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Periods per Week</th>
<th>Scheme of Examination</th>
<th>Total Marks</th>
<th>Credit</th>
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<td>Civil Engg.</td>
<td>550311 (20)</td>
<td>Structural Dynamics</td>
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<td>Elective III</td>
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<td>100 20 20 20</td>
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<td>3</td>
<td>Civil Engg.</td>
<td>550321 (20)</td>
<td>Preliminary work on Dissertation</td>
<td>- - 28</td>
<td>100 - 100</td>
<td>200</td>
<td>14</td>
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<td>4</td>
<td>Civil Engg.</td>
<td>550322 (20)</td>
<td>Seminar Based on Dissertation</td>
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<td><strong>6 2 31 300 40 160 500 24</strong></td>
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L- Lecture  
T- Tutorial  
P- Practical  
ESE- End Semester Exam  
CT- Class Test  
TA- Teacher’s Assessment

#### Table III

**ELECTIVE III**

<table>
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<tr>
<th>S.No.</th>
<th>Board of Study</th>
<th>Subject Code</th>
<th>Subject</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Civil Engg.</td>
<td>550331 (20)</td>
<td>Optimization Techniques</td>
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<tr>
<td>2</td>
<td>Civil Engg.</td>
<td>550332 (20)</td>
<td>Theory of Plates and Shells</td>
</tr>
<tr>
<td>3</td>
<td>Civil Engg.</td>
<td>550333 (20)</td>
<td>Pre-Stressed Concrete</td>
</tr>
</tbody>
</table>

**Note (1)** - 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a particular academic session.

**Note (2)** - Choice of elective course once made for an examination cannot be changed in future examinations.
UNIT I: BASIC CONCEPTS
Types and sources of dynamic loads, Methodology for dynamic analysis, Study of IS-1893, fundamentals of rigid and deformable dynamics.

UNIT II: SINGLE DEGREE OF FREEDOM SYSTEMS
Free and forced response, effect of damping, Analysis of undamped and viscously damped single degree of freedom. Response of single degree freedom systems to Harmonic loading, support motions and Transmissibility, Duhamel’s integral.

UNIT III: MULTI-DEGREE OF FREEDOM SYSTEMS
Free vibrations of lumped mass multi degree freedom systems, analysis of undamped and viscously damped multi degree of freedom. Rayleigh’s method, Orthogonality criteria.

UNIT IV: IDEALIZATION OF STRUCTURES
Mathematical models, Mode superposition methods, Distributed mass properties.

UNIT V: APPLICATION TO EARTHQUAKE ENGINEERING
Introduction to vibrations due to earthquake, Response spectra. Response spectrum method for seismic design of structures.

Text books:

Reference Books:
CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: M.E. III Branch: Civil Engineering
Subject: **Optimization Techniques** Code: 550331 (20)
Total Theory Periods: 40 Total Tutorial Periods: 12
Total Marks in End Semester Exam: **100**
Minimum number of class tests to be conducted: **02**

**UNIT I: OPTIMIZATION TECHNIQUES**
Basic Concepts and introduction of engineering optimization, single-variable optimization, Multivariable optimization with no constraints, equality constraints and inequality constraints.

**UNIT II: LINEAR PROGRAMMING**
Basic concepts of Linear programming, Applications of Linear Programming, standard forms of a Linear programming problems, solution of a system of linear simultaneous equations, Decomposition principle, Quadratic programming.

**UNIT III: NON LINEAR PROGRAMMING**
Basic concepts of Non-linear programming, Uni-modal function, Elimination methods, Interpolation methods, classification of unconstrained minimization methods- Direct search methods, Indirect search methods, characteristics of a constrained problem-Direct methods, Indirect methods.

**UNIT IV: GEOMETRIC PROGRAMMING**
Unconstrained minimization problem, constrained minimization, Applications of Geometric programming.

**UNIT V: SPECIAL OPTIMIZATION TECHNIQUES**
Separable programming, transformation of a non-linear function to separable form, multi objective optimization, calculus of variations, optimal control theory.

**Text Books:**
2. Deb K., Optimization for Engineering Design, Algorithms & examples, Prentice Hall of India, Delhi

**Reference Books:**
1. Arora J.S., Introduction to optimum Design, TMH, Delhi
UNIT I: BASIC CONCEPTS

UNIT II: ANALYSIS OF PLATES

UNIT III: FOLDED PLATES
Analysis and design of folded plates, Detailing of Reinforcement in folded plates.

UNIT IV: ANALYSIS OF SHELLS
Geometry of shells, Classification of Shells, membrane theory of circular and cylindrical shells, Introduction to the bending theory of shells.

UNIT V: CYLINDRICAL SHELLS
Analysis and design of cylindrical shells, Detailing of Reinforcement in shells.

Text Books:

Reference Books:
UNIT I: INTRODUCTION AND CODAL PROVISIONS
Principles of Prestressing, types and systems of prestressing, need for High Strength materials, Analysis methods losses, deflection (short-long term), camber, cable layouts. Behaviour under flexure,- codal provisions (IS, British ACI and DIN), ultimate strength.

UNIT II: DESIGN PRINCIPLES
Design of flexural members, Design for Shear, bond and torsion. Design of End blocks and their importance, Design of tension members, application in the design of prestressed pipes and prestressed concrete cylindrical water tanks.

UNIT III: DESIGN OF COMPRESSION MEMBERS
Design of compression members with and without flexure, its application in the design piles, flag masts and similar structures.

UNIT IV: CONTINUOUS BEAMS
Application of prestressing in continuous beams, concept of linear transformation, concordant cable profile and cap cables.

UNIT V: COMPOSITE BEAMS
Composite beams, analysis and design, ultimate strength, their applications. Partial prestressing, its advantages and applications.

Text Books:

Reference Books:
1. T.Y.Lin, Design of Prestressed Concrete Structures, John Wiley and Sons, Inc.
2. Evans, R.H. and Bennett, E.W., Prestressed Concrete, Champman and Hall, London.