**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech in STRUCTURAL ENGINEERING**
**Effective from Academic Year 2017- 18 admitted batch**

**COURSE STRUCTURE AND SYLLABUS**

**I Semester**

| Category | Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|---|
| PC-1 | Theory of Elasticity | 25 | 75 | 4 | 0 | 0 | 4 |
| PC-2 | Structural Dynamics | 25 | 75 | 4 | 0 | 0 | 4 |
| PC-3 | Advanced Structural Analysis | 25 | 75 | 4 | 0 | 0 | 4 |
| PE-1 | Advanced Concrete Technology<br>Tall Buildings<br>Advanced Foundation Engineering | 25 | 75 | **3** | 0 | 0 | 3 |
| PE-2 | Advanced R.C. Design<br>Soil Dynamic & Foundation Engineering<br>Plastic Analysis & Design | 25 | 75 | **3** | 0 | 0 | 3 |
| OE-1 | ***Open Elective -I** | 25 | 75 | 3 | 0 | 0 | 3 |
| Laboratory I | Advanced Structural Engineering Laboratory | 25 | 75 | 0 | 0 | 3 | 2 |
| Seminar I | Seminar-I | 100 | 0 | 0 | 0 | 3 | 2 |
| **Total** | | **275** | **525** | **21** | **0** | **6** | **25** |

**II Semester**

| Category | Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|---|
| PC-4 | Advanced Steel Design | 25 | 75 | 4 | 0 | 0 | 4 |
| PC-5 | Theory of Plates | 25 | 75 | 4 | 0 | 0 | 4 |
| PC-6 | Pre-stressed Concrete | 25 | 75 | 4 | 0 | 0 | 4 |
| PE-3 | Finite Element Method<br>Bridge Engineering<br>Design of Sub Structures | 25 | 75 | **3** | 0 | 0 | 3 |
| PE4 | Earthquake Resistant Design of Buildings<br>Repair & Rehabilitation of Buildings<br>Stability of Structures | 25 | 75 | **3** | 0 | 0 | 3 |
| OE-2 | ***Open Elective – II** | 25 | 75 | 3 | 0 | 0 | 3 |
| Laboratory II | CAD Lab | 25 | 75 | 0 | 0 | 3 | 2 |
| Seminar II | Seminar-II | 100 | 0 | 0 | 0 | 3 | 2 |
| **Total** | | **275** | **525** | **21** | **0** | **6** | **25** |

**III Semester**

| Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|
| Technical Paper Writing | 100 | 0 | 0 | 3 | 0 | 2 |
| Comprehensive Viva-Voce | 0 | 100 | 0 | 0 | 0 | 4 |
| Project work Review II | 100 | 0 | 0 | 0 | 22 | 8 |
| **Total** | **200** | **100** | 0 | **3** | 22 | **14** |

**IV Semester**

| Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|
| Project work Review III | 100 | 0 | 0 | 0 | 24 | 8 |
| Project Evaluation (Viva-Voce) | 0 | 100 | 0 | 0 | 0 | 16 |
| **Total** | **100** | **100** | **0** | **0** | **24** | **24** |

***Open Elective subjects must be chosen from the list of open electives offered by OTHER departments.**

**# For Project review I, please refer 7.10 in R17 Academic Regulations.**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech – I Year – I Sem. (Structural Engg.)**

**THEORY OF ELASTICITY**
**(PC-1)**

**Course 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 be able to apply numerical methods to solve continuum problems.

**UNIT-I**

Introduction: Elasticity - notation for forces and stress - components of stresses - components of strain - Hooks law. Plane stress and plane strain analysis - differential equations of equilibrium - boundary conditions – Strain Displacement Relations - compatibility equations - stress function

**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**

Two dimensional problems in polar coordinates - stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates - displacements for symmetrical stress distributions Edge Dislocation - general solution of two-dimensional problem in polar coordinates - application to Plates with Circular Holes – Rotating Disk. Bending of Prismatic Bars: Stress function - bending of cantilever - circular cross section - elliptical cross section - rectangular cross section.

**UNIT - IV**

Analysis of stress and strain in three dimensions - principal stress - stress ellipsoid - director surface - determination of principal stresses Stress Invariants - max shear stresses Stress Tensor – Strain Tensor- Homogeneous deformation - principal axes of strain-rotation. General Theorems:Differential equations of equilibrium - conditions of compatibility - determination of displacement - equations of equilibrium in terms of displacements - principle of super position - uniqueness of solution - the reciprocal theorem Strain Energy.

**UNIT - V**

Torsion of Circular Shafts - Torsion of Straight Prismatic Bars– Saint Venant's 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.

**TEXT BOOKS**

1. Theory of Elasticity by Timoshenko, Mc-Graw hill Publications
2. Advanced Mechanics of Materials by Arthur P. Boresi, John Willey publishers

**REFERENCES:**

1. Theory of Elasticity by Y.C. Fung, Dover publications, New york
2. Theory of Elasticity by Sadhu singh, Khanna Publishers
3. Advanced Mechanics of solids by L.S.Srinath, Tata Mc-Graw Hill
4. Continuum Mechanics by P.N. ChandraMouli, Yes Dee Publishers

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech – I Year – II Sem. (Structural Engg.)**

**STRUCTURAL DYNAMICS**
**(PC-2)**

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

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

**UNIT - I:**

**Theory of vibrations**: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Vectorial representation of S.H.M. - Free vibrations of single degree of freedom system - undamped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration of SDOF systems - Harmonic excitation -Dynamic magnification factor – Phase angle – Bandwidth

**UNIT - II**

**Introduction to Structural Dynamics :** Fundamental objectives of dynamic analysis -Types of prescribed loading - Methods of discretization - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's principle, Principle of virtual work and Hamilton principle.

**Single Degree of Freedom Systems:** Formulation and solution of the equation of motion - Free vibration response - Response to Harmonic, Periodic, Impulsive and general dynamic loadings - Duhamel integral.

**UNIT - III**

**Multi Degree of Freedom Systems :** Selection of the degrees of Freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion -Undamped free vibrations - Solutions of Eigen value problem for natural frequencies and mode shapes - Analysis of Dynamic response – Normal co-ordinates - Uncoupled equations of motion - Orthogonal properties of normal modes - Mode superposition procedure.

**UNIT - IV**

**Practical Vibration Analysis:** Introduction - Stodola method - Fundamental mode analysis - Analysis of second and higher modes - Holzer method - Basic procedure.

**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**

Deterministic Earthquake Response of Systems – Rigid Foundation, Types of Earthquake Excitation – Response to Rigid – Soil Excitation, Lumped SDOF elastic systems – Lumped SDOF elastic system – Distributed Parameter Elastic Systems – SRSS, CQC combination of modal responses.

**TEXT BOOKS:**

1. Structural Dynamics by Mario Paz, C.B.S Publishers, New Delhi
2. Dynamics of Structures by Clough & Penzien, McGraw Hill, New York

**REFERENCES:**

1. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.
2. Vibrations, Dynamics and Structural systems by Madhujit Mukhopadhyay, CRC press

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech – I Year – I Sem. (Structural Engg.)**

**ADVANCED STRUCTURAL ANALYSIS**
**(PC-3)**

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

**Course Outcomes**: The learner will be able to analyse different indeterminate structures using Matrix methods.

**UNIT - I**
Introduction to matrix methods of analysis - static indeterminacy and kinematic indeterminacy - degree of freedom - coordinate system - structure idealization stiffness and flexibility matrices - suitability element stiffness equations - elements flexibility equations - mixed force - displacement equations - for truss element, beam element and tensional element.
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 - band matrix - semi bandwidth - computer algorithm for assembly by direct stiffness matrix method.

**UNIT - III**
Analysis of plane truss - continuous beam - plane frame and grids by flexibility methods.

**UNIT - IV**
Analysis of plane truss - continuous beam - plane frame and grids 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.

**TEXT BOOKS:**

1. Matrix Analysis of Frames structures by William Weaver J.R and James M. Gere, CBS publications.
2. Advanced Structural Analysis by Ashok. K. Jain, Nem Chand Brothers.

**REFERENCES:**

1. Basic Structural Analysis by C.S. Reddy, Tata Mc-Graw hill
2. Matrix Structural Analysis by Madhu B. Kanchi, John Willey publishers
3. Indeterminate Structural Analysis by K.U. Muthu*et al*., I.K. International Publishing House Pvt. Ltd.
4. Matrix Methods of Structural Analysis by J.L. Meek, Mc-Graw hill

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech – I Year – I Sem. (Structural Engg.)**

**ADVANCED CONCRETE TECHNOLOGY**
**(PE-1)**

**Course Objectives:** To impart knowledge on ingredients of concrete, concrete mix design for proportioning and their testing.

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

**UNIT – I**

Ingredients of concrete: Cement-Bogue's compounds – Hydration Process– Types of cement – Setting times of cement - Aggregates – Shapes Testes on Aggregates - Gradation Charts – Combined aggregate-Alkali Silica Reaction -Admixtures – Chemical and Mineral admixtures.

**UNIT – II**

Fresh and Hardened Concrete: Fresh Concrete - workability tests on Concrete Setting times of Fresh Concrete - Segregation and bleeding.
Hardened Concrete: Abram's law- Gel space ratios, Maturity Concept – Stress Behaviour – Creep and Shrinkage – Durability tests on concrete - Non destructive testing of concrete.

**UNIT - III**

High Strength Concrete – Micro structure – Manufacturing and Properties- Design of HSC Using Erintroy Shaklok Method- Ultra High Strength Concrete.
High Performance Concrete- Requirements and properties of High Performance Concrete- Design Considerations.

**UNIT –IV**

Special Concrete: Self Compacting concrete – Polymer concrete – Fiber reinforced concrete – Reactive Powder concrete – Requirements and Guidelines – Advantages and Applications. Light weight concrete.
Concrete mix design: Quality Control - Quality assurance - Quality audit- Mix Design method - BIS method, ACI method, DOE method.

**UNIT –V**

**F**orm work – materials – structural requirements – form work systems – connections – specifications – design of form work – shores – removal for forms – reshoring – failure of form work.

**TEXT BOOKS:**

1. Properties of Concrete by A.M. Neville, ELBS publications.
2. Concrete: Micro Structure, Properties and Materials by P.K. Mehta, Tata Mc-Graw Hill Publishing House Pvt. Ltd

**REFERENCES:**

1. Concrete Technology by M.S. Shetty, S. Chand & Co.
2. Concrete Technology by A. K. Santhakumar, Oxford University Press
3. Special Structural concretes by Rafat Siddique, Galgotia Publications.
4. IS: 10262: 2009 Code of practice for design of Concrete mix

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**M. Tech – I Year – I Sem. (Structural Engg.)**

**TALL BUILDINGS**
**(PE-1)**

**Course Objective**: To impart knowledge on analysis of tall buildings.

**Course Outcomes** : The learner will be able to analyse and chose a appropriate systems for tall buildings.

**Unit-I**

**Introduction :** Evolution of tall buildings - Classification of Buildings – Low-rise, medium-rise, high-rise –– Ordinary framed buildings & Shear-wall buildings –Behaviour of buildings under lateral loads like Wind loads, Earthquake loads & Blast loads – Basic structural & functional design requirements – Strength, Stiffness & Stability.

**Unit-II**

**Lateral load resisting elements :** Frames, Shear walls & Tubes – Shear, Bending & combined modes of deformation – Structural behavior of Rigid frames – Simplified methods of analysis – Substitute frame method, Portal method, Cantilever method, Equivalent frame method –Structural behaviour of Shear walls – Approaches of analysis – Elastic continuum approach & Discrete approach -- Structural behavior of Tubes –Actions.

**Unit-III**

**Choice of System for a Building**: Frame building, Shear wall building, Shear walls acting with frames, Single framed tubes – Other structural forms – Staggered Wall-beam system, Tube-in-tube system, Base isolation technique for earthquake resistance. Load distribution in a tall building – Load resisted by different shear walls & frames – Determinate & Indeterminate problems – Equivalent Stiffness method.

**Unit-IV**

**Methods of Analysis**: Shear walls without Openings – Estimation of Stiffness by simple Cantilever theory & Deep beam theory – Shear walls with Openings – Equivalent frame for large openings – Muto's method for small openings –Elastic Continuum approach – Coull & Chowdhry's method – Design Charts – Limitations of Continuum approach. Shear wall- Frame Interaction: Sharing of loads between wall & frame - Different methods – comparison -- Khan & Sbrounis' method – Design charts -- Mac Leod's method - Advantages & limitations -- Cooperation of Floor slabs – Equivalent width.

**Unit-V**

**Modern Methods:** Analysis of Tall buildings by Stiffness method – Available Softwares for analysis of tall buildings.

**TEXT BOOKS:**

1. Design of Tall Buildings by Taranath B., McGraw Hill.

**REFERENCES**

1. Reinforced Concrete Design of Tall Buildings by Bungales. Taranath, CRC Press.
2. Analysis of Shear Walled Buildings by S. M. A. Kazimi& R. Chandra, Tor-steel Research Foundation, Calcutta, India.
3. Analysis of Framed Structures by Gere & Weaver
4. Design of Building Structures by Wolfgang Schuller, Prentice Hall

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech – I Year – I Sem. (Structural Engg.)**

**ADVANCED FOUNDATION ENGINEERING**
**(PE-1)**

**Course Objective:** To determine the bearing capacity of shallow and deep foundations and to estimate settlements of structures subjected to external loads, leading to design of foundations resting on soils.

**Course Outcome:** Students should be in a position to design foundations for varieties of structures resting on soil deposits, and appreciate the importance of reliability based design in geotechnical engineering.

**Unit-I**
**Soil Exploration**: Exploration Methods; Planning the Exploration Program; Boring and Sampling; In Situ Tests: Standard & Cone Penetration Tests, Field Vane, Dilatometer, Pressure meter; Rock Sampling, Core Recovery, RQD; Geophysical Exploration; Preparation of Soil Report, Case Studies.

**Unit-II**
**Shallow Foundations**: **Bearing Capacity:**- Shear Failure; Effect of Water Table; Footings with Eccentric or Inclined Loads, Footings on Layered Soils, Slopes on finite layer with a Rigid Base at Shallow Depth, effect of compressibility of soil, on soils with strength increasing with depth, Plate Load tests, Presumptive bearing capacity.

**Unit-III**
**Settlement**: Components – Immediate, Primary and Secondary Settlements, Consolidation, Stresses and Displacements in Homogeneous, Layered and Anisotropic Soils; Bearing Pressure using SPT, CPT, Dilatometer and Pressure meter; Settlement of foundations on Sands-Schmertmann and Burland & Burbridge methods; Structure Tolerance to Settlement and Differential Settlements, Rotation, Codal Provisions.

**Unit-IV**
**Deep Foundations**: **Single Pile:** Vertically loaded piles, Static capacity- α, β and λ Methods, Dynamic formulae; Wave Equation Analyses; Point Bearing Resistance with SPT and CPT Results; Bearing Resistance of Piles on Rock; Settlement; Pile Load Test; Uplift Resistance; Laterally Loaded Piles -Ultimate Lateral Resistance; Negative Skin Friction; Batter Piles; Under Reamed Piles; Ultimate Capacity of Pile Groups in Compression, Pullout & Lateral Load; Efficiency; Settlements of Pile Groups; Interaction of Axially & Laterally Loaded Pile Groups, Codal Provisions.

**Unit-V**
**Special Topics of Foundation Engineering**
**Foundations on Collapsible Soils**: Origin and occurrence, Identification, Sampling and Testing, Preventive and Remedial measures.
**Foundations on Expansive Soils**: The nature, origin and occurrence, Identifying, testing and evaluating expansive soils, typical structural distress patterns and Preventive design & construction measures.
***Introduction to Reliability-Based Design**: Brief introduction of probability and statistics, LRFD for structural strength requirements, LRFD for geotechnical strength requirements, Serviceability requirements

**TEXT BOOKS**

1. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004)
2. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012. Phi Learning (2008)

**REFERENCE BOOKS**

1. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
2. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design john Wiley & sons inc(1980-08)
3. Tomlinson, M. J. - Foundation Design and Construction - Prentice Hall (2003).
4. Baecher, G.B. & Christian, J.T. – Reliability and Statistics in Geotechnical Engineering, Wiley Publications (2003)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**M. Tech – I Year – I Sem. (Structural Engg.)**

**ADVANCED REINFORCED CONCRETE DESIGN**
**(PE-2)**

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

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

**UNIT - I**
**Basic Design Concepts:** Behaviour in flexure, Design of singly reinforced rectangular sections, Design of doubly reinforced rectangular sections, Design of flanged beams, Design of shear, Design for Torsion, Limit state of Serviceability: Deflections of Reinforced concrete beams and slabs, short term deflection and long term deflection, estimation of crack width in RCC members, calculation of crack widths.

**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, and 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.

**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, Detailing of Deep Beams, Analysis of Forces in a Corbels , Design of Procedure of Corbels, Design of Nibs.

**UNIT - V**
Design of Elevated intz type of Water Tank **Design of Combined Footings**- Distribution of soil Pressure – Geometry of Two Column Combined Footing – Design Considerations in Combined Footing for Two – Columns.

**TEXT BOOKS:**
1. Reinforced concrete design by S. Unnikrishna Pillai & Menon, Tata Mc. Graw Hill, 2nd Edition, 2004
2. Advanced Reinforced Concrete Design – P.C. Varghese, Prentice Hall of India, 2008

**REFERENCE BOOKS:**
1. Reinforced concrete design by Kennath Leet, Tata Mc. Graw-Hill International, editions, 2nd edition, 1991.
2. Design of Reinforced concrete structures by N.Subramanian, Oxford University Press
3. Reinforced Concrete Structures by Park and Paulay, John Willey Publishers.
4. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata Mc. Graw-Hill, 3rd Edition, 2005.
5. Limit state theory and design of reinforced concrete by Dr. S.R. Karve and Dr. V.L. Shah, Standard Publishers, Pune, 3rd Edition, 1994.
6. IS : 456 : 2000, Code of Practice for Plane and Reinforced Cement Concrete,
7. SP 16, SP 34.
8. IS 3370 Part I to Part IV.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech – I Year – I Sem. (Structural Engg.)**

**SOIL DYNAMICS AND FOUNDATIONS ENGINEERING**
**(PE-2)**

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

**Course 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.

**Unit-I**

**Fundamentals of Vibration**: Definitions, Simple harmonic motion, Response of SDOF systems of Free and Forced vibrations with and without viscous damping, Frequency dependent excitation, Systems under transient loads, Rayleigh's method of fundamental frequency, Logarithmic decrement, Determination of viscous damping, Transmissibility, Systems with Two and Multiple degrees of freedom, Vibration measuring instruments.

**Unit-II**

**Wave Propagation and Dynamic Soil Properties**: Propagation of seismic waves in soil deposits - Attenuation of stress waves, Stress-strain behaviour of soils under cyclic loads, Strength of cyclically loaded soils, Dynamic soil properties - Laboratory and field testing techniques, Elastic constants of soils, Correlations for shear modulus and damping ratio in sand, gravels, clays and lightly cemented sand. Liquefaction of soils and its evaluation using simple methods.

**Unit-III**

**Vibration Analyses**: Types, General Requirements, Permissible amplitude, Allowable soil pressure, Modes of vibration of a rigid foundation block, Methods of analysis, Lumped Mass models, elastic half space method, elasto-dynamics, effect of footing shape on vibratory response, dynamic response of embedded block foundation, Vibration isolation.

**Unit-IV**

**Design of Machine Foundations**: Analysis and design of block foundations for reciprocating engines, Dynamic analysis and design procedure for a hammer foundation, IS code of practice design procedure for foundations of reciprocating and impact type machines. Vibration isolation and absorption techniques.

**Unit-V**

**Machine Foundations on Piles**: Introduction, Analysis of piles under vertical vibrations, Analysis of piles under translation and rocking, Analysis of piles under torsion, Design procedure for a pile supported machine foundation.

**TEXT BOOKS:**

1. Swami Saran - Soil Dynamics and Machine Foundation, Galgotia Publications Pvt. Ltd. (2010)
2. Prakash, S. - Soil Dynamics, McGraw Hill Book Company (1981)

**REFERENCES:**

1. Prakash, S. and Puri, V. K. - Foundation for Machines: Analysis and Design, John Wiley & Sons, 1998.

2. Kameswara Rao, N. S. V. - Vibration Analysis and Foundation Dynamics, Wheeler Publication Ltd., 1998.
3. Das, B. M. & Ramana, G.V. - Principles of Soil Dynamics, 2nd Edition, CL Engineering Publishers, 2010.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech – I Year – I Sem. (Structural Engg.)**

**PLASTIC ANALYSIS AND DESIGN**
**(PE-2)**

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

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

**UNIT – I**
Analysis of Structures for Ultimate Load: Fundamental Principles – statical method of Analysis – Mechanism method of analysis – Method of analysis, Moment check – Carry over factor – Moment Balancing Method.

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

**UNIT – III**
Secondary Design Problems: Introduction – Influence of Axial force on the plastic moment – influence of shear force – local buckling of flanges and webs – lateral buckling – column stability.

**UNIT – IV**
Design of Connections: Introduction – requirement for connections – straight corner connections – Haunched connection – Interior Beam-Column connections.

**UNIT – V**
Design of Steel Frames: Introduction – Single bay, single storey frames – simplified procedures for Single span frames – Design of Gable frames with Haunched Connection. Ultimate Deflections: Introduction – Deflection at ultimate load – Deflection at working load – Deflections of Beams and Single span frames.

**REFERENCES:**

1. Plastic Design of Steel Frames, L.S. Beedle. John Willey & Sons.
2. Plastic Analysis, B.G.Neal. SponPres
3. Design of Steel Structures by N. Subramanian, Oxford University Press

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech – I Year – I Sem. (Structural Engg.)**

**ADVANCED STRUCTURAL ENGINEERING LAB**

**Course Objective:** to understand the test procedure and behavior of the concrete and RC beams

**Course Outcome:** the student will be able to design concrete mix which will satisfy the fresh and hardened concrete properties, and study the behavior of structural elements.

1. Workability of fresh concrete
   (a) slump core
   (b) Compaction Factor
   (c) Vee Bee Test
2. Rapid chloride penetration test of concrete
3. Air Entrainment test on fresh concrete
4. Mash cone test and modulus of elasticity of concrete
5. Permeability of concrete
6. NDT tests on hardened concrete
   a) Rebound hammer
   b) UPV hammer
7. Accelerated curing of concrete
8. Design and Testing of self compacting concrete of standard grade (M30 or M40)
   a) V- Funnel
   b) L -Box
   c) U -Box
   d) J -Ring
9. Testing of RC Beams for pure bending
   a) Under reinforced
   b) Over reinforced
10. Testing of RC Beams for shear