Shri Vaishnav Vidyapeeth Vishwavidyalaya
Master of Technology (Structural Engineering)
SEMESTER I

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTCE 1101	BS	ADVANCE MATHEMATICS AND NUMERICAL ANALYSIS	60	20	20	0	0	3	1	0	4

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
The course aims to provide students with the specialist knowledge in advanced Numerical Analysis. With this overall aim, the course strives to enable students to: Understand analytical, developmental and technical principles that relate to Numerical Linear Algebra, Numerical Methods for solving Differential Equations, and Numerical Optimization, develop the academic abilities required to solve problems and applications in Numerical Analysis and/or Numerical Optimization and critically assess relevant aspects of the industry, and demonstrate an ability to initiate and sustain in-depth research in Numerical Analysis or Numerical Optimization.

Course Outcomes:
1. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
2. Apply numerical methods to obtain approximate solutions to mathematical problems.
3. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiaon, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
4. Analyse and evaluate the accuracy of common numerical methods.

Syllabus:

UNIT I
Numerical solution of Partial Differential Equation (PDE): Numerical solution of PDE of hyperbolic, parabolic and elliptic types by finite difference method.

UNIT II
Integral transforms: general definition, introduction to Mellin, Hankel and Fourier transforms and fast Fourier transforms application of transforms to boundary value problems in engineering.

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UNIT III

Integral equations: Conversion of Linear Differential equation (LDE) to an integral equation (IE), conversion of boundary value problems to integral equations using Greens function, solution of Integral equation, IE of convolution type, Abels IE, Integral differential equations, IE with separable variable, solution of Fredholm, Equation with separable kernels, solution of Fredholm and Volterra equations by method of successive approximations.

UNIT IV

Calculus of Variation: Functional and their Variation, Eulers equation for function of one and two independent variables, application to engineering problems.

UNIT V

FEM: Variational functionals, Euler Lagranges equation, Variational forms, Ritz methods, Galerkins method, descretization, finite elements method for one dimensional problems.

Text Books:
1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.
3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH
4. Numerical Methods in engineering, Salvadori and Baron

Reference Books:
1. CF Froberg, Introduction to numerical analysis.
2. SS Sastry, Introductory methods of numerical analysis
3. Krasnove, Kiselevanded Makarenho, Integral equations
4. Buchanan, Finite element Analysis (schaum Outline S), TMH
5. Krishnamurthy, Finite element analysis, TMH

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
MTCE 1102	DCS	ADVANCE CONCRETE TECHNOLOGY	60	20	20	30	20	3	1	1	5

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
1. To understand the concrete material and their mechanism.
2. To study the Creep in detail.
3. To study about the fresh concrete and the strength
4. To study the durability and the hardness of concrete.

Course Outcomes:
1. To have the deep knowledge of concrete material
2. To know the characteristics of fresh concrete
3. To know about creep and to analyze it
4. To have the deep knowledge about the test on hard concrete

Syllabus:

UNIT I
Cement & its properties, properties of fresh concrete compaction of concrete, curing of concrete.

UNIT II
Properties of hardened concrete, strength characteristic, shrinkage, creep, durability, fattier.

UNIT III
Permeability & durability of concrete is detail, Special concrete and their properties.

UNIT IV
Concrete at low & high temperature, Air entrained concrete, high performance concrete.

UNIT V
Mix Design, Non destructive Testing of Concrete.

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Text Books:

1. A.M. Neville, Concrete Technology, ELBS, London
2. M.L. Gambir, Concrete Technology, Tata Mc Graw Hill Book Co.

Reference Books:

1. Peurifoy R.L., Construction Planning Equipment & Methods, TMH
2. Verma Mahesh, Construction Equipments and its Planning & Application

List of Practical's:

1. To determine fineness of cement by dry sieving
2. To determine the normal consistency of a given sample of cement.
3. To determine the initial and final setting time of a given sample of cement.
4. To determine bulking of aggregate.
5. To determine specific gravity of a given sample of fine aggregate.
6. To determination of particle size distribution of coarse aggregates by sieving or screening
7. To study the determination of Coarse Aggregate
8. To determine the impact value coarse aggregates.
9. To determine the relative consistency of freshly mixed concrete by the use of Slump Test.
10. To determine the relative consistency of freshly mixed concrete by the use of Test
11. The determination of consistent a Vee-Bee consistometer
12. The test method covers determination of compressive strength of cubic concrete specimens
13. This clause deals with the procedure for determining the flexural strength of moulded concrete flexure test specimens.
14. To assess the likely concrete by using rebound hammer

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
MTCE 1103	DCS	THEORY & DESIGN OF CONCRETE STRUCTURES	60	20	20	30	20	3	1	1	5

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
Student (A) will be able to analyze various loads acting on structure and design different components of RCC structure (B) at particular site (C) economically & safely (D).

Course Outcomes:
1. To provide a coherent development to the students for the courses in sector of Reinforced Concrete Designing.
2. To present the foundations of many basic engineering concepts related designing of structures.
3. To give an experience in the implementation of designing concepts which are applied in field of structural engineering
4. To involve the application of scientific and technological principles of design of buildings according to limit state method of design

Syllabus:

UNIT I
Design Philosophies: Introduction to various design philosophies, their merits and drawbacks, code provision and their meaning, Introduction to prestressed concrete.

UNIT II
Grid Structures: Types of R.C.C Grids, behaviour, design by approximate and exact methods.

UNIT III
Flat Slab: Definition, Types, behaviour, direct design method, Equivalent Frame Method.

UNIT IV
Circular Cylindrical Shells: behaviour and design using ASCE Manual Method.

UNIT V
Concept of Ductility – Detailing for ductility – Design of beams, columns for ductility - Design of cast-in-situ joints in frames.

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Text Books:

1. Shah and Kale, Text book of reinforced concrete
2. Punamia, RCC designs

Reference Books:

1. Krishna Raju, Prestressed concrete.
2. Varghese, Advanced RC Designs, PHI
3. Everard, Theory and problems of RC design (Shaum's Outline S), TMH

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
MTCE 1104	DCS	ADVANCED STRUCTURAL & ANALYSIS	60	20	20	0	0	3	1	0	4

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
The objectives of the course are to build on the student's knowledge on the theory and application of structures in buildings and to introduce the students to concept of structural stability, methods in structural analysis.

Course Outcomes:
1. Ability to analyze statically determinate trusses, beams, and frames and obtain internal loading
2. Ability to analyze cable and arch structures
3. Ability to obtain the influence lines for statically determinate and indeterminate structures
4. Ability to determine deflections of beams and frames using classical methods
5. Ability to solve statically indeterminate structures using classical methods
6. Ability to solve statically indeterminate structures using matrix (stiffness) method

Syllabus:

UNIT I
Matrix Method (Flexibility Method) : Force methods, Basic Concepts, evaluation of flexibility, transformation, analysis of a single member of different types, transformation of single member.

UNIT II
Applications to plane and space structures with pin joints and rigid joints, energy approach in flexibility method, effect of support displacement and transformation.

UNIT III
Matrix Method (stiffness Method): Displacement methods, Basic concepts, Evaluation of stiffness coefficients, direct stiffness method, energy approach in stiffness method. Code No. approach for global stiffness matrix, effect of support displacement and temperature.

UNIT IV
Symmetrical & anti-symmetrical problems, Stiffness of plane & space frames solution of problems, comparison of force and displacement methods of solution.

UNIT V
Space Frame: Tension coefficient method for analysis of pin jointed structural frames.

Text Books:
1. C.S. Reddy , Basic Structural Analysis ,TMH, Publishers
2. W Wearer Jr. & James M. Gere, Matrix Analysis of Framed Structures, CBS Pub.

Reference Books:
1. Rajsekeran, Sankarsubramanian, Computational structural Mechanics, PHI
2. Pandit, Structural Analysis: a matrix approach, TMH

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
MTCE 1105	DCS	THEORY OF ELASTICITY & PLASTICITY	60	20	20	0	0	3	1	0	4

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; *Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
1. To impart knowledge of Principal stresses and strains.
2. To develop analytical skills of solving problems using plain stress and plain strain.
3. To impart knowledge of engineering application of plasticity.

Course Outcomes:
1. The students shall be able to demonstrate the application of plane stress and plane strain in a given situation.
2. The student will demonstrate the ability to analyze the structure using plasticity.
3. To impart the knowledge of stress-strain relations for linearly elastic solids, and Torsion.

Syllabus:

UNIT I
Plane Stress & Plane Strain: Plane Stress, Plane Strain, Stress and Strain at a points, Differential equations of equilibrium, constitutive relation : anisotropic materials Linear elasticity; Stress, strain, constitutive relations; Boundary conditions, Generalised Hooke's law, Elastic Constants, Compatibility equation, stress function.

UNIT II
Two Dimensional Problems in Rectangular Co-ordinates: Solutions by Polynomials, Saint-Venants Principle, Determination of displacements, bending of beams, solution of two dimensional problems in Fourier series.

UNIT III
Two Dimensional Problems in Polar Coordinates: General equations in Polar coordinates, Pure bending of curved bars, Analysis of stress and strain in Three Dimensions: Principal stress and strain, shearing stress and strains, elementary equation of equilibrium, compatibility conditions.

UNIT IV
Theory of Plasticity: Basic experiments of monotonic loading tension and compression tests, Loading-Unloading reloading types, Loading-Unloading reverse loading types, their observations, Definition of nominal stress, strain, True stress, Natural Strain etc and their

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relations. Bauschinger's effects, Strain Hardening, Stress Strain Curve and their Empirical equations.

UNIT V
Stress and strain tensors, Principal stresses and strains, stress and strain invariants, maximum and octahedral shear stresses and strains, stress and strain deviator tensor, Physical Assumptions ,Yield Criteria like Rankines, Saint Venant's, Trescas and von mises and their 2 Dimensional representation ,Failure Theories.

Text Books:
1. Timoshenko, S.P. , Theory of Elasticity
2. Timoshenko, S.P., Theory of Elastic Stability
3. Iyenger N.G.R., Structural Stability of Columns & Plates.

Reference Books:

1. Chakraborti P.K "Plasticity" TMH

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
MTCE 1106	DCS	THEORY OF VIBRATIONS	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical;   **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
The objective of this course is to cover comprehensive fundamental principles of vibration theory Formulate mathematical models of problems in vibrations using Newton's second law or energy principles determine a complete solution to mechanical vibration problems using mathematical or numerical techniques, and Determine physical and design interpretations from the results

Course Outcomes:
1. Students will be able to construct the equations of motion from free-body diagrams.
2. Students will be able to solve for the motion and the natural frequency of a freely vibrating single degree of freedom un-damped motion and a freely vibrating single degree of freedom damped motion.
3. Students will be able to construct the governing differential equation and its solution for a vibrating mass subjected to an arbitrary force.
4. Students will be able to decompose any periodic function into a series of simple harmonic motions using Fourier series analysis.
5. Students will be able to solve for the motion and the natural frequency for forced vibration of a single degree of freedom damped or un-damped system.
6. Students will have an ability to obtain the complete solution for the motion of a single degree of freedom vibratory system (damped or un-damped) that is subjected to non-periodic forcing functions.
7. Students will be able to solve vibration problems that contain multiple degrees of freedom.
8. Students will be able to obtain design parameters and indicate methods of solution for a complicated vibratory problem.

Syllabus:

UNIT I
Single Degree of Freedom System: Free and forced vibrations, Linear Viscous Damper, Coulomb Damper: Response to harmonic excitation, rotating unbalance and support excitations, Vibration isolation and transmissibility, single degree of freedom system as vibro-meter and accelerometer, response to periodic and arbitrary excitation.

UNIT II
Duhamels integral. Impulse response function, Laplace transform Fourier transform methods. Frequency response function. Phase-Plane Techniques. Critical Speed of rotors. Energy methods, Rayleigh's method, Equivalent viscous damping.

UNIT III
Two Degree of Freedom System. Matrix Formulation, Free Vibration, Beat phenomenon. Principle of damped and un-damped vibration absorbers.

UNIT IV
Multi Degree of Freedom System: Matrix formulation, stiffness and flexibility influence coefficients, eigen value problem, normal modes and their properties. Matrix iteration technique for eigen value, and eigen vectors, Free and forced vibration by modal analysis.

UNIT V
Continuous System: Axial vibration of bar, torsion of shafts, transverse vibration of strings and bending vibration beams. Forced vibration. Normal mode method. Lagrangle's equation. Approximate methods of Rayleigh-Ritz, Galerkin etc.

Text Books:
1. RW Clough, J Penzien, Dynamics of structures
2. D G Fertia, Dynamics and vibration of Structures
3. J M Biggs, Introduction to structural dynamic

Reference Books:
1. Mario Paz, Theory of Vibration
2. A.K Chopra, Dynamics of Structures

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