

**COURSE STRUCTURE**

**AND**

**DETAILED SYLLABUS**

**STRUCTURAL ENGINEERING**

For

**M.TECH. TWO YEAR DEGREE COURSE**

(Applicable for the batches admitted from 2022-2023)



**VAAGDEVI COLLEGE OF ENGINEERING**

(Autonomous)

Bollikunta, Warangal – 506 005

Telangana State, India

**VAAGDEVI COLLEGE OF ENGINEERING**

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**M. Tech - STRUCTURAL ENGINEERING****COURSE STRUCTURE**

(R22 Regulations applicable for the batches admitted from Academic Year 2022 - 2023)

**I YEAR I - SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	M22SE01	Advanced Structural Mechanics	3	0	0	3
2.	M22SE02	Theory of Elasticity and Plasticity	3	0	0	3
3.	M22SE14	<b>Professional Elective - I</b> Advanced Reinforced Concrete Design	3	0	0	3
	M22SE15	Structural Stability				
	M22SE16	Structural Optimization				
4.	M22SE17	<b>Professional Elective - II</b> Computer Oriented Numerical Methods	3	0	0	3
	M22SE18	Advanced Structural Steel Design				
	M22SE19	Special Concretes				
5.	M22SE03	Computer Aided Design Laboratory	0	1	2	2
6.	M22SE04	Structural Engineering Laboratory	0	1	2	2
7.	M22SE05	Research Methodology & IPR	2	0	0	2
8.	Audit - I	Audit Course - I	2	0	0	0
<b>Total</b>			<b>16</b>	<b>02</b>	<b>4</b>	<b>18</b>

**I YEAR II –SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	M22SE06	Finite Element Analysis	3	0	0	3
2.	M22SE07	Structural Dynamics	3	0	0	3
3.	M22SE20	<b>Professional Elective - III</b> Design of Bridges	3	0	0	3
	M22SE21	Structural Reliability				
	M22SE22	Design of High-Rise Buildings				
4.	M22SE23	<b>Professional Elective - IV</b> Advanced Prestressed Concrete Design	3	0	0	3
	M22SE24	Structural Health Monitoring				
	M22SE25	Theory of Plates and Shells				
5.	M22SE08	Numerical Analysis Laboratory	0	1	2	2
6.	M22SE09	Advanced Structural Analysis and Design Laboratory	0	1	2	2
7.	M22SE10	Mini Project with Seminar	0	0	4	2
8.	Audit-II	Audit Course - II	2	0	0	0
<b>Total</b>			<b>14</b>	<b>02</b>	<b>8</b>	<b>18</b>

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**M. Tech - STRUCTURAL ENGINEERING****COURSE STRUCTURE**

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**II YEAR I –SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	M22SE26	<b>Professional Elective - V</b> Rehabilitation and Retrofitting of Structures	3	0	0	3
	M22SE27	Design of Pre-Engineered Buildings				
	M22SE28	Earthquake Resistant Design of Structures				
2.	Open Elective	Open Elective	3	0	0	3
3.	M22SE11	Dissertation Work Review - II	0	0	12	6
<b>Total</b>			<b>6</b>	<b>0</b>	<b>12</b>	<b>12</b>

**II YEAR II – SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	M22SE12	Dissertation Work Review - III	0	0	12	6
2.	M22SE13	Dissertation Viva-Voce	0	0	28	14
<b>Total</b>			<b>0</b>	<b>0</b>	<b>40</b>	<b>20</b>

**For Dissertation Work Review – I, please refer 7.10 in R22 Academic Regulations****Audit Course I&II:**

1. M22AC01 - English for Research Paper Writing
2. M22AC02 - Disaster Management
3. M22AC03 - Sanskrit for Technical Knowledge
4. M22AC04 - Value Education
5. M22AC05 - Constitution of India
6. M22AC06 - Pedagogy Studies
7. M22AC07 - Stress Management by yoga
8. M22AC08 - Personality Development through Life Enlightenment Skills

**Open Electives Offered by the Department:**

1. M22SE29 – Green Buildings
2. M22SE30 - Construction Project Management
3. M22SE31 - Safety and Construction Practice Regulations

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**ADVANCED STRUCTURAL MECHANICS****M.Tech - I Year I – Semester**

L	T	P	C
3	0	0	3

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

1. To learn how to calculate static and kinematic indeterminacies of structures
2. To formulate the stiffness matrix for continuous beams, portal frames and trusses
3. To formulate the flexibility matrix for continuous beams, portal frames and trusses
4. To obtain the global stiffness matrix by assembling the element stiffness matrices

**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-Transformation of coordinates - element stiffness matrix - and load vector - local and global coordinates - Assembly of stiffness matrix from element stiffness matrix – Analysis of trusses, beams and frames by stiffness matrix methods

**UNIT - II**

**Direct stiffness method:** General procedure - banded matrix - semi bandwidth - assembly by direct stiffness matrix method-Application of direct stiffness method to trusses, simple and continuous beams and frames

**UNIT - III**

**Flexibility method:** General procedure - assembly by flexibility matrix method-Application of flexibility method to trusses, simple and continuous beams and frames

**UNIT - IV****Advanced Analysis of Beams:**

Curved Beams: Circumferential Stresses in a Curved Beam - Radial Stresses in Curved Beams - Correction of Circumferential Stresses in Curved Beams Having I, T or Similar Cross Sections - Deflections of Curved Beams

Beams on Elastic Foundations - Infinite Beam Subjected to a Concentrated Load: Boundary Conditions - Infinite Beam Subjected to a Distributed Load Segment

**UNIT - V****Unsymmetrical Bending:**

Definition of Shear Center in Bending - Symmetrical and Nonsymmetrical Bending - Bending Stresses in Beams Subjected to Nonsymmetrical Bending - Deflections of Straight Beams Subjected to Nonsymmetrical Bending

**Course Outcomes:** After completion of the course, students should be able to

- CO1: Formulate the stiffness and flexibility matrices for various types of structures
- CO2: Analyze the continuous beams, portal frames and trusses by direct stiffness method
- CO3: Analyze the continuous beams, portal frames and trusses by flexibility method
- CO4: Analyze the unsymmetrical bending of beams and shear centre for different section
- CO5: Analyze various stresses on curved beam and loads on elastic foundations

**TEXTBOOKS:**

1. William Weaver, Jr. James and M. Gere and Weaver, Matrix Analysis of Framed Structures, Third Edition Springer, 1990.
2. Rajasekaran. S and Sankarasubramanian. G, Computational Structural Mechanics, Prentice Hall of India, New Delhi, 2009.
3. A. P. Boresi and R. J. Schmidt, Advanced Mechanics of Materials, John Wiley, current edition, 6<sup>th</sup> Edition, 2002.

**REFERENCES:**

1. Gerhard A. Holzapfel, Nonlinear Solid Mechanics: A Continuum Approach for Engineering, John Wiley & Sons, 2000.
2. Pandit, G.S., and Gupta, S. P., Structural Analysis: A Matrix Approach, Second Edition Tata McGraw – Hill Education, 2008.
3. Devdas Menon, Structural Analysis, Narosa Publishing Housing Pvt Ltd., Second edition, Reprint 2018
4. KU.Muttu, Indeterminate Structural Analysis IK International Publishing House Pvt. Ltd, 2014.

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105106050>

**VAAGDEVI COLLEGE OF ENGINEERING**

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**THEORY OF ELASTICITY AND PLASTICITY****M.Tech - I Year I – Semester**

L	T	P	C
3	0	0	3

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

1. To define stresses, strains, equilibrium and compatibility
2. To derive the governing equilibrium equations in Two-dimensional & in three dimensional problems
3. To understand stress –strain relation ships
4. To apply the concepts of elasticity & Plasticity to solve Structural Engineering problems

**UNIT - I**

**Stress:** Introduction to Elasticity–Definition of Kinetics and Kinematics–Notation for forces and stress – Components of stresses–Stress tensor – Differential equations of equilibrium in 2D&3D in Cartesian coordinates and in polar coordinates - boundary conditions – Cauchy’s postulate – Stress transformation – Direction Cosines -Principal stresses – Stress invariants – Decomposition of stresses-Hydrostatic and Deviatoric stresses – Octahedral stresses – stress concentration factors

**UNIT - II**

**Strain:** Notation for strain - Components of strain – Strain tensor – Strain Components - Strain - displacement relations - Strain Compatibility Conditions - Strain transformation – Direction Cosines - Principal strains – Strain invariants - Octahedral strains – Strain Rosette

**UNIT - III**

**Stress -Strain Relationship:** Navier’s equation for stress-strain relationships – Relationship between Material constants – Stress - strain relations in 2D and 3D – Complementary conditions for shear – Material symmetry-Reduction of Material constants from an isotropic to orthotropic, monoclinic, isotropic and transversely isotropic – Plane stress, Plane strain and axi-symmetric idealizations - Mohr circle in 2D and 3D – Airy’s stress function – Potential function-

**UNIT - IV**

**Solution of 2D and 3D elasticity problems:** Problem solving using stress function approach: Beam bending problems – Symmetric stress distribution problems, Plane problems.

Torsion problems in Elasticity – Membrane analogy approach – Application to non- circular thin walled sections

**UNIT - V**

**Plasticity:** Introduction to plasticity – Yield criteria for pressure dependent and independent materials– Tresca’s criterion – Von mises criterion – Mohr-Coulomb criterion -Rankine criterion -Flow rule – Associative and Non-Associative-Hardening rules and consistency conditions -Introduction to iterative and return mapping.

**Course Outcomes:** After completion of the course, students should be able to

- CO1: Analyze simple problems of elasticity and understanding the basic concepts
- CO2: Apply numerical methods to solve continuum problems
- CO3: Solve engineering problems such as thick cylinders, rotating discs
- CO4: Apply principles of stress function on beams and engineering problems related to Torsion of shafts.
- CO5: Understand various theories of failure and concept of plasticity.

**TEXTBOOKS:**

1. S. Timoshenko and J N Goodier, Theory of Elasticity, 3rd Edition McGraw-Hill, 2017.
2. Sadhu Singh, “Theory of Elasticity”, Khanna Publishers, 1988.
3. C.T. Wang, “Applied Elasticity”, McGraw-Hill Inc., US 1963.

**REFERENCES:**

1. Mohammed Amin, Computation Elasticity, Narosa Publications, 2017.
2. A.I. Lurie, “Theory of Elasticity”, Springer Science, 2005
3. Advanced Mechanics of solids by LSSrinath, 3<sup>rd</sup> Edition, 2017.
4. Elasticity and Plasticity for structural Engineers by Wang &Chen, 1988.

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105105177>

**VAAGDEVI COLLEGE OF ENGINEERING**

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**ADVANCED REINFORCED CONCRETE DESIGN**

(Professional Elective – I)

**M.Tech - I Year I – Semester**

L	T	P	C
3	0	0	3

**Pre-requisites:** Design of Reinforced Concrete Structures**Course Objectives:**

1. To understand the concept of limit state design
2. To understand the various types of loads in current codes of practice for the design
3. To understand the Design concepts of structural elements
4. To analyze and Design advanced structural elements

**UNIT -I**

**Limit state Analysis of R.C. Structures:** Introduction- Loads – Different types of Loads and load combinations – Different methods of Design- Working Stress Method and Limit State Method -- Materials - Characteristic Values – Reliability based methods of design - Partial safety factors –Stress Block Parameters - Plastic hinge, Redistribution of moments, moment rotation characteristics of RC member

**UNIT -II**

**LimitstateofFlexure:**I.S.codeprovisions,loadingpattern,BendingMomentEnvelop,Application for Fixed Beams and Continuous Beams, Deep Beams and Corbels

**UNIT - III**

**Inelastic Analysis of Slabs :**Yield line criterion – Virtual work and equilibrium methods of analysis – For square, circular, Rectangular, Triangular and Hexagonal with simple and continuous end conditions- Reinforcement details-**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**

**Limit state of Shear, Bond and Torsion:** Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond – Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement

**UNIT - V**

**Limit State of Compression:** Design of Short and Long columns - slenderness limits, Methods of Design of Slender Columns, Additional Moment Method, Procedure for Design of Slender Columns.



**Course Outcomes:** After completion of the course, students should be able to

- CO 1: Explain the concept of limit state design
- CO 2: Understand and explain the analysis of various flexure members
- CO 3: Design and Analyze slab using yield line, Ribbed slabs and Flat slabs
- CO 4: Design and analyze members subjected to shear, torsion and bond.
- CO 5: Design and analyze short and slender columns subjected to concentric and eccentric loadings

**TEXT BOOKS:**

1. S. Unnikrishna Pillai & Devdas Menon, “Reinforced Concrete Design” Tata Mc. Graw-Hill Publishing Company Ltd. New Delhi 2010.
2. N. Subramanian, “Design of Reinforced Concrete Structures”, Oxford University Press, 2013.
3. P.C. Varghese, “Advanced Reinforced Concrete” Prentice Hall of India Private Ltd. 2008.

**REFERENCES:**

1. Dr. S. R. Karve and V.L Shah, Limit State Theory and Design of Reinforced Concrete, Standard Publishers, Pune 2004.
2. Arthur H. Nelson, David Darwin, and Charles W. Dolar, Design of concrete structures, Tata Mc. Graw-Hill, 3<sup>rd</sup> Edition, 2005.
3. Kenneth Leet, Reinforced Concrete design, Tata Mc. Graw-Hill International, 2<sup>nd</sup> Edition, 1991
4. IS 456- 2000 Plain and Reinforced concrete book of Practice
5. SP 16 - Design Aids for Reinforced Concrete to IS 456
6. SP 34 - Hand Book as Concrete Reinforcement and Detailing

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105105105>

**VAAGDEVI COLLEGE OF ENGINEERING**  
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**STRUCTURAL STABILITY**  
(Professional Elective – I)

**M.Tech - I Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites:** Strength of Materials I and II, Theory of Elasticity

**Course Objectives:**

1. To derive the differential equations for beam-columns
2. To understand the elastic buckling of bars and frames
3. To understand the Torsional Buckling
4. To analyze lateral buckling of beams and plate

**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.

**Course Outcomes:** After completion of the course, students should be able to

1. Apply the approximate methods based on energy to determine the stability of simple systems
2. Analyze elastic and inelastic buckling for columns
3. Analyze elastic buckling of bars and frames
4. Analyze the beams and plates for lateral torsional buckling
5. Differentiate how the tangent modulus and double modulus theories of inelastic buckling led to the column paradox, thereby preventing further difficulties for a general theory of structures

**TEXT BOOKS:**

1. Timoshenko and Gere, Theory of elastic stability, Tata Mc GrawHill,1981
2. Chem. &Atste, Theory of Beam- Columns Vol I, Mc. GrawHill, 2007
3. Ashwini Kumar, Stability Theory of Structures, Allied publishers Ltd., New Delhi,2003.

**REFERENCE BOOKS:**

1. Alexander Chajes, Principles of Structural Stability Theory, Prentice Hall, New Jersey, 1974.
2. Iyengar, N. G. R., Structural Stability of columns and plates, Eastern west press Pvt.Ltd., 1988.
3. Bleich F. Bucking, Strength of Metal Structures, Tata McGraw Hill, Newyork 2000.

**VAAGDEVI COLLEGE OF ENGINEERING**  
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**STRUCTURAL OPTIMIZATION**  
(Professional Elective – I)

**M.Tech - I Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites:** RCC and numerical methods

**Course Objectives:**

1. To understand the concepts calculus of variation for optimization
2. To perform linear, non-linear and geometric programming methods
3. To understand the applications of mathematical optimization methods to steel and RCC
4. To perform the designs based on frequency constraint

**UNIT – I**

**Introduction:** Simultaneous Failure Mode and Design, Classical External Problems.

**UNIT – II**

**Calculus** of Variation: Variational Principles with Constraints

**UNIT – III**

**Linear Programming,** Integer Programming, Nonlinear Programming, Dynamic Programming,

**UNIT – IV**

**Geometric** Programming and Stochastic Programming.

**UNIT – V**

**Applications:** Structural Steel and Concrete Members, Trusses and Frames.

**Design:** Frequency Constraint, Design of Layouts.

**Course Outcomes:** After completion of the course, students should be able to

- CO1: Identify failure modes and problems to optimize structural element
- CO2: Use Variational principle for optimization
- CO3: Perform linear, non-linear, and dynamic programming methods
- CO4: Obtain optimization using geometric programming methods
- CO5: Design using frequency constraint and apply optimization techniques to structural steel and concrete members

**TEXT BOOKS:**

1. S.S. Rao, Optimization theory & Applications , New Age International, 2009
2. Kalyan Deb, Engineering Optimization, PHI, Second edition, 2012
3. Haftka, Raphael T., Gürdal, Zafer, Elements of Structural Optimization, Springer, 1991

**REFERENCE BOOKS:**

1. Cherkaev Andrej, Variational methods for Structural optimization, Springer, 2000.
2. Kanan & Kumar, Introductory to operation Research, Springer, 2004
3. M.C. Joshi, K.M. Moudgalya, Optimization Techniques theory and practice, Narosa Publications, 2004

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105103210>

**VAAGDEVI COLLEGE OF ENGINEERING**  
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**COMPUTER ORIENTED NUMERICAL METHODS**  
(Professional Elective – II)

**M.Tech - I Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites:** Mathematics I and II

**Course Objectives:**

1. To apply the basic knowledge of Mathematics in Engineering
2. To provide a formidable base for analysis and programming using computer applications
3. To develop the ability in programming and solutions based on the various analysis tools
4. To check the consistency of system of linear equations

**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 - Applications

**UNIT - II:**

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, Fast Fourier Transform (FFT)

Interpolation: Linear Interpolation - Higher order Interpolation - Lagrange Interpolation – Interpolating polynomials using finites 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-Boundaryconditions-Beamdeflection– Solutionofcharacteristicvalueproblems-Richardson’s extrapolation- Use of unevenly spaced pivotal points- Integration formulae by interpolating parabolas- Numerical solution to spatial differential equations.

**UNIT - IV:**

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

Numerical Integration: Method based on interpolation-method based on undetermined coefficient – Gauss – legrange interpolation method- radaua integration method- composite integration method – Double integration using Trapezoidal and Simpson’s method.

**UNIT - V:**

Ordinary Differential Equation: Euler’s method – Backward Euler method – Midpoint method – single step method, Taylor’s series method, Runge-Kutta method Predictor-Corrector Method -Trapezoidal and Midpoint method – Implicit Runge Kutta method – Boundary value problem – Difference method – Shooting method -Structural Engineering Applications

**Course Outcomes:** After completion of the course, students should be able to

- CO1: Evaluate solutions of linear equations by various methods
- CO2: Obtain solutions to different functions by eigen vectors and interpolation
- CO3: Obtain solution by finite difference methods for different boundary conditions
- CO4: Obtain solutions to functions by numerical differentiation and Numerical Integrations
- CO5: Solve ordinary and partial differential equations

**TEXTBOOKS:**

1. Atkinson K. E., An Introduction to Numerical Analysis, J. Wiley and Sons, 1989.
2. Stevan C. Chopra, Raymond P. Canal, Numerical Methods for Engineers, McGraw Hill Book Company. April, 2009.

**REFERENCES:**

1. ScheidF, Theory and Problems of Numerical Analysis, McGraw Hill Book Company, 1988.
2. Sastry S. S, Introductory Methods of Numerical Analysis, Prentice Hall of India, 1998.
3. M. K. Jain - S. R. K.Iyengar, R. K. Jain Numerical Methods for Scientific and Engineering Computations, Willey Eastern Limited, 1985.

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105105043>

**VAAGDEVI COLLEGE OF ENGINEERING**  
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**ADVANCED STRUCTURAL STEEL DESIGN**  
(Professional Elective – II)

M.Tech - I Year I – Semester

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites:** Design of Steel Structures & Structural Analysis**Course Objectives:**

1. To analyze bolted and welded eccentric connections
2. To sketch the Influence line diagrams for truss members
3. To estimate the various types of loads such as Dead, Live and Wind loads on roof trusses
4. To determine the shape factor and define the theorems of plastic analysis

**UNIT - I**

**Simple Connections – Bolted Pinned And Welded Connections:** Bolted Connections – Load Transfer Mechanism – Failure of Bolted Joints – Specifications for Bolted Joints – Bearing – Type Connections – Tensile Strength of Plate – Strength and Efficiency of the Joint – Combined Shear and Tension – Slip-Critical connections – Prying Action – Combined Shear and Tension for Slip-Critical Connections. Design of Groove Welds - Design of Fillet Welds – Design of Intermittent Fillet Welds – Failure of Welds.

**UNIT - II****Plastic Analysis:**

Introduction – Plastic Theory – Plastic neutral Axis plastic moment, Elastic & Plastic Section moduli shape factors plastic Hinge – Fundamental condition conditions in plastic analysis, methods of plastic analysis–collapse load–simply supported, propped cantilever beam, fixed beams continuous beams, portal frame single bay single storey portal frame at different level subjected to vertical and horizontal loads.

**UNIT - III**

**Eccentric and Moment Connections:** Introduction – Beams – Column Connections – Connections Subjected to Eccentric Shear – Bolted Framed Connections – Bolted Seat Connections – Bolted Bracket Connections. Bolted Moment Connections – Welded Framed Connections – Welded Bracket Connections – Moment Resistant Connections.

**UNIT - IV****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 - V**

**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 ontruss girder Bridges; wind effect on top lateral bracing; bottom lateral bracing; portal Bracing; sway bracing Design of Lacing.

**Course Outcomes:** After completion of the course, students should be able to

CO1: Recognize the design philosophy of steel structures and connections.

CO2: Determine the collapse loads for beams and portal frames

CO3: Design the simple, eccentric and moment connections

CO4: Design the truss members subjected to tension, compression

CO5: Estimate the various types of loads such as Dead, Live and Wind loads onPEB's

**TEXTBOOKS:**

1. Galyord and Gaylord , Design of Steel Structures, Tata Mc Graw Hill Education.Edition 2012.
2. Duggal S.K., “Design of Steel Structures”, Tata McGraw Hill Publishing, 3<sup>rd</sup> Edition, 2019
3. Bhavikatti S.S, “Design of Steel Structures”, Dreamtech Press, 3<sup>rd</sup> Edition, 2019
4. P.Dayaratnam, Design of Steel Structures, S. Chand, Edition2011-12.
5. Dr. Ramachandra and Vivendra,Design Steel Structures Volume – II, Gehlot Scientific Publishes JournalsDepartment, 2012.

**REFERENCES:**

1. Limitstate Design of Steel Structures by N.Subramanian, 2018.
2. Limit State Design of Steel Structures S.K. Duggal Mc Graw Hill Education Private Ltd. New Delhi, 2020.
3. Indian Standard Code – IS –800-2007.
4. Indian Standard Code – IS – 875 – Part III –2015

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105/105/105105162/>
2. <https://nptel.ac.in/courses/105/106/105106112/>

**VAAGDEVI COLLEGE OF ENGINEERING**  
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**SPECIAL CONCRETES**  
(Professional Elective – II)

**M.Tech - I Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites:** Concrete Technology

**Course Objectives:**

1. To determine the properties of concrete ingredients i.e., cement, sand, coarse aggregate by conducting different tests and decide the suitability
2. To recognize the effects of the rheology and early age properties of concrete on its long term behavior
3. To design economic concrete mix proportions for the given exposure conditions and with the available materials, for the desired strength and performance criteria
4. To use advanced techniques for Service Life assessment of Concrete Structures

**UNIT - I**

**Fresh and Hardened Concrete:** Fresh concrete - Workability tests on concrete- Workability tests on Self Compacting Concretes-segregation and bleeding. Hardened Concrete- Abram'slaw-Gel-space ratio - Maturity concept - Stress Strain behavior, Creep and Shrinkage.

**UNIT - II**

**High Performance and High Strength Concretes:** High performance concrete - Requirements and properties of high-performance concrete - Design considerations – High strength concrete – Design considerations.

**UNIT -III**

**Advanced Concrete Design:** Light weight concrete - Self Compacting concrete - Polymer concrete - Fiber reinforced concrete – Reactive powder concrete - Bacterial concrete-Geo-polymer concrete – Requirements and guidelines- Advantages and Applications – Porous pavement – White Topping – Roller compacted concrete

**UNIT -IV**

**Concrete Mix Design:** Quality control - Quality assurance - Quality audit - Mix design by various methods - BIS method - DOE method - ACI method –Erntroy& Shacklock’s method.

**UNIT - V**

**Performance Evaluation of Reinforced Concrete Structures:** Durability of concrete & Corrosion tests - Resistivity of concrete - Half Cell Potential - Rapid Chloride Penetration Test - Macro cell Corrosion - Effects of concrete exposed to acidic environment - Durability Factor - Accelerated CorrosionCrackingTest-Non-destructiveevaluationofconcretestructures-UltrasonicPulseVelocity-Evaluation of Dynamic Shear & Young’s Modulus - Introduction to XRD & SEMAnalysis.

**Course Outcomes:** After completion of the course, students should be able to

CO1: Understand the fresh and hardened properties of concrete

CO2: Design an appropriate economic cementitious composite based on the performance requirements of HPC and HSC

CO3: Determine the characteristics of concrete making materials and decide its suitability

CO4: Develop mix proportions using various methods

CO5: Assess the service life of an existing structure through determining the mechanical, durability and the current state of corrosion of reinforcement in concrete

**TEXT BOOKS:**

1. A. M. Neville, Properties of Concrete, Pearson Education, 2010.
2. P. K. Mehta and Paulo J. M. Monteiro, Concrete Microstructure, Properties and Materials, McGrawHill, 2016
3. Shan Somayaji, Civil Engineering Materials Pearson Publishers, 2000

**REFERENCES:**

1. P. Schiessl, Corrosion of Steel in Concrete, Chapman & Hall, 1988.
2. Sandor Popovics, Concrete Making Materials, Hemisphere Publishing Corporation, 1979.
3. Mark Alexander & Sydney Mindess, Aggregates in Concrete, Taylor & Francis, 2005
4. Andrzej M. Brandt, Cement Based Composites, 2005

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105104206>

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**COMPUTER AIDED DESIGN LABORATORY**

**M.Tech - I Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>

**Pre-Requisites:** Computer Aided Civil Engineering Drawing, Microsoft Excel, Structural Analysis-1&2

**Course Objectives:** The objectives of the course are to

1. Learn the usage of any fundamental software for design
2. Create geometries using pre-processor
3. Analyze and Interpret the results using post processor
4. Design the structural elements

**List of Experiments:**

1. Analysis and design of determinate and indeterminate beams & development of Excel template
2. Analysis and design of plane frames and development of Excel template.
3. Analysis and design of space frame and development of Excel template
4. Analysis and design of a multi-storeyed building subjected to DL, LL and WL
5. Analysis and design of multi-storeyed building subjected to DL, LL and EQ
6. Analysis and design of Roof trusses including WL calculation in Excel Spreadsheet
7. Analysis and design of Gantry girder and development of spreadsheet

**Course Outcomes:** After the completion of the course student should be able to

- CO 1: Model the geometry of real world structure Represent the physical model of structural element structure
- CO 2: Perform analysis of multistorey buildings and roof trusses
- CO 3: Interpret from the Post processing results
- CO 4: Design the structural elements and system as per IS Codes

**REFERENCE BOOKS:**

1. A K Jain, Advanced Structural Analysis, Nem Chand & Bros, Revised Edition 2006.
2. D. Menon, Advanced Structural Analysis, Narosa Publication, Revised Edition 2020.

**VAAGDEVI COLLEGE OF ENGINEERING**  
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**STRUCTURAL ENGINEERING LABORATORY**

**M.Tech - I Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>

**Pre-requisites:** Concrete Technology

**Course Objectives:**

1. To understand the behavior of cementitious composite systems inclusive of the effects of particulate and fibrous ingredients
2. To analyze and evaluate the performance of structural elements in the laboratory and field
3. To decide upon the type of material to be used for a particular exposure condition
4. To evaluate parameters required to determine the service life of structures

**List of Experiments:**

**A. Tests on following fresh concretes**

1. Self Compacting Concrete- Mix Design, Workability tests, Material characterization of ingredients (Specific gravity test, Water absorption test, Gradation Analysis, Tests on setting time)
2. High Strength Concrete- Mix Design, Workability tests, Material characterization of ingredients (Specific gravity test, Water absorption test, Gradation Analysis, Tests on setting time)
3. Normal Strength Concrete- Mix Design, Workability tests, Material characterization of ingredients (Specific gravity test, Water absorption test, Gradation Analysis, Tests on setting time)

**B. Tests on Hardened Concrete:**

1. Compression test on High strength Concrete Cubes and Cylinders
2. Flexure tests on Normal and High Strength Concrete
3. Study of stress and strain characteristics of concrete and determination of Young's modulus and Poisson's ratio.

**C. Durability Tests:**

1. Water Permeability
2. Rapid Chloride Permeability Test
3. Carbonation test
4. Half-cell potential test

**D. Non-Destructive testing of concrete** using Rebound hammer & Ultrasonic pulse velocity

**Course Outcomes:** After completion of the course, students should be able to

CO1:Design normal and special concretes and evaluate the parameters affecting its performance

CO2:Conduct Non-Destructive Tests on existing concrete structures

CO3: Apply engineering principles to understand mechanical and durability characteristics of structural elements

CO4:Evaluate the corrosion characteristics through various tests

**REFERENCE BOOKS:**

1. Neville A. M., Properties of Concrete, Prentice Hall, 5th Edition, 2012.
2. Shetty M. S.,Concrete Technology, S. Chand and Co.,2006.
3. A.R. Santhakumar, Concrete Technology,Oxford University Press, 2018

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**RESEARCH METHODOLOGY AND IPR**

**M.Tech - I Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**Course Objectives:**

1. To understand the research problem
2. To know the literature studies, plagiarism and ethics
3. To get the knowledge about technical writing
4. To analyze the nature of intellectual property rights and new developments
5. To know the patent rights

**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.

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

- CO 1: Follow research ethics and research problem formulation
- CO 2: Understand that today's world is controlled by Computer, Information Technology, But tomorrow world will be ruled by ideas, concept, and creativity.
- CO 3: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering  
In particular.
- CO 4: 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.
- CO 5: Analyze research related information

**TEXT BOOKS:**

1. C.R Kothari, "Research Methodology, Methods & Technique", New Age International Publishers, 2004.
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011.
3. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", Aspen Publishers, 2016.

**REFERENCE BOOKS:**

1. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.
2. Satarkar, S.V., "Intellectual property rights and copy right". ESS Publications, 2000.
3. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
4. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.

**ONLINE RESOURCES:**

1. [https://onlinecourses.nptel.ac.in/noc22\\_ge08/preview](https://onlinecourses.nptel.ac.in/noc22_ge08/preview)



**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**FINITE ELEMENT ANALYSIS**

**M.Tech - I Year II – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites:** Structural Analysis I and II, Theory of Elasticity

**Course Objectives:** The objectives of this course is to impart knowledge of

1. About the fundamentals of domain discretization, interpolation, application of boundary conditions, assembly of global matrices, and solution of the resulting algebraic systems.
2. Understand the core concepts of variational and weighted residual methods in FEM.
3. Derive the element stiffness matrix for 1-D, 2-D and 3-D problems.
4. Formulate the simple structural problems in to finite elements.

**UNIT – I**

**Introduction to FEM:** Types of Problems – Types of Materials – Elastic / Inelastic situations – Types of forces: Body forces / Surface Traction / Point loads – Deformable bodies – Types of Deformations – Homogeneous / Non homogeneous Problems – Equations of equilibrium for elastic 2-D / 3-D continua - Equilibrium equations for 2-D / 3-D boundary elements – Boundary conditions – Strain-displacement relation for 2-D / 3-D – Stress-strain relation for 2-D / 3-D – Plane stress / Plane strain problems.

**Virtual Work Formulation:** Application to problems of plane trusses with static indeterminacy not exceeding three.

**UNIT – II**

**Variational Formulation:** Approximate methods of Analysis - Weighted residual method - Rayleigh-Ritz Method - Strong form weak form - Variational principle - Stationarity Functional or Differential equation **Finite element formulation for 1-D problems:** Minimum Potential Energy Approach, weak form approach, introduction to natural coordinates - Finite element approximations in one dimension - Lagrangian approximation - Hermitian approximations, FE formulation for Axial bar, Euler Bernoulli beam - Numerical Examples

**Finite element formulation for 2-D problems:** FE Approximation in 2-Dimension, Pascals triangle, Convergence criterion, Compatible and incompatible elements, **FE Formulation** for plane stress, plane strain and Axi-symmetrical problems, Shape functions for 2-Dimensional CST Element - 4 noded quadrilateral element - Higher order triangular and rectangular elements - Consistent Nodal load vector - Numerical Examples

**UNIT – III**

**Iso-parametric elements:**

**Quadrilateral elements: FE Formulation for linear and quadratic isoparametric elements-** Construction of shape functions using natural coordinates / Strain-displacement matrices / Load matrices for body force and surface traction / Expressions for stiffness matrix, load matrices for 4-noded quadrilateral elements / Gauss Quadrature of numerical integration / Problems with rectangular elements, kinematic indeterminacy not exceeding three - Determination of shape functions for 2nd order quadrilateral elements and for elements of with serendipity / Strain-displacement matrices / Load matrices for body force and surface traction.

**UNIT – IV**

**Finite element formulation for 3 -D elements:** FE Formulation for Tetrahedral and Hexahedral elements: Volume coordinates, Strain-displacement matrix, stiffness matrix, load matrices due to body force and surface traction/introduction to Hexahedron (brick) elements Galerkin's Method of Weighted Residuals – Application to problems of mathematics / structural engineering, number of trial functions not exceeding two. Weak form of Trial Function-Application to problems of mathematics/structural engineering, number of elements limited to two-Strain-displacement relationship/stress-strain relationship/determination of stiffness matrix for 3-noded ring element and load matrices for body force and surface traction/ Problems with kinematic indeterminacy not exceeding three for 3-noded ring elements only

**UNIT – V**

**Numerical examples:** Simple 1-D model, 2-D model and a 3-D model analysis and post processing of the results using commercially available FEA software and available codes.

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

- CO1: Understand the fundamental concepts of the Finite Element Method (FEM).
- CO2: Make use of shape function and interpolation function to study structural behavior.
- CO3: Apply linear and quadratic elements in the finite element analysis of various types of structures.
- CO4: Gain knowledge on basic concept on non linear analysis
- CO5: Learn and apply finite element solutions to various solid mechanics problems.

**TEXT BOOKS:**

1. David V. Hutton, Fundamentals of Finite Element Analysis, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2005
2. Reddy, J. N, An Introduction to the Finite Element Method, McGraw Hill, New York. 1993
3. Cook, R.D., Concepts and Application of Finite Element Analysis, John Wiley and Sons. 1981
4. Zienkiewicz, O.C. and Taylor, R.L, The Finite Element Method, Vol. 1, McGraw Hill Company Limited, London, 1989

**REFERENCES:**

1. Chandrupatla, T. R. And Belegundu, A. D, Introduction to Finite Elements in Engineering, Prentice Hall of India, New Delhi, 2001
2. Seshu, P, Finite Element Analysis, Prentice Hall of India Private Limited, New Delhi, 2003
3. Bathe, K. J, Finite Element Procedures, Prentice Hall of India, New Delhi, 2006
4. Seshu, "Textbook of Finite Element Analysis", 1<sup>st</sup> Edition, PHI, 2009.

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/112104193>

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**STRUCTURAL DYNAMICS**

**M.Tech - I Year II – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisites:** Structural Analysis I, Mathematics I and II

**Course Objectives:**

1. To know the fundamental concepts and theory of dynamic analysis
2. To understand the free vibrations concepts and the problem of determining the natural frequency of a system
3. To understand the free vibrations concepts of harmonically excited vibrations
4. To understand the free Vibrations of Multi -degree of freedom

**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. – 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.

**UNIT - II**

**Single Degree of Freedom Systems:** Free vibrations of single degree of freedom system-undamped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration of SDOF systems - Half Power (Band-Width) Method-Harmonic excitation - Vibration Isolation – Response to support motion-Force transmitted to the foundation-Transmissibility-Dynamic magnification factor – Phase angle.

**Response to General Dynamic Loading** – Duhamel’s Integral-Constant Force, Rectangular load, Triangular load, Response to Periodic loading-Fourier series expression of periodic loading-Response to Fourier series loading

**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.

**UNIT - V**

**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.

**Course Outcomes:** After completion of the course, students should be able to

CO1: Understand the fundamental concepts of SDOF and MDOF systems.

CO2: Characterize the dynamic properties of a structure for various dynamics systems.

CO3: Calculate the natural frequency of a system using equilibrium or energy methods.

CO4: Determine the effect of viscous damping on the response of a freely vibrating system.

CO5: Extract and analyze the natural frequencies and mode shapes of discrete and continuous vibratory systems

**TEXT BOOKS:**

1. Anil K. Chopra, Dynamics of Structures, Pearson Education, Delhi, 2007.
2. Clough & Penzien, Dynamics of Structures, McGraw Hill, New York, 1983.
3. Mario Paz, Structural Dynamics C.B.S Publishers, New Delhi, 2006.

**REFERENCES:**

1. Ray W. Clough & Joseph Penzien, Dynamics of Structures, Second Edition, CBS Publishers & Distributors, 1975.
2. W.T. Thomson, Theory of Vibrations, Pearson, 2008.
3. Roy. R. Craig, Fundamentals of Structural Dynamics, John Wiley & Sons, 2006.
4. I.S: 1893 - 1984, "Code of practice for Earthquake resistant design of Structures"

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105106151>

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**DESIGN OF BRIDGES**  
(Professional Elective – III)

M.Tech - I Year II – Semester

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisites:** Structural Analysis I &II, Reinforced Concrete Design**Course Objectives:**

1. To understand the bridge hydrology
2. To list the components of bridge substructure, superstructure and types of bearings
3. To understand the codal provisions for loading and design standards of bridges
4. To design RC and PSC bridges

**UNIT - I**

Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading-Dead load- live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinal forces-Seismic loads- Frictional resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements.

Solid slab Bridges: Introduction-Method of Analysis and Design.

**UNIT - II**

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

**UNIT - III**

Box Culverts: - Single Cell Box Culvert – Design Loads, Design Moments, Shears and Thrusts. Design of Critical sections.

**UNIT - IV**

Pre-Stressed Concrete Bridges: Basic principles-General Design requirements-Mild steel reinforcement in prestressed concrete member-Concrete cover and spacing of prestressing steel-Slender beams- Composite Section-Propped-Design of Propped Composite Section-Unpropped composite section- Two-stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges.

**UNIT - V**

Sub-structure of bridges: Substructure- Beds block-Piers- Pier Dimensions- Design loads for piers- Abutments- Design loads for Abutments.

**Course Outcomes:** After completion of the course, students should be able to

- CO1: Determine flood discharge, waterway, economic span in concrete bridges
- CO2: Analyze and design RCC girder bridges
- CO3: Analyze and design Box Culverts
- CO4: Analyze and design Pre-stressed concrete bridges
- CO5: Select type of super structure, sub structure and the bearings

**TEXT BOOKS:**

1. V. N. Vazirani and M. M.Ratwani,Design of Concrete Bridges,1995.
2. T.R. Jagadeesh & M.A. Jayaram, Design of Bridge Structures, PHI, 2<sup>nd</sup> Edition, 2009.
3. V. K.Raina, Concrete Bridge Design and Practice 5<sup>th</sup> Edition, 2014.

**REFERENCES:**

1. E. C.Hambly, Bridge Deck Behaviour,CRC Press 1991.
2. Johnson Victor, Essentials of Bridge Engineering, Oxford &IBH, 2019.
3. V. V. Sastry, Design of Bridges, Dhanpat Rai &Co, 2012

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105105165>
2. <https://nptel.ac.in/courses/105105216>

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**STRUCTURAL RELIABILITY**  
(Professional Elective – III)

**M.Tech - I Year II – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites:** Mathematics I and II, Concrete Technology

**Course Objectives:**

1. To acquire basic knowledge of Statistics and Probability Theory
2. To understand resistance distribution and parameters
3. To develop the ability to do computation of structural reliability
4. To understand reliability design criteria

**UNIT - I**

**Concepts of Structural Safety:** General - Design methods- Basic Statistics: Introduction - Data reduction – Histograms - Sample correlation - Probability Theory: Introduction, Random events - Random variables - Functions of random variables - Moments and expectation - common probability distribution - Extremal distribution.

**UNIT - II**

**Resistance Distributions and Parameters:** Introduction - Statistics of properties of concrete, steel, strength of bricks and mortar - dimensional variations - characterization of variables - Allowable stresses based on specified reliability.

**UNIT - III**

**Basic Structural Reliability:** Introduction - Computation of Structural reliability- Monte Carlo Study of Structural Safety: General- Monte Carlo method - Applications.

**UNIT - IV**

**Reliability Methods:** Introduction - Basic variables and failure surface - First-order second-moment methods (FOSM)

**UNIT - V**

**Reliability Based Design:** Introduction - Determination of partial safety factors - Safety checking formats - Development of reliability-based design criteria - Optimal safety factors - Summary of results of study for Indian standard – RCC Design.

**Course Outcomes:** After completion of the course, students should be able to

- CO1: Understand Basics of Statistics and explain Probability Theory
- CO2: Characterize the dimensional variations of materials
- CO3: Explain and apply Monte Carlo method
- CO4: Understand the concept of reliability methods
- CO5: Develop reliability-based designs

**TEXT BOOKS:**

1. R. Ranganathan, Structural Reliability Analysis and Design, Jaico Publishing House,2006.
2. R.E. Melchers, Structural Reliability – Analysis & Prediction, 2/e, Wiley – Blackwell,1999.

**REFERENCES:**

1. Maurice Lemaire, Structural Reliability, Wiley(2009).
2. Dan M. Frangopol, Mitsuo Kawatani&Chul-Woo Kim, Reliability and Optimization of Structural Systems, Taylor & Francis(2006)

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105103140>



**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**DESIGN OF HIGH-RISE BUILDINGS**  
(Professional Elective – III)

**M.Tech - I Year II – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites:** Structural Analysis I and II, Structural Dynamics

**Course Objectives:**

1. To understand the design aspects of Transmission Towers and Masts
2. To understand the analysis and design of Steel and RC Chimneys
3. To develop through understanding of the loading and structural forms of Tall Buildings
4. To understand the modelling for analysis of Tall Buildings

**UNIT - I**

**Loading and Design Principles:** Loading- sequential loading, Gravity loading, Wind loading, Earthquake loading, - Equivalent lateral force, modal analysis - combination of loading, – Static and Dynamic approach - Analytical and wind tunnel experimental methods - Design philosophy - working stress method, limit state method and plastic design.

**UNIT - II**

**Behaviour of Various Structural Systems:** Factors affecting growth, height and structural form. High rise behaviour, Rigid Frames, braced frames, In filled frames, shear walls, coupled shear walls, wall- frames, tubulars, cores, outrigger - braced and hybrid mega systems.

**UNIT - III**

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

**UNIT - IV**

**Structural Elements:** Sectional shapes, properties and resisting capacity, design, deflection, cracking, prestressing, shear flow, Design for differential movement, creep and shrinkage effects, temperature effects and fire resistance.

**UNIT - V**

**Stability of Tall Buildings:** Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

**Course Outcomes:** After completion of the course, students should be able to

1. Understand various loadings and structural forms of Tall Buildings
2. Understand the behaviour of various structural systems
3. Analysis tall buildings subject and perform modal analysis
4. Design structural elements subjected to collapse and service loads
5. Perform non linear analysis on tall buildings

**TEXT BOOKS:**

1. Taranath B.S., “Structural Analysis and Design of Tall Buildings”, McGraw Hill,1988.
2. Beedle.L.S., “Advances in Tall Buildings”, CBS Publishers and Distributors, Delhi,1986.
3. BryanStaffordSmithandAlexcoull,“TallBuildingStructures-AnalysisandDesign”,JohnWiley and Sons, Inc., 2005.

**REFERENCES:**

1. Gupta.Y.P, Proceedings of National Seminar on High Rise Structures - Design and ConstructionPracticesforMiddleLevelCities,NewAgeInternationalLimited,NewDelhi,1995.
2. Lin T.Y and Stotes Burry D, “Structural Concepts and systems for Architects and Engineers”, John Wiley,1988.

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**ADVANCED PRESTRESSED CONCRETE DESIGN**  
(Professional Elective – IV)

**M.Tech - I Year II – Semester**

L	T	P	C
3	0	0	3

**Pre-requisites:** Design of Reinforced Concrete Structures

**Course Objectives:**

1. To critically review the techniques of pre-stressing both Pre-tensioning and Post-tensioning
2. To design the pre-stressed concrete members for ultimate limit state and limit state of serviceability
3. To realize the importance of the Statically Indeterminate structures and Load Balancing•
4. To analyze and design continuous pre-stressed concrete beams with bent cables having straight and parabolic profiles

**UNIT I:**

**Introduction** – Prestressing Systems – Pretensioning Systems – Post-tensioning Systems – High Strength Steel and Concrete - Analysis of Prestress - Resultant Stresses at a Section – Pressure Line or Thrust Line – Concept of Load Balancing .

**Losses of Prestress** – Loss Due to Elastic Deformation of Concrete – Shrinkage of Concrete – Creep - Relaxation of Stress in Steel – Friction – Anchorage Slip.

**UNIT II:**

**Deflections of prestressed concrete members:** Importance of Control of Deflections – Factors Influencing Deflection – Short-term Deflections of Uncracked Members – Prediction of Long-time Deflections – Deflections of Cracked Members – Requirements of IS 1343-2012.

**Ultimate Flexural Strength of Beams:** Introduction, Flexural theory using first principles – Simplified Methods – Ultimate Moment of Resistance of untensioned Steel.

**UNIT III:**

**Composite constructions:** Introduction, Advantages, Types of Composite Construction, Analysis of Composite beams- Differential shrinkage- Ultimate Flexural and shear strength of composite sections- Deflection of Composite Beams. Design of Composite sections.

**UNIT IV:**

**Prestressed concrete slabs:** Types Of Prestressed Concrete Floor Slabs- Design of Prestressed Concrete One Way and Two Way Slabs.

**Prestressed Concrete Pipes:** Circular prestressing- Types of Prestressed Concrete Pipes- Design of Prestressed Concrete Pipes.

**UNIT V:**

**Continuous beams:** Advantage of Continuous Members – Effect of Prestressing Indeterminate Structures – Methods of Achieving Continuity – Methods of Analysis of Secondary Moments – Concordant Cable Profile – Guyon’s Theorem, Redistribution of moments in a continuous beam.

**Anchorage Zone Stresses in Beams:** Introduction, Stress distribution in End Block – Anchorage zone stresses –Magnel’s method- Guyon’s Method - Anchorage zone Reinforcement as per IS1343-2012.

**Course Outcomes:** After completion of the course, students should be able to

- CO1: To understand principles of pre-stressing, including materials systems of pre-stressing, structural behaviour, advantages, losses of pre-stress.
- CO2: Analyze and design prestressed flexure members, horizontal and vertical shear in prestressed members
- CO3: Study the behaviour of composite constructions under prestressing
- CO4: Realize importance of prestressing long span structures and heavily loaded members.
- CO5: Develop skills in planning, analysis and design of prestressed concrete beams and slabs.

**TEXTBOOKS:**

1. Krishna Raju, Prestressed Concrete, TataMcGrawHillBook–Co.,5<sup>th</sup> Edition, New Delhi, 2019.
2. T.Y.Linand Burn, Design of Prestress Concrete Structures, John Wiley,NewYork, 2014.
3. N. Rajagopalan, Prestressed Concrete, Narosa Publishing House, 2010.

**REFERENCES:**

1. K. U. Muthu, Prestressed concrete, PHI Learning Pvt.Ltd, 2015
2. Lin T. Yand Burns, Design of prestressed concrete structure, Asia Publication house, 1995.
3. Gutan Y, Limit state design of prestressed concrete, Applied science publishers,1972.
4. IS:1343-2012- Code of practice for Prestressedconcrete

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105106118>

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**STRUCTURAL HEALTH MONITORING**  
(Professional Elective –IV)

**M.Tech - I Year II – Semester**

L	T	P	C
3	0	0	3

**Pre-requisites:** Advanced Concrete Technology

**Course Objectives:**

1. To understand the concepts of health monitoring
2. To assess the structural health of the structures using static and dynamic field methods
3. To suggest the possible repair and rehabilitation methods

**UNIT – I**

**Structural Health:** Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.

**UNIT – II**

**Structural Health Monitoring:** Concepts, Various Measures, Structural Safety in Alteration.  
**Structural Audit:** Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

**UNIT – III**

**Static Field Testing:** Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

**UNIT – IV**

**Dynamic Field Testing:** Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

**UNIT – V**

**Introduction to Repairs and Rehabilitations of Structures:** Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

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

- CO1: Acquire knowledge on structural health
- CO2: Diagnosis the distress in the structure understanding the causes and factors.
- CO3: Assess the health of structure using static field methods.
- CO4: Assess the health of structure using dynamic field tests.
- CO5: Suggest repairs and rehabilitation measures of the structure

**TEXT BOOKS:**

1. Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes Structural Health Monitoring, , John Wiley and Sons,2006
2. Douglas E Adams, Health Monitoring of Structural Materials and Components Methods with Applications, John Wiley and Sons,2007.
3. J. P.Ou,H.Liand Z.D.Duan, Structural Health Monitoring and Intelligent Infrastructure, Vol 1, Taylor and Francis Group, London, UK,2006.

**REFERENCES:**

1. Victor Giurgutiu, Structural Health Monitoring with Wafer Active Sensors, Academic PressInc, 2007.

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/114106046>

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**THEORY OF PLATES AND SHELLS**  
(Professional Elective – IV)

**M.Tech - I Year II – Semester**

L	T	P	C
3	0	0	3

**Pre-requisites:** Theory of Elasticity, Structural Analysis I and II

**Course Objectives:**

1. To understand the behavior of Rectangular and circular Plates subjected to various loading
2. To understand the behavior of various types of Shells subjected to various loading
3. To study the analysis procedures for plates and shells
4. To study the analysis of 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.

**Course Outcomes:** After completion of the course, students should be able to

- CO1: Use analytical methods for the solution of thin plates and shells
- CO2: Analyze plates under different boundary connections by various classical methods.
- CO3: Analyze circular plates for various loading conditions
- CO4: Apply the numerical techniques and tools for the complex problems in shells
- CO5: Apply principles of double curvature on various elements like paraboids and axi-symmetric shells

**TEXTBOOKS:**

1. Timoshenko and Krieger, Theory of Plates and Shells, 2<sup>nd</sup> Edition, Tata McGraw Hill, 2010.
2. AnselC.Ugural, Stresses in plate and shells, McGraw Hill International Edition, 1999.
3. Bairagi, Plate Analysis, Khanna Publishers, 1996.

**REFERENCES:**

1. G. S. Ramaswami, Analysis and design of concrete shell roofs, CBS publications, 2005.
2. Bulson.P.S., "Stability Of Flat Plates., American Elsevier Publisher. Co.,1969.
3. Chandrashekhara, K. Theory of Plates, University Press (India) Ltd., Hyderabad, 2001.
4. Reddy J N, "Theory and Analysis of Elastic Plates and Shells", McGraw Hill, 2006.

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105103209>



**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**NUMERICAL ANALYSIS LABORATORY**

**M.Tech - I Year II – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>

**Pre-requisites:** Mathematics I and II

**Course Objectives:**

1. To solve a system of linear and non-linear equations
2. To draw best fit curve for the given dataset
3. To find numerical solutions by FDM and FEM
4. To solve ordinary and partial differential equations numerically

**LIST OF EXPERIMENTS:**

1. Overview of MATLAB, Matrix operations (Addition, Subtraction, Multiplication, Transpose)
2. Solution of simultaneous equations using matrix in version–Resolution of forces and moments and finding the reactions on a beam.
3. Solution of system of linear equations using Gauss Elimination method - Application to the analysis of indeterminate beams
4. Solution of System of linear equations using Gauss Seida iteration Method– Application to the analysis of portal frames
5. Finding the Roots of non-linear equations using Newton – Raphson Method - Application for finding the slopes and deflections in determinate beams
6. Finding the Solution of an Eigen Value problem – Application to a multistory RC building for determining the Time periods and Mode shapes.
7. Numerical Integration using Trapezoidal & Simpson’s Rule – Application for finding the Areas and Volumes of a given plot.
8. Numerical solution of ordinary differential equations by Runge- Kutta method
9. Numerical solution of second and higher order differential equations
10. Plotting Simple Graphs, Basic 2D Plots, 3DPlots

**Course Outcomes:** After completion of the course, students should be able to

- CO1: Analyze the beams by solving a system of equations
- CO2: Generate the best fit curves, Sketch the basic 2D, 3Dplots
- CO3: Apply the concepts of FDM and FEM to solve Structural Engineering Problems
- CO4: Solve the ODE and PDE and apply to the Structural Engineering Problems

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**ADVANCED STRUCTURAL ANALYSIS AND DESIGN LABORATORY**

**M.Tech - I Year II – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>

**Pre-requisites:** RCC and Steel design

**Course Objectives:**

1. To model the beams, frames and trusses
2. To analyze the beams, frames and trusses
3. To interpret the results from post processing

**List of Experiments**

1. Analysis of a Bridge Deck by Grillage Analogy
2. Analysis and Design of a PEB Structure
3. Analysis and design of a Gantry Girder
4. Analysis and design of a High Rise Multi storied Building
5. Analysis and design of a High rise Multi storey Building with shear wall
6. Analysis and design of a High rise Multi storey Building with Flat Slab System
7. Analysis and design of Flat Slab Raft foundation
8. Analysis and design of Beam Slab Raft foundation

**Course Outcomes:** After completion of the course, students should be able to

CO1: Analyze the Beams, Portal Frames and Trusses

CO2: Analyze and Design of Multistory RC Buildings for various loads

CO3: Analyze and Design of PEB components

CO4: Analyse and design raft foundations

**REFERENCE BOOKS:**

1. A K Jain, Advanced Structural Analysis, Nem Chand & Bros, Revised Edition 2006.
2. D. Menon, Advanced Structural Analysis, Narosa Publication, Revised Edition 2020.

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**REHABILITATION AND RETROFITTING OF STRUCTURES**  
(Professional Elective – V)

**M.Tech - II Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisites:** Reinforced Concrete Design, Steel Design, Concrete Technology

**Course Objectives:**

1. To impart knowledge about different types of distress in structures
2. Testing the structures for the deterioration of structures
3. Testing the structures for the diagnosis of defects and different types of repairing methods.

**UNIT – I**

Introduction – Definition of Repair, Retrofitting, Strengthening and rehabilitation, Deterioration of Structures – Distress in Structures – Causes and Prevention, Mechanism of Damage – Types of Damage, Physical and Chemical Causes of deterioration of concrete structures, Evaluation of structural damages to the concrete structural elements due to earthquake

**UNIT – II**

**Corrosion of Steel Reinforcement** – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation, Damage Assessment -, Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive and semi destructive testing systems -Influence on Serviceability and Durability- Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection.

**UNIT – III**

**Maintenance and Retrofitting Techniques:** Definitions: Maintenance, Facts of Maintenance and importance of Maintenance Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, Externally bonding(ERB) technique, near surface mounted (NSM) technique, External post- tensioning, Section enlargement and guidelines for seismic rehabilitation of existing building, Inspection and Testing – Symptoms and Diagnosis of Distress - Damage assessment – NDT.

**UNIT – IV**

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting – Shotcrete – Underpinning. Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing.

**UNIT – V**

**Materials for Repair and Retrofitting:** Artificial fibre reinforced polymer like CFRP,GFRP,AFRP and natural fiber like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning- Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

**Course Outcomes:** After studying this course, students will be able to:

- CO1: Understand the cause of deterioration of concrete structures.
- CO2: Under the concept of corrosion with remedial measures in building.
- CO3: Able to assess the damage for different type of structures
- CO4: Summarize the principles of repair and rehabilitation of structures
- CO5: Recognize ideal material for different repair and retrofitting technique

**TEXT BOOKS:**

1. R.N.Raikar, Diagnosis and treatment of structures in distress, R&D Centre of Structural Designers & Consultants Pvt.Ltd., Mumbai,1994.
2. Dovkaminetzky, Design and Construction Failures, Galgotia Publication, New Delhi, 2001
3. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B. A. Richardson,(1991).

**REFERENCES:**

1. A.R. Santakumar, Concrete Technology,Oxford Universitypress, 2014.
2. W. H. Ranso , Concrete Repair and Maintenance, RS Means Company Inc,(1981)
3. Bungey, Non-Destructive Evaluation of Concrete Structures, Surrey UniversityPress, 2010.

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105105213>

**VAAGDEVI COLLEGE OF ENGINEERING**  
UGC-Autonomous

**DEIGN OF PRE-ENGINEERED BUILDINGS**  
(Program Elective – V)

**M.Tech - II Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites:** Design of Steel Structures & Structural Analysis

**Course Objectives:**

1. To distinguish between conventional steel buildings and PEB's
2. To identify the Pre-Engineered Building components
3. To estimate the loads on Pre-Engineered Buildings
4. To identify the various design parameters of PEB frames

**UNIT - I:**

**Introduction to Pre-Engineered Buildings:** Introduction–History-Advantages of PEB- Applications of PEB – Materials used for manufacturing of PEB. Difference between Conventional Steel Buildings and Pre-Engineered buildings.

**UNIT - II:**

**Pre-Engineered Building Components:** Primary System: Main frames, Gable End Frame- Secondary frame system: Sizes and Properties of Purlins & Girts – Bracing System: Rod, angle, Portal, Pipe bracing – Sheeting and Cladding: Roof Sheeting and Wall sheeting – Accessories: Turbo Ventilators, Ridge vents, Sky Lights, Louvers, Insulation, Stair cases, Design of PEB frame under the influence of Dead, Live, Collateral, Wind, Seismic and Other applicable Loads. Serviceability Limits as per code., Design Parameters of PEB Frames - Depth of the section, Depth to Flange width ratios, Thickness of Flange to thickness of Web ratio.  $d/t_w$ ,  $b_f/t_f$  ratios of sections as per IS code. Section Sizes as per Manufacturing Limitations, Analysis and Design of Rigid Frames.

**UNIT - III:**

**Peb Frame Connection Design Methodology:** Rigid Frame Moment Connection, Shear Connection, High strength bolts & grades, Lever arm, bolt Patten its effect on connection design, thickness of connection plate, Selection of governing forces for connection design.

**UNIT - IV:**

**Mezzanine Floor Systems:** Design of Mezzanine Beams, Columns and joists – Mezzanine decking, Different types of Mezzanine Floor systems – Grating, Chequered plate and Rigid floor System, Types of base plate Pinned, Fixed, strength bolts, different types of bolts & grades, Lever arm, bolt Patten its effect on connection design, thickness of connection plate, base plate size, Selection of governing forces for base connection design & Anchor bolt.

**UNIT - V:**

**Analysis and Design Of Pre-Engineered Buildings:** 2D and 3D Modelling of Portal Frames, Optimization Techniques, Comparison of software output with manual calculations. Design of Cold Formed Sections, Purlins and Girts, Design of Roof Sheeting, trapezoidal, Standing seam sheeting, Welding technology, Manufacturing process , Erection Procedures

**Course Outcomes:** After completion of the course, students should be able to

- CO1: Understand the functions of Primary system, Secondary system and Bracing system of PEB components.
- CO2: Calculate the Dead, Live, Wind and Seismic loads acting on PEB's
- CO3: Check the structural stability of PEB's
- CO4: Design of Mezzanine floor system
- CO5: Analyze and Design the PEB's

**REFERENCES:**

1. K.S.Vivek and P.Vyshnavi, Pre-Engineered Steel Building, Lamdert Academic Publishing, 2017.
2. Alexander Newman, Metal building systems: Design and Specifications, McGraw-Hill Education, 3<sup>rd</sup> Edition 2017.

**VAAGDEVI COLLEGE OF ENGINEERING**  
(Autonomous)

**EARTHQUAKE RESISTANT DESIGN OF STRUCTURES**  
(Professional Elective – V)

**M.Tech - II Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites:** Structural Dynamics, Reinforced Concrete Design

**Course Objectives:**

1. To explain the possible causes for earthquakes understanding seismology
2. To understand the principles of earthquake resistant design of RC and masonry buildings
3. To learn to evaluate base shears using IS methods
4. To detail the structural members for ductile requirements

**UNIT - I**

Engineering Seismology: Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics- Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales- Energy released-Earthquake measuring instruments-Seismoscope, Seismograph, accelerograph- Characteristics of strong ground motions- Seismic zones of India.

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 Structures-Twisting of Buildings – Flexible Building and Rigid Building Systems.

Strength and Stiffness – Ductility – Definition – Ductility Relationships – Choice of construction Materials - Unconfined Concrete & Confined Concrete - Design Earthquake Loads – Basic Load Combinations – Permissible Stresses.

Seismic Methods of Analysis – Static Method – Equivalent Lateral Force Method. Dynamic Analysis– Response Spectrum Method.

**UNIT - III**

Introduction to Earthquake Resistant Design – Seismic Design Requirements and Methods.

RC Buildings – IS Code based Method- Vertical Irregularities – Mass Irregularity Torsional Irregularity-Plan Configuration Problem - Design Lateral Force, Base Shear Evaluation – Lateral Distribution of Base Shear – Structural Walls Strategies and the Location of Structural Walls – Sectional Shapes – Behaviour of Unreinforced and Reinforced Masonry Walls – Behaviour of Walls Box Action and Bands – Behaviour of infill Walls - Non Structural Elements – Failure Mechanism of Nonstructural Elements – Effects of Nonstructural Elements on Structural System – Analysis – Prevention of Damage to Nonstructural Elements – Isolation of Non-Structures.

**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 – Behaviour of Coupled Shear Walls.

**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 IS13920. Behavior of beams, columns and joints in RC buildings during earthquakes- Vulnerability of open ground storey and short columns during earthquake.

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

**Course Outcomes:** After completion of the course, students should be able to:

- CO 1: Predict the sources of earthquakes understanding seismology and conceptually design the buildings
- CO 2: Apply the Response Spectrum Analysis Method and static equivalent method for the determination of lateral loads on the buildings
- CO 3: Assess seismic performance of non-structural components and structural components and identify effective measures to mitigate potential damage
- CO 4: Analyze and design shear walls
- CO 5: Apply ductility requirements for the design of structural components

**TEXTBOOKS:**

1. S. K. Duggal, Earthquake Resistant Design of structures, Oxford University Press, 2<sup>nd</sup> Edition, 2013.
2. Pankaj Agarwal and Manish Shrikhande, Earthquake Resistant Design of structures – Prentice Hall of India Pvt.Ltd, 2011.
3. T. Paulay and M.J.N.Priestly, Seismic Design of Reinforced Concrete and Masonry Building – John Wiley & Sons, 1992
4. N. Subramanian, Design of Reinforced Concrete Structures, Oxford University Press, 2019.

**REFERENCES:**

1. Anand S.Arya, Masonry and Timber structures including earthquake Resistant Design – Nemchand & Bros, 1992.
2. Miha Tomazevic, Earthquake – Resistant Design of Masonry Building – Imperial college Press, 1999.
3. C. V. R.Murty, Earthquake Tips – Learning Earthquake Design and Construction 2009.
4. IS: 1893 (Part-1) -2016. “Criteria for Earthquake Resistant – Design of structures.” B.I.S., New Delhi.
5. IS:13920-2016, “Ductile detailing of concrete structures subjected to seismic force” – Guidelines, B.I.S., New Delhi.

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105101004>
2. <https://nptel.ac.in/courses/105107204>



## VAAGDEVI COLLEGE OF ENGINEERING

Autonomous

### GREEN BUILDINGS

(Open Elective)

**M.Tech - II Year I – Semester**

L	T	P	C
3	0	0	3

**Prerequisite:** None

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

- To Reduce Wastage of Water and Energy
- To Improve Air and Water Quality and Conserve Natural Resources
- To protect Biodiversity and Ecosystems
- To create a Market for Green Product and Services
- To improve the Occupant Productivity, Quality of Life and Minimizes Strain on Local Infrastructure

#### UNIT I

##### **Green Buildings**

Definition of Green Buildings, typical features of green buildings, benefits of Green Buildings, Green building Principles, Sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation, planning for storm water drainage

#### UNIT II

##### **Environmentally Friendly Building Materials and Technologies**

Natural Materials like bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime pozzolana cements, materials from agro and industrial waste, ferro-cement, alternative roofing systems, various paints reducing the heat gain of the building, etc.

#### UNIT III

##### **Energy and Resource Conservation and Use of Renewable Energy Resources**

Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings- water harvesting in buildings – waste to energy management in residential complexes or gated communities. Wind and Solar Energy Harvesting.

#### UNIT IV

##### **Building Resources**

Passive energy system design, Building envelope, orientation and components of building fabric and shading, Construction of curtain walls, Sourcing and recycling of building materials.

#### UNIT V

##### **Green Building Rating Systems**

Introduction to Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment – Modular wastewater treatment systems for built environment.

**Course Outcomes:**

After the completion of this course, the students should be able to

- CO1: Apply the knowledge in development of green field infrastructure in relation to sustainable environment.
- CO2: Explain Green Building specifications and various eco-friendly materials
- CO3: Choose and size building components, as well as energy and environmental systems suitable for different categories of buildings to achieve the smallest feasible life-time environmental impact.
- CO4: Utilize a variety of tools and methodologies suitable for evaluating the resource consumption and overall environmental performance of buildings in different stages of their lifecycles
- CO5: Demonstrate the passive energy system and components of building fabrics and materials

**TEXTBOOKS:**

- 1. K.S.Jagadish, B. U. Venkataramareddy, K. S. Nanjundarao, Alternative Building Materials and Technologies, 2nd Ed., New Age International, 2007
- 2. Osman Attmann, Green Architecture Advanced Technologies and Materials, McGraw Hill, 2010

**REFERENCES**

- 1. Kibert, C. J, Sustainable Construction: Green Building Design and Delivery, 3 rd Ed., John Wiley & Sons, Inc., 2012
- 2. G. D. Rai, Non-Conventional Energy Resources, 6th Ed., Khanna Publishers. 1988
- 3. Greening Building – Green Congress, US. (Web).
- 4. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

## VAAGDEVI COLLEGE OF ENGINEERING

Autonomous

### CONSTRUCTION PROJECT MANAGEMENT

(Open Elective)

M.Tech - II Year I – Semester

L	T	P	C
3	0	0	3

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

- Learn the fundamentals of construction law.
- Learn the fundamentals of construction safety.
- Understand various equipment used in construction.
- Learn Fundamentals of Project Planning.

#### UNIT-I

Fundamentals of construction Technology – Construction activities – process – construction schedule – construction records – documents – quality – safety – codes and regulations.

#### UNIT-II

Construction method – earthwork – piling – concrete and concreting – formwork – fabrication and erection - Mechanized construction – construction equipment – equipment economics – excavators – Rollers – Dozers – Scrapers – Handling equipment – concrete equipment – cranes – draglines and clamshalls

#### UNIT-III

Quality control, Assurance and safety – ISO – 9000 – quality systems – principles on safety – personnel, fire and electrical safety – environment protection – concept of green building.

#### UNIT-IV

Contract management – project estimation – types of estimation – contract document – Earnest money deposit - Further security deposit – Powers of sanctions - classification with specific reference to PPP and BOT Projects – bidding – procurement process – Construction planning – project planning techniques – planning of manpower, material, equipment and finance.

#### UNIT-V

Project scheduling – PERT – CPM, Resource leveling - Construction claims, Dispute and project closure – source of claim – claim management – Dispute Resolution – Arbitration – Construction Closure – Contract Closure – Documentation.

#### Course Outcomes:

**After completion of this course, student should be able to**

- CO1: Relate the fundamentals of construction technology
- CO2: Differentiate construction methods and equipment utilized.
- CO3: Demonstrates quality assurance and control as per ISO 9000 Standards.
- CO4: Prepare Plan and control resources of projects.
- CO5: Prepare schedule of activities in a construction project

**TEXT BOOKS**

1. Ghalot, P.S., Dhir,D.M., Construction Planning and Management, Wiley EasternLimited, 2018.
2. Chitkara,K.K., Construction Project Management, Tata McGraw Hill Publishing Co,Ltd., New Delhi, 2001.
3. SubirK.Sarkar, SubhajitSaraswati, Construction Technology, Oxford University Press, 2008.
4. Niraj kumarjha, Construction Project Management – Theory and Practice, PearsonEducation, 2007.

**REFERENCES:**

1. B. Sengupta and H. Guha, Construction Management and Planning, tata mcgraw-hillPublications, 2009.
2. Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications,New Delhi,1987.

## VAAGDEVI COLLEGE OF ENGINEERING

Autonomous

### SAFETY AND CONSTRUCTION PRACTICEREGULATIONS

(Open Elective)

M.Tech - II Year I – Semester

L	T	P	C
3	0	0	3

#### Course Objectives:

This course aims to make the students well-versed with the latest safety and health regulations and the Indian Standards applicable to the construction industry.

#### UNIT I

##### **Introduction to Safety in Health and Environment**

Basic terminology in safety, types of injuries, safety pyramid, Introduction to Safety Management- Industrial Safety- Health Management- Environment Management, Need for Safety in Indian Construction Sites.

#### UNIT II

##### **Enforcement of Health and Safety Laws**

Introduction- Health and Safety Commission, Powers of the Factory Inspectorate, Methods to Ensure Compliance. Introduction to OSHA regulations; Role of stakeholders in safety, Site safety programs - Job hazard analysis, accident investigation & accident indices-violation, penalty.

#### UNIT III

##### **Personal Protective Equipment (PPE) and Safety Training**

General Requirements & Legislation for Protective Clothing and Safety Equipment, Personal Protective Equipment, Need for Safety Training, Induction and Training Courses for Employees.

#### UNIT IV

##### **Hazards of Construction and their Prevention**

Physical Injury Hazards- Excavation, Scaffolding, Formwork, Structural Framework, Roof work, Cranes and Heavy Lifting, Transport and Mobile Plants, Highways, Tunneling, Sewers and Confined Spaces, Demolition and Contaminated Sites, Work over Water

#### UNIT V

##### **Safety Policies, Construction & Safety Costs**

Health and Safety Policy Statements, Safety Organization, Safety Management Contracting, Subcontracting, Safety Groups and Group Safety Schemes, Management Systems for Safe Pre-contract Activities, Survey and Investigation, Design and Specification, Design Aids for Safe Construction, Management of Construction, Costs of Safety

#### Course Outcomes:

**After completion of this course, student should be able to**

- CO1: Demonstrates the safety in health and Environment on construction sites
- CO2: Describe safety laws as per OSHA regulations
- CO3: Classify personal protective Equipment and discover safety trainings
- CO4: Explain prevention of various hazards at construction site
- CO5: Demonstrate Safety Policies and Safety Costs

**TEXT BOOKS**

1. Construction Safety, Prentice Hall, Hinze, J.W., 1997.
2. Construction Safety Planning, Mac Collum, D.V., John Wiley & Sons, 1995.
3. Handbook of OSHA Construction Safety and Health, Taylor & Francis, Reese, C.D. &Eidson, J.V. 2006.

**REFERENCES:**

1. Occupationalhealth and Safety in Construction Project Management, Lingard, H. & Rowlinson, S, Spon Press, 2005.
2. Principles of Construction Safety,Holt, A.S.J, Wiley-Blackwell Publishers, 2005.
3. Construction Safety Engineering Principles, MacCollum, D.V, McGraw Hill Publishers, 2007.
4. Safety Management in Construction, Bhattacharjee, S.K, Khanna Publishers, 2011.
5. Construction Safety, Li, R.Y.M. & Poon, S.W, Springer Publishers, 2013.

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**DISSERTATION WORK REVIEW – II**

**M.Tech - II Year I – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>12</b>	<b>6</b>

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

1. Identify structural engineering problems reviewing available literature.
2. Identify appropriate techniques to analyze complex structural systems.
3. Apply engineering and management principles through efficient handling of project

**Syllabus Contents:**

The evaluation will done by the DRC and Supervisor. The supervisor and DRC will examine the problem Definitions, objectives, scope of work, literature survey in the same domain and progress of the dissertation work.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific researchh.

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**DISSERTATION WORK REVIEW – III**

**M.Tech - II Year II – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>12</b>	<b>6</b>

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

1. Solve complex structural problems by applying appropriate techniques and tools.
2. Exhibit good communication skill to the engineering community and society.
3. Demonstrate professional ethics and work culture.

**Syllabus Contents:**

The evaluation will done by the DRC and Supervisor. The DRC will examine the overall progress of the dissertation work and decide whether or not the dissertation is eligible for final submission.

After the approval the student has to submit the detail report for Dissertation viva voce examination.



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**DISSERTATION WORK VIAVA-VOCE**

**M.Tech - II Year II – Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>28</b>	<b>14</b>

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

1. Solve complex structural problems by applying appropriate techniques and tools.
2. Exhibit good communication skill to the engineering community and society.
3. Demonstrate professional ethics and work culture.

**Syllabus Contents:**

Followed by Dissertation Review III, Dissertation evaluation done by the external examiner at the end semester through viva voce examination..

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

L	T	P	C
2	0	0	0

**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

**Course outcomes:**

After the completion of this course, the students should be able to

- CO1: Understand the varies of technical communication.
- CO2: Understand the formatting of a research paper.
- CO3: Write a paper for publication in a standard journal.
- CO4: Work on citations and ably place them in his/her research work.
- CO5: Understand the importance of plagiarism and how to avoid the same

**TEXT BOOKS:**

1. Goldbort R (2006) Writing for Science, Yale University Press (available on GoogleBooks)
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.

**REFERENCES:**

1. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. MLA Hand book for writers of Research Papers, East West Press Pvt. Ltd, New Delhi, 7<sup>th</sup> Edition, 2008.
3. C. R Kothari, Gaurav, Garg, Research Methodology Methods and Techniques, New Age International Publishers, 2022.

**VAAGDEVI COLLEGE OF ENGINEERING**

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**DISASTER MANAGEMENT**

(Audit Course - I &amp; II)

L	T	P	C
2	0	0	0

**Pre-requisites:** 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.

**Course outcomes:**

After the completion of this course, the students should be able to

- CO1: Perceive the various types of disaster.
- CO2: Interpret the various types of Hazards and Vulnerability.
- CO3: Perceive different approaches of disaster risk reduction.
- CO4: Describe the disaster management and safety plan.
- CO5: Discuss the various disaster risks in India. Understand the importance of plagiarism and how to avoid the same

**TEXT BOOKS/ REFERENCES:**

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies ""New Royal bookCompany.
2. Sahni, Pardeep Et. Al. (Eds.), "Disaster Mitigation Experiences and Reflections", Prentice Hall of India, NewDelhi.

**VAAGDEVI COLLEGE OF ENGINEERING**

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**(M22AC03) SANSKRIT FOR TECHNICAL KNOWLEDGE**

(Audit Course - I & II)

L	T	P	C
2	0	0	0

**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

**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

**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

**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.

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**(M22AC04) VALUE EDUCATION**  
(Audit Course - I & II)

L	T	P	C
2	0	0	0

**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

**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

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

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

**TEXT BOOKS/ REFERENCES:**

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

**VAAGDEVI COLLEGE OF ENGINEERING**  
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**(M22AC05) CONSTITUTION OF INDIA**  
(Audit Course - I & II)

L	T	P	C
2	0	0	0

**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.

**UNIT-I:**

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

**UNIT-II:**

Philosophy of the Indian Constitution: Preamble, Salient Features

**UNIT-III:**

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-IV:**

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-V:**

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-VI:**

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.

**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.

**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.

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**(M22AC06) PEDAGOGY STUDIES**  
(Audit Course - I & II)

L	T	P	C
2	0	0	0

**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.

**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 in depth 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.

**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?

**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).

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**(M22AC07) STRESS MANAGEMENT BY YOGA**  
(Audit Course - I & II)

L	T	P	C
2	0	0	0

**Prerequisite:** None

**Course Objectives:**

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

**UNIT-I:**

Definitions of Eight parts of yoga. (Ashtanga)

**UNIT-II:**

Yam and Niyam.

**UNIT-III:**

Do's and Don't's in life.

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

**UNIT-IV:**

Asan and Pranayam

**UNIT-V:**

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

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

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

**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
3. <https://nptel.ac.in/courses/121105009>

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**(M22AC08) PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT****SKILLS**

(Audit Course - I &amp; II)

L	T	P	C
2	0	0	0

**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

**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

**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

**TEXT BOOKS/ REFERENCES:**

1. “Srimad Bhagavad Gita” by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata.
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.