ACADEMIC REGULATIONS
COURSE STRUCTURE AND
DETAILED SYLLABUS

CIVIL ENGINEERING

For

M. Tech. (Structural Engineering)
(Two Year Full Time Programme)

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(Autonomous)
Kukatpally, Hyderabad – 500 085, Telangana, India.
2015
# JNTUH COLLEGE OF ENGINEERING HYDERABAD
## M.Tech. (Structural Engineering) – Full Time w.e.f. 2015-16

## I – SEMESTER

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Theory of Elasticity</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Structural Dynamics</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Elective – 1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Elective – 2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Elective – 3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Elective – 4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Advanced Concrete Laboratory</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Soft Skills Lab</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

## II – SEMESTER

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Finite Element Methods</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Analysis of Plates &amp; Shells</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Elective – 5</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Elective – 6</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Elective – 7</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Elective – 8</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>CAD Laboratory</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Seminar</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

## III – SEMESTER

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Comprehensive Viva Voce</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Project Phase – I</td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

## IV – SEMESTER

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project Phase – II &amp; Dissertation</td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.TECH (STRUCTURAL ENGINEERING) – FULL TIME W.E.F. 2015-16

Elective – 1
1. Advanced Reinforced Concrete Design
2. Soil Dynamics and Machine Foundations

Elective – 2
1. Advanced Concrete Technology
2. Fracture Mechanics of Concrete Structures

Elective – 3
1. Experimental Stress Analysis
2. Advanced Structural Analysis

Elective – 4
1. Computer Oriented Numerical Methods
2. Optimization Techniques in Structural Engineering

Elective – 5
1. Composite Materials
2. Principles of Bridge Engineering

Elective – 6
1. Rehabilitation and Retrofitting of Structures
2. Earthquake Resistant Design of Buildings

Elective – 7
1. Advanced Steel Design
2. Plastic Analysis and Design
3. Design of Industrial Structures

Elective – 8
1. Design of Prestressed Concrete Structures
2. Stability of Structures
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Structural Engineering)  
L  T  P  C  
4  0  0  4

THEORY OF ELASTICITY

Prerequisites: Strength of Materials I & II

Objectives:
To impart knowledge on the basic concepts of theory of elasticity, and solve the Structural Engineering problems.

Course outcomes:
The learner will be able to solve problems of elasticity and plasticity and be able to apply numerical methods to solve continuum problems.

UNIT-I

UNIT II
Two dimensional problems in rectangular coordinates - solution by polynomials - Saint-Venants principle - determination of displacements - bending of simple beams – Simple Supported and Cantilever Beam.

UNIT III

UNIT IV

UNIT V
Torsion of Circular Shafts - Torsion of Straight Prismatic Bars – Saint Venants Method - torsion of prismatic bars - bars with elliptical cross sections - membrane analogy - torsion of a bar of narrow rectangular bars - solution of torsional problems by energy method - torsion of shafts, tubes, bars etc.Torsion of Rolled Profile Sections.

References
1. Theory of Elasticity by Timeshenko, McGrawhill Publications.
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Structural Engineering) L T P C

4 0 0 4

STRUCTURAL DYNAMICS

Prerequisites: Structural Analysis I & II

Objectives:
To impart knowledge on the fundamental of structural dynamics and their applications.

Outcomes: The learner will be able to understand the equation of motion, dynamics response of single and multi degree-of freedom systems.

UNIT I:

UNIT II


UNIT III

UNIT IV

Continuous Systems: Introduction - Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions - Principles of application to continuous beams.

UNIT V

References:
3. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.
ADVANCED REINFORCED CONCRETE DESIGN
(Elective–1)

**Prerequisites:** Design of Reinforced Concrete Structures

**Objectives:**
To impart knowledge on the behavior and design on various reinforced concrete structural elements.

**Outcome:**
The learner will be able to design the reinforced concrete elements like beams, slabs and compression members.

**UNIT I**

**UNIT II**
**Limit Analysis of R.C.Structures:** Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, applications for fixed and continuous beam. Yield line analysis for slabs: Upper bound and lower bound theorems – yield line criterion – Virtual work and equilibrium methods of analysis – For square and circular slabs with simple and continuous end conditions. Moment Curvature diagram.

**UNIT III**
**Design of Ribbed slabs, Flat slabs:** Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.
**Flat slabs:** Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears-Introduction to Equivalent frame method. Limitations of Direct design method, Distribution of moments in column strips and middle strip.

**UNIT IV**
**Design of Reinforced Concrete Deep Beams & Corbels:** Steps of Designing Deep Beams, Design by IS 456, Checking for Local Failures, Analysis of Forces in a Corbels, Design of Procedure of Corbels, Design of Nibs.

**UNIT V**

**Design of Combined Footings** - Distribution of Soil Pressure - Geometry of Two-column Combined Footing – Design Considerations in Two-Column Footings.
REFERENCE:

SOIL DYNAMICS AND MACHINE FOUNDATIONS  
(Regular – 1)

Prerequisites: Soil Machines, Foundation Engineering and Structural Analysis

OBJECTIVE: To understand the wave propagation in soils, determine dynamic properties of soil for analyzing and designing foundations subjected to vibratory loading.

OUTCOME: Able to understand the fundamentals of wave propagation in soil media, evaluate the dynamic properties of soil, and design foundations for centrifugal and reciprocating machines.


Text Books:
References:

JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Structural Engineering)  
ADVANCED CONCRETE TECHNOLOGY  
(Elective – 2)

Prerequisites: Concrete Technology

Objectives:
To impart knowledge on concrete making materials, concrete mix design for proportioning and their testing.

Outcomes:
The learner will be able to design concrete mixes of different grades and also use the special concretes.

UNIT – I

UNIT – II
Fresh And Hardened Concrete: Fresh Concrete – workability tests on Concrete – Setting Times of Fresh Concrete – Segregation and bleeding.

Hardened Concrete: Abrams Law, Gel space ratios, Maturity concept – Stress strain Behaviour – Creep and Shrinkage – Durability Tests on Concrete – Non Destructive Testing of Concrete. BIS Provisions.

UNIT – III


UNIT – IV
Special Concretes: Self Compacting concrete, Polymer Concrete, Fibre Reinforced Concrete – Reactive Powder Concrete – Requirements and Guidelines – Advantages and Applications.

Concrete Mix Design: Quality Control – Quality Assurance – Quality Audit - Mix Design Method – BIS Method – DOE Method – Light Weight Concrete, Self Compacting Concrete.

UNIT – V

REFERENCES:
3. Concrete Technology by M.S.Shetty, S.Chand & Co 2009.
7. Relevant BIS Codes
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Structural Engineering)                      L   T    P   C
                                                             4    0    0   4

FRACTURE MECHANICS OF CONCRETE STRUCTURES
(Elective – 2)

Prerequisites: Concrete Technology Strength of Materials I & II

Objectives:
To impart knowledge on the mechanisms of failure and non linear fracture mechanics.

Outcomes:
The learner will be able to understand the behavior of concrete with tension and compression failure surfaces and concepts of CTOD and CMD.

UNIT I
Fundamentals of Fracture Mechanics, Mechanisms of fracture and crack growth

UNIT II
Cleavage fracture, ductile fracture, fatigue cracking, Environment assisted cracking, Quasi brittle materials.

UNIT III
Service failure analysis, linear elastic fracture mechanics, Griffith’s criteria, stress intensity factors, crack tip plastic zone, Erwin’s plastic zone correction, R curves, compliance, J Integral, nonlinear analysis ,Review of concrete behaviour in tension and compression, Basic frameworks for modeling of quasibrittle materials.

UNIT IV

UNIT V
Concept of CTOD and CMD, Material models, crack models, band models, models based on continuum damage mechanics

REFERENCES:
Prerequisites: Strength of Materials I & II

Objectives:
To impart knowledge on the strain measurement, brittle coating and photo elasticity.

Outcomes: The learner will be able to understand the properties of strain-gauge systems and the computation techniques.

UNIT I

UNIT II
Strain Measurement using Strain Gauges: Definition of strain and its relation to Experimental Determinations, properties of strain-gauge systems, Types of strain gauges, Mechanical and Optical strain gauges. Electrical Strain Gauges- Introduction, LVDT - resistance strain gauge - various types - gauge factor, Materials for adhesion base, etc.

Strain Rosettes: Introduction, The three element rectangular Rosette - The delta rosette - Corrections for Transverse strain effects.

UNIT III
Brittle Coating Method: Introduction, Coating stresses - Failure theories - Brittle coating Crack pattern - Crack detection - Types of Brittle coating - Test procedures for brittle coating analysis - Calibration procedures - Analysis of brittle coating data.

UNIT IV

UNIT V

REFERENCES:
1. Experimental Stress Analysis by J.W.Dally and W.F.Riley, 2007
2. Experimental Stress Analysis by Dr. Sadhu Singh, Khanna Publishers, New Delhi
3. Experimental Stress Analysis by Dove and Adams 2006, Macmillan Publishing Company
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Structural Engineering)  
ADVANCED STRUCTURAL ANALYSIS  
(Elective – 3)

Prerequisites: Structural Analysis I & II

Objectives:
To impart knowledge on the analysis of indeterminate structures like continuous beams, trusses and portal frames.

Outcome:
The learner will be able to analyse different indeterminate structures using Matrix methods.

UNIT I

Transformation of coordinates - element stiffness matrix - and load vector - local and global coordinates.

UNIT II
Assembly of stiffness matrix from element stiffness matrix - direct stiffness method - general procedure - banded matrix - semi bandwidth - computer algorithm for assembly by direct stiffness matrix method.

UNIT III
Analysis of plane truss - continuous beams with and without settlement - plane frame including side sway grids, by flexibility methods and gables frames by System Approach.

UNIT IV
Analysis of plane truss - continuous beams with and without settlement - plane frame including sides sway, grids and gable frames by stiffness methods.

UNIT V. Special analysis procedures - static condensation and sub structuring - initial and thermal stresses.

Shear walls- Necessity - structural behaviour of large frames with and without shear walls - approximate methods of analysis of shear walls.

REFERENCES
1. Matrix Analysis of Frames structures by William Weaver J.R and James M.Gere, CBS publications.
7. Structural Analysis by Ghali and Neyveli.
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Structural Engineering)  L  T  P  C
4    0    0   4

COMPUTER ORIENTED NUMERICAL METHODS
(Elective – 4)

Prerequisites: Mathematics I & II

Objectives:
To impart knowledge about various methods of analysing linear equations and understand the different mathematical techniques.

Outcome:
The learner will be able to apply various mathematical techniques to Structural engineering problems.

UNIT I:

UNIT II:

UNIT III

UNIT IV.

UNIT V
References:
5. Computer based numerical analysis by Dr. M.Shanta Kumar, Khanna Book publishers New Delhi.
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Structural Engineering)                      L   T    P   C
4    0    0   4

OPTIMIZATION TECHNIQUES IN STRUCTURAL ENGINEERING
(Elective – 4)

Prerequisites: Mathematics I&II

OBJECTIVE:
To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.

OUTCOME:
The student will be able to understand the basic principles of optimization, and in a position to formulate optimization models for a wide range of civil engineering problems and able to solve them.


UNIT V: Application of Optimization techniques to trusses, Beams and Frames.
REFERENCES
3. Elements of Structural Optimization by R.T.Haftka and Z.Gurdal Kluwer academic publishers
ADVANCED CONCRETE LABORATORY

Prerequisites: Concrete Technology Lab

Objectives: To impart knowledge on the test on cement and aggregates.

Outcomes:
The learner will be able to understand the properties of the materials and the behavior of the concrete.

1. Gradation Charts of Aggregates.
2. Bulking of fine Aggregate.
3. Aggregate Crushing and Impact value
4. Workability Tests on Fresh Self Compacting Concrete
6. Air Entrainment Test on Fresh Concrete
7. Rapidly Chloride Permeability Test.
8. Non Destructive Testing of Concrete.
9. Accelerated Curing of Concrete (Demo).
11. Influence of W/C Ratio on Strength and Aggregate / Cement Ratio on Strength & Workability.
12. Influence of Different Chemical Admixtures on Concrete
13. Marsh Cone Test.
SOFT SKILLS LAB
(Activity-based)

Course Objectives

- To improve the fluency of students in English
- To facilitate learning through interaction
- To illustrate the role of skills in real-life situations with case studies, role plays etc.
- To train students in group dynamics, body language and various other activities which boost their confidence levels and help in their overall personality development
- To encourage students develop behavioral skills and personal management skills
- To impart training for empowerment, thereby preparing students to become successful professionals

Learning Outcomes

- Developed critical acumen and creative ability besides making them industry-ready.
- Appropriate use of English language while clearly articulating ideas.
- Developing insights into Language and enrich the professional competence of the students.
- Enable students to meet challenges in job and career advancement.

INTRODUCTION

Definition and Introduction to Soft Skills – Hard Skills vs Soft Skills – Significance of Soft/Life/Self Skills – Self and SWOT Analysis

1. Exercises on Productivity Development
   - Effective/Assertive Communication Skills (Activity based)
   - Time Management (Case Study)
   - Creativity & Critical Thinking (Case Study)
   - Decision Making and Problem Solving (Case Study)
   - Stress Management (Case Study)

2. Exercises on Personality Development Skills
   - Self-esteem (Case Study)
   - Positive Thinking (Case Study)
   - Emotional Intelligence (Case Study)
   - Team building and Leadership Skills (Case Study)
   - Conflict Management (Case Study)

3. Exercises on Presentation Skills
   - Netiquette
   - Importance of Oral Presentation – Defining Purpose- Analyzing the audience- Planning Outline and Preparing the Presentation- Individual & Group Presentation- Graphical Organizers- Tools and Multi-media Visuals
   - One Minute Presentations (Warming up)
   - PPT on Project Work- Understanding the Nuances of Delivery- Body Language – Closing and Handling Questions – Rubrics for Individual Evaluation (Practice Sessions)

4. Exercises on Professional Etiquette and Communication
   - Role-Play and Simulation- Introducing oneself and others, Greetings, Apologies, Requests, Agreement & Disagreement….etc.
• Telephone Etiquette  
• Active Listening  
• Group Discussions (Case study)- Group Discussion as a part of Selection Procedure- Checklist of GDs  
• Analysis of Selected Interviews (Objectives of Interview)  
• Mock-Interviews (Practice Sessions)  
• Job Application and Preparing Resume  
• Process Writing (Technical Vocabulary) – Writing a Project Report- Assignments

5. Exercises on Ethics and Values
Introduction — Types of Values - Personal, Social and Cultural Values - Importance of Values in Various Contexts  
• Significance of Modern and Professional Etiquette – Etiquette (Formal and Informal Situations with Examples)  
• Attitude, Good Manners and Work Culture (Live Examples)  
• Social Skills - Dealing with the Challenged (Live Examples)  
• Professional Responsibility – Adaptability (Live Examples)  
• Corporate Expectations

Note: Hand-outs are to be prepared and given to students.

Training plan will be integrated in the syllabus.

Topics mentioned in the syllabus are activity-based.

SUGGESTED SOFTWARE:
• Preparing for being Interviewed  
• Positive Thinking  
• Interviewing Skills  
• Telephone Skills  
• Time Management  
• Team Building  
• Decision making

SUGGESTED READING:
12. The Hindu Speaks on Education by the Hindu Newspaper
FINITE ELEMENT METHODS

Prerequisites: SA- I &II Advanced Structural Analysis

Objectives:
To impart knowledge about various finite element techniques and development of finite element code.

Outcome:
The learner will be able to solve continuum problems using finite element analysis.

UNIT I

UNIT II
One dimensional FEM: Stiffness matrix for beam and bar elements - shape functions foe ID elements.

Two dimensional FEM: Different types of elements for plane stress and plane strain analysis - displacement models - generalized coordinates - shape functions - convergent and compatibility requirements - geometric invariance - natural coordinate system - area and volume coordinates - generation of element stiffness and nodal load matrices

UNIT III
Isoparametric formulation: Concept - different isoparametric elements for 2D analysis - formulation of 4-noded and 8-noded isoparametric quadrilateral elements - Lagrange elements - serendipity elements.


Three dimensional FEM: Different 3-D elements-strain-displacement relationship – formulation of hexahedral and isoparametric solid element.

UNIT IV

UNIT V
Introduction to non – linear analysis – basic methods – application to Special structures.

REFERENCES:
1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E. Plesha, John Wiley & Sons Singapour
4. Introduction to Finite element Method by Tirupathi Chandra Patila and Belugunudu Prentice Hall of India Pvt Ltd - 2007
ANALYSIS OF PLATES & SHELLS

Prerequisites: Theory of Elasticity, Structural Analysis

Objectives:
To impart knowledge on the behavior and design of shells and Folded plates.

Outcomes:
The learner will be able to analyse and design the shells and folded plates.

UNIT I
Small Deflection Theory of Thin Rectangular Plates: Assumptions – Derivation of governing differential equation for thin plates – Boundary conditions – simply supported plate under sinusoidal load – Navier solution – Application to different cases – Levy’s solution for various boundary conditions subjected to different loadings like uniform and hydrostatic pressure.

UNIT II
Plates on Elastic Foundations: Governing differential equation – deflection of uniformly loaded simply supported rectangular plate – Navier and Levy type solutions - Large plate loaded at equidistant points by concentrated forces.

UNIT III
Buckling of Plates: Governing equation for Bending of plate under the combined action of in-plane loading and lateral loads – Buckling of rectangular plates by compressive forces acting in one and two directions in the middle plane of plate

UNIT IV

UNIT V
Introduction to the shells of Double curvatures: Geometry, analysis and design of elliptic paraboloid, conoid and hyperbolic parabolic shapes, inverted umbrella type.

Axi- Symmetrical shells: General equation - Analysis and axi-symmetrical by membrane theory. Application to spherical shell and hyperboloid of revolution cooling towers.

REFERENCES:
3. Theory of Plates and Shells by Timoshenko- Tata MC Graw Hill, College
4. Analysis and design of concrete shell roofs By G.S.Ramaswami. CBS publications.
5. Design of concrete shell roofs By Chaterjee. Oxford and IBH.
Prerequisites: Reinforced Concrete Design

Objectives:
To impart knowledge on the properties of composite materials, their uses and advantages.

Outcomes:
The learner will be able to understand use of different composite materials and design GRP Box beams.

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V
Design of GRP Box Beams: Introduction, loading, span and cross-sectional shape, Selection of material, Beam manufacture, Beam stresses, Experimental Behaviour, Effect on Beam performance- Modulus of Elasticity, Compressive Strength, I value, prevention of compression buckling failure, Behaviour under long term loading.

Design of Stressed skinned roof structure: Introduction, loading and material properties, preliminary design, and computer analysis.

References:
1.  GRP in Structural Engineering M.Holmes and D.J.Just.
M.Tech. I Year II-Sem (Structural Engineering)  

PRINCIPLES OF BRIDGE ENGINEERING  
(Elective – 5)  

Prerequisites: Structural Analysis I &II, Reinforced Concrete Design  

Objectives:  
To impart knowledge about different types of bridges, their analysis and design for combination of different loading condition as per codal provisions.  

Outcomes:  
The learner will be in a position to understand and design different types of bridges.  

UNIT I  

UNIT II  

UNIT III  
Girder Bridges: Introduction-Method of Analysis and Design-Courbon's Theory, Grillage analogy  

UNIT IV  
Pre-Stressed Concrete Bridges: Basic principles-General Design requirements-Mild steel reinforcement in prestessed concrete member-Concrete cover and spacing of pre-stressing steel-Slender beams-Composite Section-Propped-Design of Propred Composite Section-Unproped composite section-Two-stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges – Design of Beams and Expansion Joints.  

UNIT V  

References  
7. Bridge Engineering by V.V.Sastry, DhanPat Rai & Co.
REHABILITATION AND RETROFITING OF STRUCTURES
(Elective – 6)

Prerequisites: Reinforced Concrete Design, Steel Design, Concrete Technology

Objectives:
To impart knowledge about different types of determination of structures testing the structures for the deterioration of structures testing the structures for the diagnosis defects and different types of repairing methods.

Outcomes:
The learner will be understand about different types of distresses in structures, their causes, testing of structures for different problems and suggest suitable repair method.

UNIT – I

UNIT – II

UNIT – III
Inspection and Testing – Symptoms and Diagnosis of Distress - Damage assessment – NDT.

UNIT – IV

UNIT – V
Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

REFERENCES:
1. Concrete Technology by A.R. Santakumar, Oxford University press
3. Non-Destructive Evaluation of Concrete Structures by Bungey - Surrey University Press
EARTHCOURSE RESISTANT DESIGN OF BUILDINGS
(Elective – 6)

Prerequisites: Structural Dynamics, Reinforced Concrete Design

Objectives:
To impart knowledge on the seismology and behavior of buildings during earthquakes.

Outcomes : The learner will be able to analyse and design buildings to resist seismic forces.

UNIT - I
Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength - Seismic design requirements-regular and irregular configurations-basic assumptions.

UNIT - II
Conceptual Design - Horizontal and Vertical Load Resisting Systems - System and Members for Lateral Loads and High Rise / Tall Structures.

UNIT - III

UNIT - IV
Design of Shear walls: Classification according to Behavior, Loads in Shear walls, Design of Rectangular and Flanged Shear walls, Derivation of Formula for Moment of Resistance of Rectangular Shear walls – Coupled Shear Walls. Introduction to non-linear static Oush Over Analysis.

UNIT - V
Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction-Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting
Ductility- Ductile detailing considerations as per IS 13920. Behavior of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquake- Seismic Evaluation and Retrofitting.

Capacity Based Design: Introduction to Capacity Design, Capacity Design for Beams and Columns-Case studies.

REFERENCES:
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.
4. Masonry and Timber structures including earthquake Resistant Design –Anand S.Arya, Nem chand & Bros
6. Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press.

Reference Codes:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year II-Sem (Structural Engineering)  

ADVANCED STEEL DESIGN  
(Elective – 7)

Prerequisites: Design of Steel Structures & Structural Analysis

Objectives:  
To impart knowledge on behavior and design of various connections, industrial and steel girders.

Outcomes: The learner will be able to design different steel structures.

UNIT I:  
SIMPLE CONNECTIONS – RIVETED, BOLTED PINNED AND WELDED CONNECTIONS:  

UNIT II:  
ECCENTRIC AND MOMENT CONNECTIONS:  

UNIT III:  ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS:  
Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; Design of angular roof truss, tubular truss, truss for a railway platform. Design of purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions. Design of bracings.

UNIT IV: DESIGN OF STEEL TRUSS GIRDER BRIDGES:  
Types of truss bridges, component parts of a truss bridge, economic Proportions of trusses, self weight of truss girders, design of bridge Compression members, tension members; wind load on truss girder Bridges; wind effect on top lateral bracing; bottom lateral bracing; portal Bracing; sway bracing.

UNIT V: DESIGN OF STEEL BUNKERS AND SILOS:  

References:  
2. Design Steel Structures Volume – II, Dr. Ramachandra & Vivendra Gehlot Scientific Journals Department.  
PLASTIC ANALYSIS AND DESIGN
(Elective – 7)

Prerequisites: Design of Steel Structures & Structural Analysis I & II

Objectives:
To impart knowledge on the analysis of steel structures like continuous beams, steel frames and connection, using Plastic Analysis.

Outcomes:
The learner will be able to design continuous beams and steel frames.

UNIT – I

UNIT - II
Design of Continuous Beams: Continuous Beams of uniform section throughout – Continuous Beams with different cross-sections.

UNIT - III

UNIT - IV

UNIT - V

References:
Prerequisites: Design of Steel Structures & Structural Analysis

Objectives:
To impart knowledge about different types of industrial structures their analysis and design for different conditions as per codal provision.

Outcomes:
The learner will be able to plan different types of industrial structures such as cold framed members, RC buckers, Soil, Chimneys. Cylindrical shells and design them.

UNIT 1

UNIT 2
Thin Walled / Cold Formed Steel Members : Definitions – Local Bucking of Thin-Elements - Post Buckling of Thin-Elements – Light Guage Steel Columns and Compression Members – Form-Factor for Columns and Compression Members – Behaviour of Stiffened Elements Under Uniform Compression – Multiple Stiffened Compression Elements – Effective Length of Light Gauge Steel Compression Members – Light Gauge Steel Tension Members.

UNIT 3

UNIT 4

UNIT 5
Design Principles of Cylindrical Shells & Design Problems.

References:
3. Design of Steel Structures, By Duggal - Tata McGraw-Hill publishers – 2010
DESIGN OF PRESTRESSED CONCRETE STRUCTURES

Elective – 8

Prerequisites: Reinforced Concrete Design & Structural Analysis

Objectives:
To impart knowledge on basics of prestressing and designing of different structural elements using Prestressing techniques.

Outcomes:
The learner will be able to understand the prestressing techniques, design the various structural elements using Prestressing techniques.

UNIT I:

UNIT II:


UNIT III:

UNIT IV:
PRESTRESSED CONCRETE SLABS: Types Of Prestressed Concrete Floor Slabs- Design of Prestressed Concrete One Way and Two Way Slabs.

Prestressed Concrete Pipes and Poles : Circular prestressing- Types of Prestressed Concrete Pipes- Design of Prestressed Concrete Pipes - Prestressed Concrete Poles.

UNIT V:

Anchorage Zone Stresses in Beams : Introduction, Stress distribution in End Block – Anchorage zone stresses –Magnel’s method- Guyon’s Method - Anchorage zone Reinforcement.
References:
3. Prestressed Concrete by N. Rajagopalan, Narosa Publishing House
4. IS 1343 -2012, Prestressed Concrete – Code of Practice, Bureau of Indian Standards.
5. Prestressed Concrete: Analysis and Design Practice by Karuna Moy Ghosh, Prentice Hall of India
Prerequisites: Theory of Elasticity & Advanced Structural Analysis

Objectives:
To impart knowledge on the elastic, inelastic buckling and torsional buckling of structures.

Outcomes:
The learner will be able to understand buckling of bars and frames.

UNIT – I

UNIT - II
Elastic Buckling of bars and frames: Elastic Buckling of straight columns – Effect of shear stress on buckling – Eccentrically and laterally loaded columns- Buckling of frames-large deflections of buckled bars-Energy methods- Buckling of bars on elastic foundations- Buckle line of bar with intermediate compressive forces - Buckling of bars with change in cross-section – Effect of shear force on critical load- built up columns.

UNIT - III
In Elastic Buckling: Buckle line of straight bar- Double modulus theory – Tangent modulus theory, Inelastic lateral Buckling. Experiments and design formulae: Experiments on columns – Critical stress diagram – Empirical formulae for design – various end conditions

UNIT - IV
Torsion Buckling: Pure torsion of thin walled bars of open cross section – Non-uniform torsion of thin walled bars of open cross section- Torsional buckling – Buckling by torsion and flexure.

UNIT – V
Lateral buckling of simply supported Beams: Beams of Rectangular cross-section subjected to pure bending. Buckling of simply supported Rectangular plates: Derivation of equation of plate subjected to constant compression in one and two directions.

References
2. Stability of metallic structures by Blunch- Mc Graw Hill
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year II-Sem (Structural Engineering)  

CAD LABORATORY

Prerequisites: Advanced Structural Analysis

Objectives:
To impart knowledge on the use of various softwares

Outcomes:
The learner will be able to understand and design the structures using the software.

1. Program for design of slabs. Using Excel
2. Program for design of beams. Using Excel
3. Program for design of column using Excel
4. Analysis of truss using STAAD Pro
5. Analysis of Multistoreyed space frame, using STAAD Pro, ETABS
6. Analysis of Bridge deck slab
7. Analysis of Plane frames using STAAD. Pro.
8. Program for Design of a combined footing using ETABS Excel
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year II-Sem (Structural Engineering) L T P C

0 0 4 2

SEMINAR

Prerequisites: None.

OBJECTIVE:
To understand the topic on thrust area by reviewing about 8-10 research papers and relevant books and material in the website and present the topic and prepare technical report.

OUTCOME:
At the end of the course, the student will be able to undertake a critical review of literature on a chosen topic. Present topics of relevance to a group of professionals. Prepare a technical report.
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. II Year I-Sem (Structural Engineering)  

COMPREHENSIVE VIVA

Prerequisites: None.

OBJECTIVE:
To test the knowledge gained and to evaluate analyzing skills on the subjects studied in the masters programme.

OUTCOME:
The student will be able to undertake a assimilate knowledge of different courses studied, Develop overall comprehension about Geotechnical Engineering, Analyze real life geotechnical problems with theoretical knowledge learned, Interpret and articulate solutions to real life geotechnical problems.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. II Year I-Sem (Structural Engineering)  

PROJECT PHASE-I

Prerequisites: None.

OBJECTIVE: To identify the topic by reviewing literature (Journal/ Conferences/ Articles etc.) and based on the topic, setting objectives and developing methodology to carryout project thesis work

OUTCOME: The student will be able to identify topics in thrust areas of Geotechnical engineering. Take up critical review of literature on the chosen topic. Carryout independent research work on the topic by experimental / analytical approaches. Documentation and presentation of the research work
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year III-Sem (Structural Engineering)  

PROJECT PHASE – II & DISSERTATION

**Prerequisites:** None.

**OBJECTIVE:**
To carry out experimental/analytical programme and critical analysis of results on the identified topic in thrust areas of Geotechnical engineering.

**OUTCOME:**
Take up critical review of literature on the chosen topic carry out independent research work on the topic by experimental / analytical approaches. Preparation of document and critical analysis of the results of research work and presentation.