

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech in STRUCTURAL ENGINEERING**  
Effective from Academic Year 2019 - 20 admitted batch

**R19 COURSE STRUCTURE AND SYLLABUS**

**I YEAR I – SEMESTER**

Course Code	Course Title	L	T	P	Credits
Professional Core - I	Theory of Elasticity	3	0	0	3
Professional Core - II	Advanced Structural Analysis	3	0	0	3
Professional Elective - I	1. Theory of Plates and Shells 2. Theory and Applications of Cement Composites 3. Theory of Structural Stability	3	0	0	3
Professional Elective - II	1. Advanced Reinforced Concrete Design 2. Advanced foundation Design of reinforced concrete 3. Numerical Methods in Structural Engineering	3	0	0	3
Lab - I	Numerical Analysis Lab	0	0	4	2
Lab - II	Advanced Concrete Technology Lab	0	0	4	2
MC	Research Methodology and IPR	2	0	0	2
Audit - I	Audit Course - I	2	0	0	0
	<b>Total Credits</b>	<b>16</b>	<b>0</b>	<b>8</b>	<b>18</b>

**I YEAR II – SEMESTER**

Course Code	Course Title	L	T	P	Credits
Professional Core - III	FEM in Structural Engineering	3	0	0	3
Professional Core - IV	Structural Dynamics	3	0	0	3
Professional Elective - III	1. Advanced Steel Design 2. Design of High-Rise Buildings 3. Design of Masonry Structures	3	0	0	3
Professional Elective - IV	1. Soil Structure Interaction. 2. Design of Prestressed concrete Structures 3. Structural Optimization	3	0	0	3
Lab - III	Advanced Structural Engineering Lab	0	0	4	2
Lab - IV	Structural Design Lab	0	0	4	2
	Mini Project with Seminar	0	0	4	2
Audit - II	Audit Course- II	2	0	0	0
	<b>Total Credits</b>	<b>14</b>	<b>0</b>	<b>12</b>	<b>18</b>

**Audit Course 1 & 2:**

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by yoga
8. Personality Development Through Life Enlightenment Skills

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

**THEORY OF ELASTICITY (PC – I)**

**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 plasticity and be able to apply numerical methods to solve continuum problems.

**Prerequisites:** Strength of Materials I & II

**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 2D & 3D - boundary conditions – Strain Displacement Relations - compatibility equations – stress tensor and strain tensor.

**UNIT II**

Two dimensional problems in rectangular coordinates - solution by polynomials - Saint-Venants principle - determination of displacements - bending of simple beams stress function – Simply Supported and Cantilever Beams.

**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 - 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 Venants Method - torsion of prismatic bars - bars with elliptical cross sections - membrane analogy - torsion of a bar of narrow rectangular bars - torsion of shafts, tubes, bars etc.

**REFERENCES:**

1. Theory of Elasticity by Timoshenko, McGraw-Hill Publications
2. Theory of Elasticity by Y.C. Fung.
3. Theory of Elasticity by Gurucharan Singh.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

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

**Pre-requisites:** Structural Analysis I & II

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

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

**UNIT I**

Introduction to matrix methods of analysis - statical indeterminacy and kinematical 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 torsional 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 - banded matrix - semi bandwidth - assembly by direct stiffness matrix method.

**UNIT III**

Analysis of plane truss - continuous beams with and without settlement - plane frame including side sway single storey, single – bay and gable frame by flexibility method using system approach by flexibility methods and gables frames by Gable 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, single bay – two storey, two bay single – storey.

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

**REFERENCES:**

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, New Channel Brothers.
3. Matrix method of S.A by Pandit & Gupta
4. Matrix Structural Analysis by Madhu B. Kanchi.
5. Matrix Methods of Structural Analysis by J.Meek.
6. Structural Analysis by Ghali and Neyveli.
7. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt Ltd.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

**THEORY OF PLATES AND SHELLS (PE – I)**

**Prerequisites:** Theory of Elasticity, Structural Analysis

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

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

**UNIT I**

**Introduction:** Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions.

**UNIT II**

**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 III**

**Circular Plates:** Differential Equation for symmetrical bending of Laterally loaded circular Plates – Uniformly loaded circular plates – circular plate concentrically loaded – circular plate loaded at center

**UNIT IV**

Shells – functional behaviour – examples – structural behaviour of shells classification of shells – Definitions – various methods of analysis of shells – merits and demerits of each method – 2D. Membrane equation.

Equations of equilibrium: Derivation of stress resultants – cylindrical shells – Flugge's equations.

**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:**

1. Theory of Plates & Shells –Stephen, P. Timoshenko, S. Woinowsky-Krieger – Tata MC Graw Hill Edition
2. Analysis and design of concrete shell roofs By G.S. Ramaswami. CBS publications.
3. Design of concrete shell roofs By Billington – Tata MC Graw Hill, New York
4. Shell Analysis By N.K. Bairagi. Khanna Publishers, New Delhi.
5. Design of Shells and Folded Plates by P.C. Varghese, PHI Learning Pvt. Ltd
6. Design of concrete shell roofs By Chaterjee. Oxford and IBH.,

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

**THEORY AND APPLICATIONS OF CEMENT COMPOSITES (PE – 1)**

**Course Outcomes:** At the end of the course, students will be able to

1. Formulate constitutive behaviour of composite materials – Ferrocement, SIFCON and Fibre Reinforced Concrete - by understanding their strain- stress behaviour.
2. Classify the materials as per orthotropic and anisotropic behaviour.
3. Estimate strain constants using theories applicable to composite materials.
4. Analyse and design structural elements made of cement composites.

**UNIT – I**

**Introduction:** Classification and Characteristics of Composite Materials- Basic Terminology, Advantages. Stress-Strain Relations- Orthotropic and Anisotropic Materials, Engineering Constants for Orthotropic Materials, Restrictions on Elastic Constants, Plane Stress Problem, Biaxial Strength, Theories for an Orthotropic Lamina.

**UNIT – II**

**Mechanical Behaviour:** Mechanics of Materials Approach to Stiffness- Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness- Bounding Techniques of Elasticity, Exact Solutions - Elasticity Solutions with Continuity, Halpin, Tsai Equations, Comparison of approaches to Stiffness.

**UNIT – III**

**Cement Composites:** Types of Cement Composites, Terminology, Constituent Materials And their Properties, Construction Techniques for Fibre Reinforced Concrete – Ferro cement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing.

**UNIT – IV**

**Mechanical Properties of Cement Composites:** Behavior of Ferrocement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

**UNIT – V**

**Application of Cement Composites:** FRC and Ferrocement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behaviour, Constitutive relationship, Elastic Constants.

**Analysis and Design of Cement Composite Structural Elements –** Ferro cement, SIFCON and Fibre Reinforced Concrete.

**REFERENCE BOOKS:**

1. Mechanics of Composite Materials, Jones R. M., 2nd Ed., Taylor and Francis, BSP Books, 1998.
2. Ferrocement – Theory and Applications, Pama R. P., IFIC, 1980.
3. New Concrete Materials, Swamy R.N., 1stEd., Blackie, Academic and Professional, Chapman &Hall, 1983.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

**THEORY OF STRUCTURAL STABILITY (PE – I)**

**Course Outcomes:** At the end of the course, students will be able to

1. Determine stability of columns and frames
2. Determine stability of beams and plates
3. Use stability criteria and concepts for analyzing discrete and continuous systems,

**UNIT – I**

**Criteria for Design of Structures:** Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behavior.

**UNIT – II**

**Stability of Columns:** Axial and Flexural Buckling, Lateral Bracing of Columns, Combined Axial, Flexural and Torsion Buckling.

**UNIT – III**

**Stability of Frames:** Member Buckling versus Global Buckling, Slenderness Ratio of Frame Members.

**UNIT – IV**

**Stability of Beams:** lateral torsion buckling.

**Stability of Plates:** axial flexural buckling, shear flexural buckling, buckling under combined loads.

**UNIT – V**

**Introduction to Inelastic Buckling** and Dynamic Stability.

**REFERENCE BOOKS:**

1. Theory of elastic stability, Timoshenko and Gere, Tata Mc Graw Hill, 1981
2. Principles of Structural Stability Theory, Alexander Chajes, Prentice Hall, New Jersey.
3. Structural Stability of columns and plates, Iyengar, N. G. R., Eastern west press Pvt. Ltd.
4. Strength of Metal Structures, Bleich F. Bucking, Tata McGraw Hill, New York.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

**ADVANCED REINFORCED CONCRETE DESIGN (PE – II)**

**Prerequisites:** Design of Reinforced Concrete Structures

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

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

**UNIT I**

**Basic Design Concepts:** Behavior in flexure, Design of singly Reinforced rectangular sections, Design of Doubly Reinforced rectangular sections, Design of flanged beam sections, Design for shear – Design for Torsion, Limit state of Serviceability: Deflections of Reinforced concrete beams and slabs short term deflections 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, 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**

Ribbed 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 sketch showing reinforcement details.

**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 Compression Members - Estimation of Effective Length of a Column – Code Requirements on Slenderness Limits, – Design of Short Columns Under Axial Compression – Design of Short Columns Under Compression With Uniaxial Bending – Design of Short Columns Under Axial Compression With Biaxial Bending – Design of Slender Columns sketch showing reinforcement details.

Design of Combined Footings - Distribution of Soil Pressure - Geometry of Two-column Combined Footing – Design Considerations in Two-Column Footings sketch showing reinforcement details.



**REFERENCES:**

1. "Reinforced Concrete Design" S. Unnikrishna Pillai & Devdas Menon; Tata Mc. Graw-Hill Publishing Company Ltd. New Delhi 2010.
2. "Advanced Reinforced Concrete" P.C. Varghese Prentice Hall of INDIA Private Ltd. 2008.
3. "Limit State Theory and Design of Reinforced Concrete" Dr. S. R. Karve and V.L Shah. Standard Publishers, PUNE 2004.
4. "Design of Reinforced Concrete Structures" by N.Subramanian, Oxford University Press.
5. Reinforced concrete structural elements – behaviour, Analysis and design by P. Purushotham, Tata Mc.Graw-Hill, 1994.
6. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata Mc. Graw-Hill, 3<sup>rd</sup> Edition, 2005.
7. Reinforced Concrete design by Kennath Leet, Tata Mc. Graw-Hill International, editions, 2<sup>nd</sup> edition, 1991.
8. "Design Reinforced Concrete Foundations" P.C. Varghese Prentice Hall of INDIA Private Ltd.
9. IS 456-2000
10. SP 16
11. SP 34

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

**ADVANCED FOUNDATION DESIGN OF REINFORCED CONCRETE (PE – II)**

**UNIT-I**

Introduction -Principles of Design of Foundations, Types of shear failures in foundation soils, Types of foundations, Design Loads, Basic Concepts of safe and allowable bearing capacity. Shallow Foundations Bearing Capacity Analysis: Bearing capacity theories – Terzaghi, Meyerhof, Skempton, Hansen, Vesic and IS Methods, Bearing capacity evaluation from Standard Penetration test and Plate load test. Settlement Analysis:

**UNIT-II**

Uniform and Differential Settlements, Elastic and Consolidation Settlements, Settlement analysis in cohesionless soils by Schemmertmann and Hartman method, Penetration tests; Permissible settlements as per IS 1904-1978, causes of settlement, settlement Control.

**UNIT-III**

Proportioning of footings: Isolated column footings, Strip, combined Footings and Strap Footing. Raft Foundations: Bearing capacity of raft foundation, floating raft, Types of rafts, Beam on Elastic foundation and Conventional methods of Design, determination of modulus of subgrade reaction.

**UNIT-IV**

Deep Foundations - Pile Foundations: Types, load capacity- dynamic formulae, static formula; pile load tests- Vertical load test, lateral load test, Cyclic load test; settlement of piles and pile groups, negative skin friction on single pile and pile groups; laterally loaded piles - Broom's Analysis, IS Code method; Under reamed piles – Load capacity, design and construction.

Well Foundations: Types, Bearing Capacity of well foundations, Construction of pneumatic caissons, Tilts and Shifts: precautions, Remedial measures; Lateral stability analysis by Terzaghi's Method, Design aspects of Components of well foundation.

**UNIT-V**

Foundations in Expansive Solis Introduction, Identification of expansive soils, Swell potential and swelling pressure, Active depth, Foundation Problems, Foundation practices in expansive soils, Soil Replacement and 'CNS' concepts. Foundations of Transmission Line Towers - Introduction, Necessary information, Forces on tower foundations, General design criteria, Choice and type of foundation, Design procedure.

**TEXT BOOKS:**

1. Analysis and Design of Substructures by Swami Saran, Oxford & IBH Publishing Co. Pvt. Ltd.
2. Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R. Rao, New Age International Publications

**REFERENCE BOOKS:**

1. Foundation Analysis and Design by J.E. Bowles, Mc Graw Hill Publishing Co.
2. Foundation Design by W.C. Teng, John Wiley, New York.
3. Analysis and Design of Substructures by Swami Saran, Oxford & IBH Publishing Co.
4. Foundation Engineering by P.C. Varghese, Prentice Hall of India.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

**NUMERICAL METHODS IN STRUCTURAL ENGINEERING (PE – II)**

**Prerequisites:** Mathematics I & II

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

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

**UNIT-I:**

Solutions of linear equations: Direct method – Cramer’s rule, Gauss – Elimination method- Gauss – Jordan elimination – Triangulation (LU Decomposition) method – Iterative methods Jacobi – Iteration method – Gauss – Siedel iteration, Successive over –relaxation method. Eigen values and eigen vectors: Jacobi method for symmetric matrices- Given’s method for symmetric matrices- Householder’s method for symmetric matrices- Rutishauser method of arbitrary matrices – Power method.

**UNIT-II:**

Interpolation: Linear Interpolation, Higher order Interpolation, Lagrange Interpolation, Interpolating polynomials using finite differences- Hermite Interpolation, piece-wise and spline Interpolation.

**UNIT-III**

Finite Difference and their Applications: Introduction- Differentiation formulas by Interpolating parabolas – Backward and forward and central differences- Derivation of Differentiation formulas using Taylor series- Boundary conditions- Beam deflection – Solution of characteristic value problems- Richardson’s extrapolation- Use of unevenly spaced pivotal points- Integration formulae by interpolating parabolas- Numerical solution to spatial differential equations – Application to Simply Supported Beams, Columns & rectangular Plates.

**UNIT-IV.**

Numerical Differentiation: Difference methods based on undetermined coefficients- optimum choice of step length– Partial differentiation.

Numerical Integration: Method based on interpolation-method based on undetermined coefficient – Gauss – Lagrange interpolation method- Radaua integration method- composite integration method – Double integration using Trapezoidal and Simpson’s method – New Marks Method and Application to Beams – Calculations of Slopes & Deflections.

**UNIT V**

Ordinary Differential Equation: Euler’s method – Backward Euler method – Midpoint method – single step method, Taylor’s series method- Boundary value problems.

**REFERENCES:**

1. Numerical Methods For Scientific and Engineering Computations. M. K. Jain- S. R. K. Iyengar – R. K. Jain Willey Eastern Limited. New Age International (p) Ltd., Publishers, Reprint 2004, ISBN: 81-224-1461-3 56789101112.
2. Numerical Methods for Engineering Problems by N. Krishna Raju and K. U. Muthu, M.C. Millan Publishers, New Delhi

3. Numerical Methods for Engineers Stevan C. Chopra, Raymond P. Canal Mc. Graw Hill Book Company. April 2009
4. C Language and Numerical methods by C. Xavier – New Age International Publisher. Reprint March 2012 ISBN: 978-81-224-1174-4.
5. Computer based numerical analysis by Dr. M. Shanta Kumar, Khanna Book publishers New Delhi.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

**NUMERICAL ANALYSIS LAB (Lab – I)**

**Course Outcomes:** At the end of the course, students will be able to

1. Find Roots of non-linear equations by Bisection method and Newton's method.
2. Do curve fitting by least square approximations
3. Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/ Gauss - Jordan Method
4. To Integrate Numerically Using Trapezoidal and Simpson's Rules
5. To Find Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge-Kutta Method.

**Syllabus Contents:**

1. Find the Roots of Non-Linear Equation Using Bisection Method.
2. Find the Roots of Non-Linear Equation Using Newton's Method.
3. Curve Fitting by Least Square Approximations.
4. Solve the System of Linear Equations Using Gauss - Elimination Method.
5. Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.
6. Solve the System of Linear Equations Using Gauss - Jordan Method.
7. Integrate numerically using Trapezoidal Rule.
8. Integrate numerically using Simpson's Rules.
9. Numerical Solution of Ordinary Differential Equations By Euler's Method.
10. Numerical Solution of Ordinary Differential Equations By Runge- Kutta Method.
11. Practice with MATLAB

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

**ADVANCED CONCRETE TECHNOLOGY LAB (Lab – II)**

**Course Outcomes:** At the end of the course, students will be able to

1. Design high grade concrete and study the parameters affecting its performance.
2. Conduct Non-Destructive Tests on existing concrete structures.
3. Apply engineering principles to understand behavior of structural/ elements.

**List of Experiments/Assignments:**

1. Mix design of standard grade and high strength concrete
2. Study of stress-strain curve of high strength concrete, Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
3. Behavior of Beams under flexure, Shear and Torsion.
4. Fresh properties of self-compacting concrete.
5. RCPT

**REFERENCE BOOKS:**

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012.
2. Concrete Technology, Shetty M. S., S. Chand and Co., 2006.
3. Concrete Technology by A.R. Santha Kumar, Oxford University Press

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M.TECH.- I YEAR- I SEMESTER  
STRUCTURAL ENGINEERING**

**RESEARCH METHODOLOGY AND IPR**

**Prerequisite:** None

**Course Objectives:**

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

**Course Outcomes:** At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

**UNIT-I:**

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

**UNIT-II:**

Effective literature studies approaches, analysis, Plagiarism, Research ethics

**UNIT-III:**

Effective technical writing, how to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

**UNIT-IV:**

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

**UNIT-V:**

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

**TEXT BOOKS:**

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

**REFERENCES:**

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
7. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M. Tech. (Structural Engineering)**

**ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)**

**Prerequisite:** None

**Course objectives:** Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

**UNIT-I:**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

**UNIT-II:**

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

**UNIT-III:**

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

**UNIT-IV:**

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

**UNIT-V:**

skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

**TEXT BOOKS/ REFERENCES:**

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (Structural Engineering)**

**DISASTER MANAGEMENT (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

**UNIT-I:**

**Introduction:**

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

**Disaster Prone Areas in India:**

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

**UNIT-II:**

**Repercussions of Disasters and Hazards:**

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

**UNIT-III:**

**Disaster Preparedness and Management:**

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

**UNIT-IV:**

**Risk Assessment Disaster Risk:**

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

**UNIT-V:**

**Disaster Mitigation:**

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

**TEXT BOOKS/ REFERENCES:**

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep &Deep Publication Pvt. Ltd., New Delhi.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (Structural Engineering)**

**SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:**

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

**Course Outcomes:** Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

**UNIT-I:**

Alphabets in Sanskrit,

**UNIT-II:**

Past/Present/Future Tense, Simple Sentences

**UNIT-III:**

Order, Introduction of roots,

**UNIT-IV:**

Technical information about Sanskrit Literature

**UNIT-V:**

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

**TEXT BOOKS/ REFERENCES:**

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (Structural Engineering)**

**VALUE EDUCATION (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

**Course outcomes:** Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

**UNIT-I:**

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

**UNIT-II:**

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

**UNIT-III:**

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

**UNIT-IV:**

Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

**UNIT-V:**

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

**TEXT BOOKS/ REFERENCES:**

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (Structural Engineering)**

**CONSTITUTION OF INDIA (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

**Course Outcomes:** Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

**UNIT-I:**

**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble, Salient Features.

**UNIT-II:**

**Contours of Constitutional Rights & Duties:** Fundamental Rights Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

**UNIT-III:**

**Organs of Governance:** Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

**UNIT-IV:**

**Local Administration:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

**UNIT-V:**

**Election Commission:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

**TEXT BOOKS/ REFERENCES:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (Structural Engineering)**

**PEDAGOGY STUDIES (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

**Course Outcomes:** Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

**UNIT-I:**

**Introduction and Methodology:** Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

**UNIT-II:**

**Thematic overview:** Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

**UNIT-III:**

Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

**UNIT-IV:**

**Professional development:** alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

**UNIT-V:**

**Research gaps and future directions:** Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

**TEXT BOOKS/ REFERENCES:**

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.



3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? *International Journal Educational Development*, 33 (3): 272–282.
5. Alexander RJ (2001) *Culture and pedagogy: International comparisons in primary education*. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. [www.pratham.org/images/resource%20working%20paper%202.pdf](http://www.pratham.org/images/resource%20working%20paper%202.pdf).

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD  
M. Tech. (Structural Engineering)**

**STRESS MANAGEMENT BY YOGA (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:**

- To achieve overall health of body and mind
- To overcome stress

**Course Outcomes:** Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

**UNIT-I:**

Definitions of Eight parts of yog. (Ashtanga)

**UNIT-II:**

Yam and Niyam.

**UNIT-III:**

Do`s and Don`ts in life.

- i) Ahinsa, satya, astheya, bramhacharya and aparigraha
- ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

**UNIT-IV:**

Asan and Pranayam

**UNIT-V:**

- i) Various yog poses and their benefits for mind & body
- ii) Regularization of breathing techniques and its effects-Types of pranayam

**TEXT BOOKS/ REFERENCES:**

1. 'Yogic Asanas for Group Training-Part-I': Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (Structural Engineering)**

**PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**  
**(Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:**

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

**Course Outcomes:** Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

**UNIT-I:**

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

**UNIT-II:**

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

**UNIT-III:**

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

**UNIT-IV:**

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

**UNIT-V:**

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

**TEXT BOOKS/ REFERENCES:**

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.