KURUKSHETRA UNIVERSITY, KURUKSHETRA
('A+' Grade, NAAC Accredited)

SCHEME OF EXAMINATIONS FOR
Master of Technology (Civil Engineering) Specialization: Structural Engineering
(w.e.f. SESSION: 2018-19)

SEMESTER- I

S. No.	Course Code	SUBJECT	L	T	P	Total	Evaluation		Cr.	Durat of Ex (Hrs
							Mid Sem	End Sem		
1	MTSE-101 A	Advanced Structural analysis	3	-	-	3	40	60	3	3
2	MTSE-103 A	Advanced solid mechanics	3	-	-	3	40	60	3	3
3	*	Program Elective –I	3	-	-	3	40	60	3	3
4	**	Program Elective-II	3	-	-	3	40	60	3	3
5	MTSE-117 A	Structural Design Lab	-	-	2	2	40	60	2	3
6	MTSE-119 A	Advanced Concrete Lab	-	-	2	2	40	60	2	3
7	MTRM-111 A	Research Methodology and IPR	2	-	-	2	40	60	2	3
8	***	Audit Course-I	2	-	-	0	100	-	0	0
	TOTAL		**16**	**0**	**4**	**18**	**280**	**420**	**18**	
							700			

***Program Elective - I**		****Program Elective- II**	
MTSE-105 A	Theory of Thin Plates and Shells	MTSE-111A	Analytical and Numerical Methods for Structural Engineering.
MTSE-107 A	Theory and Applications of Cement Composites	MTSE-113 A	Structural Health Monitoring
MTSE-109 A	Theory of Structural Stability	MTSE-115 A	Structural Optimization

***** Audit Course-I**	
MTAD-101 A	English for Research Paper Writing
MTAD-103 A	Disaster Management
MTAD-105 A	Sanskrit for Technical Knowledge
MTAD-107 A	Value Education

Note: 1.The course of program elective will be offered at 1/3rd or 6 numbers of students (whichever is smaller) strength of the class.

2. *** Along with the credit course, a student may normally be permitted to take audit course, however for auditing a course; prior consent of the course coordinator of the course is required. These courses shall not be mentioned for any award/calculation of SGPA/CGPA in the DMC. A certificate of successful completion of the audit course will be issued by the Director/Head of institution.

SEMESTER-II

S. No.	Course code	Subject	L	T	P	Total	Evaluation		Cr.	Duration Exam (Hrs.)
							Mid Sem	End Sem		
1	MTSE- 102 A	FEM in Structural Engineering	3	-	-	3	40	60	3	3
2	MTSE-104 A	Structural Dynamics	3	-	-	3	40	60	3	3
3	*	Program Elective-III	3	-	-	3	40	60	3	3
4	**	Program Elective-IV	3	-	-	3	40	60	3	3
5	MTSE-122 A	Model Testing Lab		-	2	2	40	60	2	3
6	MTSE- 124 A	Numerical Analysis Lab	-	-	2	2	40	60	2	3
7	MTSE- 126 A	Mini Project	-	-	4	2	40	60	2	3
8	***	Audit Course-II	2			0	100		0	3
		TOTAL	**14**		**8**	**18**	**280**	**420**	**18**	
							700			

***Program Elective - III**		****Program Elective – IV**	
MTSE-106 A	Advanced Steel Design	MTSE-114 A	Design of Advanced Concrete Structures
MTSE-108 A	Design of Formwork	MTSE-116 A	Advanced Design of Foundations
MTSE-110 A	Design of High Rise Structures	MTSE-118 A	Soil Structure Interaction
MTSE-112 A	Design of Masonry Structures	MTSE-120 A	Design of Industrial Structure

***** Audit Course - II**	
MTAD-102 A	Constitution of India
MTAD-104 A	Pedagogy Studies
MTAD-106 A	Stress Management by Yoga

MTAD-108 A	Personality Development through Life Enlightenment Skills.

Note: 1.The course of program elective will be offered at 1/3rd or 6 numbers of students (whichever is smaller) strength of the class.

2. ***Along with the credit course, a student may normally be permitted to take audit course, however for auditing a course; prior consent of the course coordinator of the course is required. These courses shall not be mentioned for any award/calculation of SGPA/CGPA in the DMC. A certificate of successful completion of the audit course will be issued by the Director/Head of institution.

SEMESTER-III

S. No.	Course Code	Subject	L	T	P	Total	Evaluation		Cr.	Duration of Exam (Hrs.)
							Mid Sem	End Sem		
1	*	Program Elective-V	3	-	-	3	40	60	3	3
2	**	Open Elective	3	-	-	3	40	60	3	3
3	MTSE-209 A	Dissertation Phase-I	-	-	20	20	100	-	10	3
		TOTAL	**6**		**20**	**26**	**180**	**120**	**16**	
							300			

***Program Elective –V**	
MTSE-201 A	Design of Pre-stressed Concrete Structures
MTSE-203 A	Analysis of Laminated Composite Plates
MTSE-205 A	Fracture Mechanics of Concrete Structures
MTSE-207 A	Design of Plates and Shells

****Open Elective**

1.	MTOE-201 A	Business Analytics
2.	MTOE-203 A	Industrial Safety
3.	MTOE-205 A	Operations Research
4.	MTOE-207 A	Cost Management of Engineering Projects
5.	MTOE-209 A	Composite Materials
6.	MTOE-211 A	Waste to Energy

SEMESTER-IV

S. No.	Course Code		L	T	P	Total	Evaluation		Cr.	Duration of Exam (Hrs.)
							Mid Sem	End Sem		
1	MTSE-202 A	Dissertation Phase-II	-	-	32	32	100	200	16	3
	TOTAL						**300**		**16**	

Total Credits of all four semesters: 68

Note: 1.The course of program elective/ open elective will be offered at 1/3rd or 6 numbers of students (whichever is smaller) strength of the class.

Evaluation of Mid Sem. (40 Marks) for all the semesters:

(a)Mid semester examination(s): Two Nos each of 10 marks=20 Marks

(b)Attendance/ Regularity : 10 Marks

(c) Teacher's Assessment / Quizzes/ Assignments etc : 10 Marks

MTSE-101 A	Advanced Structural Analysis						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Analyze the skeleton structures using stiffness analysis code.*						
CO2	*Use direct stiffness method understanding its limitations*						

Unit I

Influence Coefficients: Physical Significance, Effects of Settlements, Temperature Change and Lack of Fit, Member Approach and Structure Approach

Unit II

Stiffness Method applied to Large Frames: Local Coordinates and Global Coordinates.

Stiffness Matrix Assembly of Structures: Stiffness Matrix in Global Coordinates, Boundary Conditions, Solution of Stiffness Matrix Equations, Calculation of Reactions and Member Forces

Unit III

Applications to Simple Problems: Beams, Plane Trusses, Plane Rigid Jointed Frames and Grids by Structure Approach and Member Approach.

Unit IV

Boundary Value Problems (BVP): Approximate Solution of Boundary Value Problems, Modified Galerkin Method for One-Dimensional BVP, Matrix Formulation of the Modified Galerkin Method.

Linear Element: Shape Functions, Solution for Poisson's Equation, General One Dimensional Equilibrium Problem.

References:

- Matrix Analysis of Framed Structures, Weaver and Gere.
- The Finite Element Method, Lewis P. E. and Ward J. P., Addison-Wesley Publication Co.

- Computer Methods in Structural Analysis, Meek J. L., E and FN, Span Publication.

- The Finite Element Method, Desai and Able, CBS Publication.
- Matrix Analysis of Structures, Pandit & Gupta, Tata McGraw Hill Publications

MTSE-103 A	Advanced Solid Mechanics						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Solve simple problems of elasticity and plasticity understanding the basic concepts*						
CO2	*Apply numerical methods to solve continuum problems*						

Unit I

Introduction to Elasticity: Displacement, Strain and Stress Fields, Constitutive Relations, Cartesian Tensors and Equations of Elasticity.

Strain and Stress Field: Elementary Concept of Strain, Stain at a Point, Principal Strains and Principal Axes, Compatibility Conditions, Stress at a Point, Stress Components on an Arbitrary Plane, Differential Equations of Equilibrium, Hydrostatic and Deviatoric Components.

Unit II

Equations of Elasticity: Equations of Equilibrium, Stress- Strain relations, Strain Displacement and Compatibility Relations, Boundary Value Problems, Co-axiality of the Principal Directions.

Unit III

Two-Dimensional Problems of Elasticity: Plane Stress and Plane Strain Problems, Airy's stress Function, Two-Dimensional Problems in Polar Coordinates.

Torsion of Prismatic Bars: Saint Venant's Method, Prandtl's Membrane Analogy,

Torsion of Rectangular Bar, Torsion of Thin Tubes

Unit IV

Plastic Deformation: Strain Hardening, Idealized Stress- Strain curve, Yield Criteria, von Mises Yield Criterion, Tresca Yield Criterion, Plastic Stress-Strain Relations, Principle of Normality and Plastic Potential, Isotropic Hardening.

References:

- Theory of Elasticity, Timoshenko S. and Goodier J. N., McGraw Hill, 1961.
- Elasticity, Sadd M.H.,Elsevier,2005.
- Engineering Solid Mechanics, Ragab A.R., Bayoumi S.E., CRC Press,1999.
- Computational Elasticity, Ameen M., Narosa,2005.
- Solid Mechanics, Kazimi S. M. A., Tata McGraw Hill,1994.
- Advanced Mechanics of Solids, Srinath L.S., Tata McGraw Hill, 2000.

.

MTSE-117 A	**Structural Design Lab**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
0	**0**	**2**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Design and Detail all the Structural Components of Frame Buildings.*						
CO2	*Design and Detail complete Multi-Storey Frame Buildings*						

Syllabus Content:

Design and detailed drawing of complete G+ 3 structures by individual student using

latest relevant IS codes.

MTSE-119 A	Advanced Concrete Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
0	**0**	**2**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Design high grade concrete and study the parameters affecting its performance*						
CO2	*Conduct Non Destructive Tests on existing concrete structures*						
CO3	*Apply engineering principles to understand behavior of structural/ elements*						

- **List of Experiments:**
-
    - Study of stress-strain curve of high strength concrete, Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
    - Effect of cyclic loading on steel.
    - Non-Destructive testing of existing concrete members.
    - Behavior of Beams under flexure, Shear and Torsion.

References:

- Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012.
- Concrete Technology, Shetty M. S., S. Chand and Co., 2006.

MTRM -111 A	Research Methodology and IPR	

Lecture	Tutorial	Practical	Credit	End Sem. Evaluation	Mid Sem. Evaluation	Total	Time
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Understand Research problem formulation*						
CO2	*Analyze research related information*						
CO3	*Follow research ethics*						
CO4	*Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.*						
CO5	*Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.*						
CO6	*Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits*.						

Unit I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit II

Effective literature studies approaches, analysis Plagiarism, Research ethics.

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 III

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 IV

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.

References:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for

science & engineering students'".
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
- Mayall , "Industrial Design", McGraw Hill, 1992.
- Niebel , "Product Design", McGraw Hill, 1974
- Asimov , "Introduction to Design", Prentice Hall, 1962.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
- T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

MTSE-102 A	**Finite Element Method in Structural Engineering**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Use Finite Element Method for structural analysis.*						
CO2	*Execute the Finite Element Program/ Software*						
CO3	*Solve continuum problems using finite element analysis*						

Unit I

Introduction: History and Applications. Spring and Bar Elements, Minimum Potential Energy Principle, Direct Stiffness Method, Nodal Equilibrium equations, Assembly of Global Stiffness Matrix, Element Strain and Stress

Unit II

Beam Elements: Flexure Element, Element Stiffness Matrix, Element Load Vector.

Method of Weighted Residuals: Galerkin Finite Element Method, Application to Structural Elements, Interpolation Functions, Compatibility and Completeness Requirements, Polynomial Forms, Applications

Unit III

Types: Triangular Elements, Rectangular Elements, Three-Dimensional Elements, Isoparametric Formulation, Axi-Symmetric Elements, Numerical Integration, Gaussian Quadrature

Unit IV

Application to Solid Mechanics: Plane Stress, CST Element, Plane Strain Rectangular Element, Isoparametric Formulation of the Plane Quadrilateral Element, Axi- Symmetric Stress Analysis, Strain and Stress Computations.

Computer Implementation of FEM procedure, Pre-Processing, Solution, Post-

Processing, Use of Commercial FEA Software.

References:

- Finite Element Analysis, Seshu P., Prentice-Hall of India,2005.
- Concepts and Applications of Finite Element Analysis, Cook R. D., Wiley J., New York, 1995.
- Fundamentals of Finite Element Analysis, Hutton David, Mc-Graw Hill, 2004
- Finite Element Analysis, Buchanan G.R., McGraw Hill Publications, New York, 1995
- Finite Element Method, Zienkiewicz O.C. & Taylor R.L. Vol. I, II & III, Elsevier, 2000
- Finite Element Methods in Engineering, Belegundu A.D., Chandrupatla, T.R., Prentice Hall India, 1991

MTSE-104 A	**Structural Dynamics**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Analyze and study dynamics response of single degree freedom system using fundamental theory and equation of motion.*						
CO2	*Analyze and study dynamics response of Multi degree freedom system using fundamental theory and equation of motion*						
CO3	*Use the available software for dynamic analysis*						

Unit I

Introduction: Objectives, Importance of Vibration Analysis, Nature of Exciting Forces, Mathematical Modeling of Dynamic Systems.

Unit II

Single Degree of Freedom System: Free and Forced Vibration with and without Damping, Response to Harmonic Loading, Response to General Dynamic Loading using Duhamel's Integral, Fourier Analysis for Periodic Loading, State Space Solution for Response.

Numerical Solution to Response using Newmark Method and Wilson Method, Numerical Solution for State Space Response using Direct Integration.

Unit III

Multiple Degree of Freedom System (Lumped parameter): Two Degree of Freedom System, Multiple Degree of Freedom System, Inverse Iteration Method for Determination of Natural Frequencies and Mode Shapes, Dynamic Response by Modal Superposition Method, Direct Integration of Equation of Motion.

Unit IV

Multiple Degree of Freedom System (Distributed Mass and Load): Single Span Beams, Free and Forced Vibration, Generalized Single Degree of Freedom System

Special Topics in Structural Dynamics (Concepts only): Dynamic Effects of Wind Loading, Moving Loads, Vibrations caused by Traffic, Blasting and Pile Driving, Foundations for Industrial Machinery, Base Isolation.

References:

- Dynamics of Structures, Clough R. W. and Penzien J., McGraw Hill.
- Structural Dynamics and Introduction to Earthquake Engineering, Chopra A. K.
- Vibration of Structures - Application in Civil Engineering Design, Smith J. W., Chapman and Hall
- Dynamics of Structures, Humar J. L., Prentice Hall.
- Structural Dynamics - Theory and Computation, Paz Mario, CBS Publishers
- Dynamics of Structures, Hart and Wong

MTSE-122 A	**Model Testing Lab**	

Lecture	Tutorial	Practical	Credit	End Sem. Evaluation	Mid Sem. Evaluation	Total	Time
0	**0**	**2**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Understand the response of structures.*						
CO2	*Prepare the models*						
CO3	*Conduct model testing for static loading.*						
CO4	*Conduct model testing for free and forced vibrations*						

Syllabus Content:

- Response of structures and its elements against extreme loading events.
- **Model Testing**: Static - testing of plates, shells, and frames models.
- **Model Testing**: Free and forced vibrations, Evaluation of dynamic modulus.
- Beam vibrations, Vibration isolation, Shear wall building model, Time and frequency-domain study, Vibration Characteristics of RC Beams using Piezoelectric Sensors etc.

MTSE-124 A	Numerical Analysis Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
0	**0**	**2**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Find Roots of non-linear equations by Bisection method and Newton's method.*						
CO2	*Do curve fitting by least square approximations.*						
CO3	*Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/ Gauss - Jorden Method*						
CO4	*To Integrate Numerically Using Trapezoidal and Simpson's Rules*						
CO5	*To Find Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge- Kutta Method*						

List of Experiments:

- Find the Roots of Non-Linear Equation Using Bisection Method.
- Find the Roots of Non-Linear Equation Using Newton's Method.
- Curve Fitting by Least Square Approximations.
- Solve the System of Linear Equations Using Gauss - Elimination Method.
- Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.
- Solve the System of Linear Equations Using Gauss - Jorden Method.
- Integrate numerically using Trapezoidal Rule.
- Integrate numerically using Simpson's Rules.

- Numerical Solution of Ordinary Differential Equations By Euler's Method.
- Numerical Solution of Ordinary Differential Equations ByRunge- Kutta Method.

MTSE-126 A	**Mini Project**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
0	**0**	**4**	**2**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Identify structural engineering problems reviewing available literature*						
CO2	*Study different techniques used to analyze complex structural systems.*						
CO3	*Work on the solutions given and present solution by using his/her technique applying engineering principles.*						

Syllabus Content:

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.
End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.
Continuous assessment of Mini Project at Mid Semester and End Semester will be monitored by the departmental committee.

Program Elective -I

MTSE-105 A	Theory of Thin Plates and Shells						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Use analytical methods for the solution of thin plates and shells*						
CO2	*Use analytical methods for the solution of shells.*						
CO3	*Apply the numerical techniques and tools for the complex problems in thin plates*						
CO4	*Apply the numerical techniques and tools for the complex problems in shells.*						

Unit 1

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 2

Static Analysis of Plates: Governing Equation for a Rectangular Plate, Navier Solution for Simply- Supported Rectangular Plate under Various Loadings, Levy solution for Rectangular Plate with other Boundary Conditions

Unit 3

Circular Plates: Analysis under Axi- Symmetric Loading, Governing Differential

Equation in Polar Co-ordinates. Approximate Methods of Analysis- Rayleigh-Ritz approach for Simple Cases in Rectangular Plates.

Unit 4

Static Analysis of Shells: Membrane Theory of Shells - Cylindrical, Conical and Spherical Shells,

Unit 5

Shells of Revolution: with Bending Resistance - Cylindrical and Conical Shells, Application to Pipes and Pressure Vessels.

Unit 6

Thermal Stresses in Plate/ Shell

References:

- Theory of Plates and Shells, Timoshenko S. and Krieger W., McGraw Hill.
- Stresses in Plates and Shells, Ugural Ansel C., McGraw Hill.
- Thin Elastic Shells, Kraus H" John Wiley and Sons
- Theory of Plates, Chandra shekhara K., Universities Press
- Design and Construction of Concrete Shells, RamaswamyG.S

Program Elective -I

MTSE-107 A	**Theory and Applications of Cement Composites**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Formulate constitutive behaviour of composite materials – Ferrocement, SIFCON and Fibre Reinforced Concrete - by understanding their strain- stress behaviour.*						
CO2	*Classify the materials as per orthotropic and anisotropic behaviour.*						
CO3	*Estimate strain constants using theories applicable to composite materials.*						
CO4	*Analyse and design structural elements made of cement composites.*						

Unit 1

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

Unit 2

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

Unit 3

Cement Composites: Types of Cement Composites, Terminology, Constituent Materials and their Properties, Construction Techniques for Fibre Reinforced Concrete - Ferrocement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing

Unit 4

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

Unit 5

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

Unit 6

Analysis and Design of Cement Composite Structural Elements - Ferrocement, SIFCON and Fibre Reinforced Concrete.

References:

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

Program Elective -I

MTSE-109 A	Theory of Structural Stability						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Determine stability of columns and frames*						
CO2	*Determine stability of beams and plates*						
CO3	*Use stability criteria and concepts for analyzing discrete and continuous systems*						

Unit-1

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

Unit-2

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

.

Unit-3

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

Unit-4

Stability of Beams: lateral torsion buckling

Unit-5

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

Unit-6

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

Reference Books:

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

Program Elective -II

MTSE-111 A	Analytical and Numerical Methods for Structural Engineering						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Solve ordinary and partial differential equations in structural mechanics using numerical methods*						
CO2	*Write a program to solve a mathematical problem.*						

Unit 1

Fundamentals of Numerical Methods: Error Analysis, Polynomial Approximations and Interpolations

Unit 2

Curve Fitting; Interpolation and extrapolation

Unit 3

Solution of Nonlinear Algebraic and Transcendental Equations

Unit 4

Elements of Matrix Algebra: Solution of Systems of Linear Equations, Eigen Value Problems

Unit 5

Numerical Differentiation & Integration: Solution of Ordinary and Partial Differential Equations.

Unit 6

Finite Difference scheme: Implicit & Explicit scheme

Unit 7

Computer Algorithms: Numerical Solutions for Different Structural Problems, Fuzzy Logic and Neural Network

References:

- An Introduction to Numerical Analysis, AtkinsonK.E., J. Wiley and Sons, 1989.
- Theory and Problems of Numerical Analysis, Scheid F, McGraw Hill Book Company, (Shaum Series), 1988.
- Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India, 1998

Program Elective -II

MTSE-113 A	**Structural Health Monitoring**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Diagnosis the distress in the structure understanding the causes and factors.*						
CO2	*Assess the health of structure using static field methods.*						
CO3	*Assess the health of structure using dynamic field tests*						
CO4	*Suggest repairs and rehabilitation measures of the structure*						

Unit 1

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

Unit 2

Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.

Unit 3

Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

Unit 4

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

Unit 5

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 6

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.

References:

- Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006
- Health Monitoring of Structural Materials and Components Methods with Applications, Douglas E Adams, John Wiley and Sons, 2007
- Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006
- Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc, 2007

Program Elective -II

MTSE-115 A	Structural Optimization						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Use Variational principle for optimization*						
CO2	*Apply optimization techniques to structural steel and concrete members*						
CO3	*Design using frequency constraint*						

Unit 1

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

Unit 2

Calculus of Variation: Variational Principles with Constraints.

Unit 3

Linear Programming Integer Programming, Nonlinear Programming, Dynamic Programming, Geometric Programming and Stochastic Programming.

Unit 4

Applications: Structural Steel and Concrete Members, Trusses and Frames

Unit 5

Design: Frequency Constraint, Design of Layouts

References:

- Elements of Structural Optimization, Haftka, Raphael T., Gürdal, Zafer, Springer.
- Variational methods for Structural optimization, Cherkaev Andrej, Springer

Program Elective -III

MTSE-106 A	Advanced Steel Design						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Design steel structures/ components by different design processes*						

CO2	*Analyze and design beams and columns for stability and strength, and drift*
CO3	*Design welded and bolted connections*

Unit 1

Properties of Steel: Mechanical Properties, Hysteresis, Ductility.

Unit 2

Hot Rolled Sections: compactness and non-compactness, slenderness, residual stresses.

Unit 3

Design of Steel Structures: Inelastic Bending Curvature, Plastic Moments, Design Criteria Stability, Strength, Drift.

Unit 4

Stability of Beams: Local Buckling of Compression Flange &Web, Lateral Torsional Buckling.

Unit 5

Stability of Columns: Slenderness Ratio, Local Buckling of Flanges and Web, Bracing of Column about Weak Axis.

Unit 6

Method of Designs: Allowable Stress Design, Plastic Design, Load and Resistance Factor Design;

Unit 7

Strength Criteria: Beams - Flexure, Shear, Torsion, Columns - Moment Magnification Factor, Effective Length PM Interaction, Biaxial Bending, Joint Panel Zones.

Unit 8

Drift Criteria: P Effect, Deformation Based Design

Unit 9

Connections: Welded, Bolted, Location Beam Column, Column Foundation, Splices.

References:

- Design of Steel Structures - Vol. II, Ramchandra. Standard Book House, Delhi
- Design of Steel Structures - Arya A. S., Ajmani J. L., Nemchand and Bros.,

Roorkee
- The Steel Skeleton- Vol. II, Plastic Behaviour and Design - Baker J. F., Horne M. R., Heyman J., ELBS
- Plastic Methods of Structural Analysis, Neal B. G., Chapman and Hall London
- IS 800: 2007 – General Construction in Steel - Code of Practice, BIS, 2007
- SP – 6 - Handbook of Structural Steel Detailing, BIS,1987

Program Elective -III

MTSE-108 A	Design of Formwork						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Select proper formwork, accessories and material*						
CO2	*Design the form work for Beams, Slabs, columns, Walls and Foundations*						
CO3	*Design the form work for Special Structures*						
CO4	*Understand the working of flying formwork*						
CO5	*Judge the formwork failures through case studies*						

Unit 1

Introduction: Requirements and Selection of Formwork

Unit 2

Formwork Materials- Timber, Plywood, Steel, Aluminum, Plastic, and Accessories. Horizontal and Vertical Formwork Supports

Unit 3

Formwork Design: Concepts, Formwork Systems and Design for Foundations, Walls, Columns, Slab and Beams

Unit 4

Formwork Design for Special Structures: Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Bridges

Unit 5

Flying Formwork: Table Form, Tunnel Form, Slip Form, Formwork for Precast Concrete, Formwork Management Issues –Pre- and Post-Award.

Unit 6

Formwork Failures: Causes and Case studies in Formwork Failure, Formwork Issues in

Multi-Story Building Construction

References:

- Formwork for Concrete Structures, Peurify, Mc Graw Hill India, 2015
- Formwork for Concrete Structures, Kumar NeerajJha, Tata McGraw Hill Education, 2012
- IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS

Program Elective -III

MTSE-110 A	Design of High Rise Structures						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Analyze, design and detail Transmission/ TV tower, Mast and Trestles with different loading conditions*						
CO2	*Analyze, design and detail the RC and Steel Chimney*						
CO3	*Analyze. design and detail the tall buildings subjected to different loading conditions using relevant codes*						

Unit 1

Design of transmission/ TV tower, Mast and trestles: Configuration, bracing system, analysis and design for vertical transverse and longitudinal loads.

Unit 2

Analysis and Design of RC and Steel Chimney, Foundation design for varied soil strata.

Unit 3

Tall Buildings: Structural Concept, Configurations, various systems, Wind and Seismic loads, Dynamic approach, structural design considerations and IS code provisions. Firefighting design provisions

Unit 4

Application of software in analysis and design.

References:

- Structural Design of Multi-storeyed Buildings, Varyani U. H., 2nd Ed., SouthAsian Publishers, New Delhi, 2002
- Structural Analysis and Design of Tall Buildings, Taranath B. S., Mc Graw Hill, 1988
- Illustrated Design of Reinforced Concrete Buildings (GF+3storeyed), Shah V. L. & Karve S. R., Structures Publications, Pune, 2013
- Design of Multi Storeyed Buildings, Vol. 1 & 2, CPWD Publications, 1976
- Tall Building Structures, Smith Byran S. and Coull Alex, Wiley India. 1991
- High Rise Building Structures, Wolfgang Schueller, Wiley., 1971
- Tall Chimneys, Manohar S. N., Tata Mc Graw Hill Publishing Company, New Delhi

Program Elective -III

MTSE-112 A	**Design of Masonry Structures**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							

CO1	*Understand the masonry design approaches.*
CO2	*Analyze Reinforced Masonry Members*
CO3	*Determine interactions between members*
CO4	*Determine shear strength and ductility of Reinforced Masonry members*
CO5	*Check the stability of walls*
CO6	*Perform elastic and Inelastic analysis of masonry walls*

Unit-I

Introduction: Historical Perspective, Masonry Materials, Masonry Design Approaches, Overview of Load Conditions, Compression Behavior of Masonry, Masonry Wall Configurations, Distribution of Lateral Forces

Unit-II

Flexural Strength of Reinforced Masonry Members: In plane and Out-of-plane Loading

Unit-III

Interactions: Structural Wall, Columns and Pilasters, Retaining Wall, Pier and Foundation

Unit-IV

Shear Strength and Ductility of Reinforced Masonry Members

Unit-V

Prestressed Masonry - Stability of Walls, Coupling of Masonry Walls, Openings, Columns, Beams

Unit-VI

Elastic and Inelastic Analysis, Modeling Techniques, Static Push-Over Analysis and use of Capacity Design Spectra

References Books:

- Design of Reinforced Masonry Structures, Narendra Taly, ICC, 2nd Edn
- Masonry Structures: Behavior and Design, Hamid Ahmad A. and Drysdale Robert G., 1994
- Mechanics of Masonry Structures, Editor: Maurizio Angelillo, 2014
- Earthquake-resistant Design of Masonry Buildings, Toma evi Miha, Imperial College Press, 1999

Program Elective -IV

MTSE-114 A	Design of Advanced Concrete Structures						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Analyze the special structures by understanding their behaviour*						
CO2	*Design and prepare detail structural drawings for execution citing relevant IS codes*						

Unit-I

Design philosophy, Modeling of Loads, Material Characteristics

Unit-II

Reinforced Concrete - P-M, M-phi Relationships, Strut-and- Tie Method, Design of Deep Beam and Corbel, Design of Shear Walls, Compression Field Theory for Shear Design, Design against Torsion; IS, ACI and Eurocode

Unit-III

Steel Structures -- Stability Design, Torsional Buckling - Pure, Flexural and Lateral, Design of Beam-Columns, Fatigue Resistant Design, IS code, AISC Standards and Eurocode

References Books:

- Reinforced Concrete Design, Pillai S. U. and MenonD., Tata McGraw-Hill, 3rd Ed, 1999
- Design of Steel Structures, Subramaniam N., Oxford University Press, 2008
- Reinforced Concrete Structures, Park R.and PaulayT. , John Wiley & Sons, 1995
- Advanced Reinforced Concrete Design, Varghese P. C., Prentice Hall of India, New Delhi
- Unified Theory of Concrete Structures, Hsu T. T. C. and Mo Y. L., John Wiley & Sons, 2010
- Steel Structures Design and Behavior Emphasizing Load and Resistance Factor Design, Salmon C. G., Johnson J. E. and Malhas F. A., Pearson Education, 5th Ed, 2009
- Design of Steel Structures - Vol. II, Ramchandra. Standard Book House, Delhi

- Plastic Methods of Structural Analysis, Neal B.G., Chapman and Hall London

Program Elective -IV

MTSE-116 A	Advanced Design of Foundation						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	Decide the suitability of soil strata for different projects						
CO2	Design shallow foundations deciding the bearing capacity of soil						
CO3	Analyze and design the pile foundation						
CO4	Understand analysis methods for well foundation						

Unit-I

Planning of Soil Exploration for Different Projects, Methods of Subsurface Exploration, Methods of Borings along with Various Penetration Tests

Unit-II

Shallow Foundations, Requirements for Satisfactory Performance of Foundations, Methods of Estimating Bearing Capacity, Settlements of Footings and Rafts, Proportioning of Foundations using Field Test Data, Pressure - Settlement Characteristics from Constitutive Laws

Unit-III

Pile Foundations, Methods of Estimating Load Transfer of Piles, Settlements of Pile

Foundations, Pile Group Capacity and Settlement, Laterally Loaded Piles, Pile Load Tests, Analytical Estimation of Load- Settlement Behavior of Piles, Proportioning of Pile Foundations, Lateral and Uplift Capacity of Piles

Unit-IV

Well Foundation, IS and IRC Code Provisions, Elastic Theory and Ultimate Resistance Methods

Unit-V

Tunnels and Arching in Soils, Pressure Computations around Tunnels

Unit-VI

Open Cuts, Sheeting and Bracing Systems in Shallow and Deep Open Cuts in Different Soil Types

Unit-VII

Coffer Dams, Various Types, Analysis and Design, Foundations under uplifting loads, Soil-structure interaction

Reference Books

- Design of foundation system, N.P. Kurian, Narosa Publishing House
- Foundation Analysis and Design, J. E. Bowles, Tata McGraw Hill New York
- Analysis and Design of Substructures, Sawmi Saran, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi

Program Elective -IV

MTSE-118 A	**Soil Structure Interaction**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Understand soil structure interaction concept and complexities involved*						
CO2	*Evaluate soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics*						
CO3	*Prepare comprehensive design oriented computer programs for interaction problems based on theory of sub grade reaction such as beams, footings, rafts etc*						
CO4	*Analyze different types of frame structure founded on stratified natural deposits with linear and non-linear stress-strain characteristics*						

CO5	*Evaluate action of group of piles considering stress-strain characteristics of real soils*	

Unit- I

Critical Study of Conventional Methods of Foundation Design, Nature and Complexities of Soil Structure Interaction

Unit- II

Application of Advanced Techniques of Analysis such as FEM and Finite Difference Method.

Relaxation and Interaction for the Evaluation of Soil Structure Interaction for Different Types of

Structure under various Conditions of Loading and Subsoil Characteristics

Unit -III

Preparation of Comprehensive Design Oriented Computer Programs for Specific Problems, Interaction Problems based on Theory of Sub Grade Reaction Such as Beams, Footings, Rafts Etc.

Unit- IV

Analysis of Different Types of Frame Structures Founded on Stratified Natural Deposits with Linear and Non-Linear Stress-Strain Characteristics.

Unit- V

Determination of Pile Capacities and Negative Skin Friction, Action of Group of Piles Considering Stress-Strain Characteristics of Real Soils, Anchor Piles and Determination of Pullout Resistance

References:

- Analytical and Computer Methods in Foundation, Bowels J.E.,McGraw Hill Book Co., New York, 1974
- Numerical Methods in Geotechnical Engineering, Desai C.S. and Christian J.T., McGraw Hill Book Co., New York
- Soil Structure Interaction - The real behaviour of structures, Institution of Structural Engineers
- Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg. Vol-17, Elsevier Scientific Publishing Company
- Elastic Analysis of Soil-Foundation Interaction, Selvadurai A.P.S., Elsevier Scientific Publishing Company
- Analysis & Design of substructures, Swami Saran, Oxford & IBH Publishing Co. Pvt. Ltd.
- Design of Foundation System- Principles & Practices, Kurian N. P., Narosa

Publishing

Program Elective -IV

MTSE-120 A	**Design of Industrial Structure**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Design Steel Gantry Girders*						
CO2	*Design Steel Portal, Gable Frames*						
CO3	*Design Steel Bunkers and Silos*						
CO4	*Design Chimneys and Water Tanks*						

Unit I

Steel Gantry Girders – Introduction, loads acting on gantry girder, permissible stress, types of gantry girders and crane rails, crane data, maximum moments and shears, construction detail, design procedure

Unit II

Portal Frames – Design of portal frame with hinge base, design of portal frame with fixed base - Gable Structures – Lightweight Structures

Unit III

Steel Bunkers and Silos – Design of square bunker – Jansen's and Airy's theories – IS Code provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams Design of cylindrical silo – Side plates – Ring girder – stiffeners

Unit IV

Chimneys – Introduction, dimensions of steel stacks, chimney lining, breech openings and access ladder, loading and load combinations, design considerations, stability consideration, design of base plate, design of foundation bolts, design of foundation

Unit V

Water Tanks – Design of rectangular riveted steel water tank – Tee covers – Plates – Stays – Longitudinal and transverse beams –Design of staging – Base plates – Foundation and anchor bolts

Unit VI

Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder –Design of staging and foundation

References:

- Design of Steel Structure, Punmia B. C., Jain Ashok Kr., Jain Arun Kr., 2nd Ed., Lakshmi Publishers, 1998
- Design of Steel Structures, Ram Chandra, 12th Ed., Standard Publishers, 2009.
- Design of Steel Structures, Subramaniyam

Program Elective -V

MTSE-201 A	Design of Pre-stresssed Concrete Structures						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Find out losses in the prestressed concrete. Understand the basic aspects of prestressed concrete fundamentals, including pre and post-tensioning processes*						
CO2	*Analyze prestressed concrete deck slab and beam/ girders*						
CO3	*Design prestressed concrete deck slab and beam/ girders*						
CO4	*Design of end blocks for prestressed members*						

Unit I

Introduction to prestressed concrete: types of prestressing, systems and devices, materials, losses in prestress. Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provisions

Unit II

Statically determinate PSC beams: design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions

Unit III

Transmission of prestress in pretensioned members; Anchorage zone stresses for posttensioned members

Unit IV

Statically indeterminate structures - Analysis and design - continuous beams and frames, choice of cable profile, linear transformation and concordancy

Unit V

Composite construction with precast PSC beams and cast in-situ RC slab - Analysis and design, creep and shrinkage effects. Partial prestressing - principles, analysis and design

concepts, crack-width calculations

Unit VI

Analysis and design of prestressed concrete pipes, columns with moments

References Books:

- Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House, 1955
- Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi, 1981
- Limited State Design of Prestressed CONcrete, GuyanY., Applied Science Publishers, 1972
- IS: 1343- Code of Practice for Prestressed Concrete

Program Elective -V

MTSE-203 A	**Analysis of Laminated Composite Plates**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Analyze the rectangular composite plates using the analytical methods*						
CO2	*Analyze the composite plates using advanced finite element method*						
CO3	*Develop the computer programs for the analysis of composite plates*						

Unit I

Introduction: Displacement Field Approximations for Classical Laminated Plate Theory (CLPT) and First Order Shear Deformation Theory (FSDT), Analytical Solutions for Bending of Rectangular Laminated Plates using CLPT

Unit II

Governing Equations. Navier Solutions of Cross-Ply and Angle-Ply Laminated Simply-Supported Plates, Determination of Stresses. Levy Solutions for Plates with Other Boundary Conditions, Analytical Solutions for Bending of Rectangular Laminated Plates

Using FSDT

Unit III

Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT

Unit IV

Introduction to Finite Element Method, Rectangular Elements, Formation of Stiffness Matrix, Formation of Load Vector, Numerical Integration, Post Computation of Stresses

Unit V

Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT

Unit VI

Finite Element Model, C^0Element Formulation, Post Computation of Stresses. Analysis of Rectangular Composite Plates using Analytical Methods

Reference:

- Mechanics of Laminated Composites Plates and Shells, Reddy J. N., CRC Press

Program Elective -V

MTSE-205 A	**Fracture Mechanics of Concrete Structures**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Identify and classify cracking of concrete structures based on fracture mechanics*						
CO2	*Implement stress intensity factor for notched members*						

CO3	*Apply fracture mechanics models to high strength concrete and FRC structures*
CO4	*Compute J-integral for various sections understanding the concepts of EFM*

Unit I

Introduction: Basic Fracture Mechanics, Crack in a Structure, Mechanisms of Fracture and Crack Growth, Cleavage Fracture, Ductile Fracture, Fatigue Cracking, Environment assisted Cracking, Service Failure Analysis

Unit II

Stress at Crack Tip: Stress at Crack Tip, Linear Elastic Fracture Mechanics, Griffith's Criteria, Stress Intensity Factors, Crack Tip Plastic Zone, Erwin's Plastic Zone Correction, R curves, Compliance, J Integral, Concept of CTOD and CMD

Unit III

Material Models: General Concepts, Crack Models, Band Models, Models based on Continuum Damage Mechanics, Applications to High Strength Concrete, Fibre Reinforced Concrete, Crack Concepts and Numerical Modeling.

References:

- Fracture Mechanics, Suri C. T. and Jin Z.H., 1st Edition, Elsevier Academic Press, 2012
- Elementary Engineering Fracture Mechanics, BroekDavid, 3rd Rev. Ed. Springer, 1982.

- Fracture Mechanics of Concrete Structures – Theory and Applications, Elfgreen L., RILEM Report, Chapman and Hall, 1989
- Fracture Mechanics – Applications to Concrete, Victor, Li C., Bazant Z. P., ACI SP 118, ACI Detroit, 1989

Program Elective -V

MTSE-207 A	Design of Plates and Shells						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Analyze and design prismatic folded plate systems*						
CO2	*Analyze and design shells using approximate solutions*						
CO3	*Analyze and Design Cylindrical Shells*						
CO4	*Design Doubly Curved Shells using Approximate Solutions*						

Unit I

Prismatic folded Plate Systems

Unit II

Shell Equations

Unit III

Approximate Solutions

Unit IV

Analysis and Design of Cylindrical Shells

Unit V

Approximate Design methods for Doubly Curved Shells

References:

- Theory of Plates and Shells, Timoshenko and Woinowsky-Krieger S., Tata Mc Graw Hill Edition, 2010
- Design and Construction of Concrete Shell Roofs, Ramaswamy G. S., 1st Edition, 2005
- Design of Reinforced Concrete Shells & Folded Plate, Varghese P. C., 1st Edition, PHI
- Design of Plate and Shell Structures, Jawad Maan H., Springer Science

Open Elective

MTOE-201 A	Business Analytics						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Program Objective (PO)							
PO1	*Understand the role of business analytics within an organization*						
PO2	*Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization*						
PO3	*To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making*						
PO4	*To become familiar with processes needed to develop, report, and analyze business data*						
PO5	*Use decision-making tools/Operations research techniques*						
PO6	*Mange business process using analytical and management tools*						
PO7	*Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc*						
Course outcomes (CO)							
CO1	*Students will demonstrate knowledge of data analytics*						
CO2	*Students will demonstrate the ability of think critically in making decisions based on data and deep analytics*						
CO3	*Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making*						
CO4	*Students will demonstrate the ability to translate data into clear, actionable insights*						

Unit I

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling and estimation methods overview.

Unit II

Trendiness and Regression Analysis: Modeling Relationships and Trends in Data, simple Linear

Regression.
Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit III

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.
Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization

Unit IV

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression orecasting with Casual Variables, Selecting Appropriate Forecasting Models.
Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model

Unit V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without 8 Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Unit VI

Recent Trends in Embedded and collaborative business intelligence, Visual data 4 recovery, Data Storytelling and Data journalism.

References

- Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press
- Business Analytics by James Evans, persons Education

Open Elective

MTOE-203 A	Industrial Safety						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**

Unit I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and fire fighting, equipment and methods.

Unit II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance,

Maintenance cost & its relation with replacement economy, Service life of equipment

Unit III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

References

- Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
- Maintenance Engineering, H. P. Garg, S. Chand and Company.
- Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication
- Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London

Open Elective

MTOE-205 A	Operations Research						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Students should able to apply the dynamic programming to solve problems of discreet and continuous variables*						
CO2	*Students should able to apply the concept of non-linear programming*						
CO3	*Students should able to carry out sensitivity analysis*						
CO4	*Student should able to model the real world problem and simulate it*						

Unit I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit II

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit IV

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References

- H.A. Taha, Operations Research, An Introduction, PHI, 2008
- H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982
- J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
- Hitler Libermann Operations Research: McGraw Hill Pub. 2009
- Pannerselvam, Operations Research: Prentice Hall of India 2010
- Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Open Elective

MTOE-207 A	Cost Management of Engineering Projects						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Course Outcomes (CO)							
CO1	*Students should able to learn the cost concepts in decision making*						
CO2	*Student should be able to do cost planning and Marginal Costing*						
CO3	*Students should be able to create a database for operational control and decision making.*						

Unit I

Introduction and Overview of the Strategic Cost Management Process

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Unit II

Project: meaning, Different types, why to manage, cost overruns centers, various stages of project

execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.

Unit III

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis.

Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints.

Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Unit IV

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

References

- Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
- Charles T. Horngren and George Foster, Advanced Management Accounting
- Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting

Open Elective

MTOE-209 A	**Composite Materials**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Program Objective (PO)	*To enable students to aware about the composite materials and their properties.*						
Course Outcomes (CO)							
CO1	*Students should able to learn the Classification and characteristics of Composite materials.*						
CO2	*Students should able reinforcements Composite materials.*						
CO3	*Students should able to carry out the preparation of compounds.*						
CO4	*Student should able to do the analysis of the composite materials.*						

UNIT I

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures,

Inverse rule of mixtures. Iso-strain and Iso-stress conditions.

UNIT II

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT III

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT IV

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

- Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
- Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.

3. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:

- Hand Book of Composite Materials-ed-Lubin.
- Composite Materials – K.K.Chawla.
- Composite Materials Science and Applications – Deborah D.L. Chung.
- Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

Open Elective

MTOE-211 A	**Waste to Energy**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
3	**0**	**0**	**3**	**60**	**40**	**100**	**3 Hrs.**
Program Objective (PO)	*To enable students to aware about the generation of energy from the waste.*						
Course Outcomes (CO)							
CO1	*Students should able to learn the Classification of waste as a fuel.*						
CO2	*Students should able to learn the Manufacture of charcoal.*						
CO3	*Students should able to carry out the designing of gasifiers and biomass stoves.*						

CO4	*Student should able to learn the Biogas plant technology.*	

Unit I

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit II

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit III

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit IV

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:

- Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
- Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
- Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
- Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

Audit-I

MTAD-101 A	**English For Research Paper Writing**	

Lecture	Tutorial	Practical	Credit	End Sem. Evaluation	Mid Sem. Evaluation	Total	Time
2	**0**	**0**	**0**	**-**	**100**	**100**	**3 Hrs.**
Program Objective (PO)	*Student will able to understand the basic rules of research paper writing.*						
Course Outcomes (CO)							
CO1	*Understand that how to improve your writing skills and level of readability*						
CO2	*Learn about what to write in each section*						
CO3	*Understand the skills needed when writing a Title*						
CO4	*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. 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 IV

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.

References:

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

Audit -I

MTAD-103 A	Disaster Management						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
2	**0**	**0**	**0**	**-**	**100**	**100**	**3 Hrs.**
Program Objective (PO)	*Develop an understanding of disaster risk reduction and management*						
Course Outcomes (CO)							
CO1	*Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.*						
CO2	*Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.*						
CO3	*Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.*						
CO4	*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.

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 IV

Disasters 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

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 4

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

References:

- R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
- Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
- Goel S. L., Disaster Administration And Management Text And Case Studies",Deep &Deep Publication Pvt. Ltd., New Delhi.

Audit -I

MTAD-105 A	**Sanskrit for Technical Knowledge**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
2	**0**	**0**	**0**	**-**	**100**	**100**	**3 Hrs.**
Program Objective (PO)	*Students will be able to Understanding basic Sanskrit language and Ancient Sanskrit literature about science & technology can be understood and Being a logical language will help to develop logic in students*						
Course Outcomes (CO)							
CO1	*To get a working knowledge in illustrious Sanskrit, the scientific language in the world*						
CO2	*Learning of Sanskrit to improve brain functioning*						
CO3	*Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power*						
CO4	*The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature*						

Unit I

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences.

Unit II

Order, Introduction of roots, Technical information about Sanskrit Literature

Unit III

Technical concepts of Engineering: Electrical, Mechanical

Unit IV

Technical concepts of Engineering: Architecture, Mathematics

References

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

Audit I

MTAD-107 A	**Value Education**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
2	**0**	**0**	**0**	**-**	**100**	**100**	**3 Hrs.**
Program Objective (PO)	*Understand value of education and self- development, Imbibe good values in students and Let the should know about the importance of character*						
Course Outcomes (CO)							
CO1	*Knowledge of self-development*						
CO2	*Learn the importance of Human values*						
CO3	*Developing the overall personality*						
CO4	*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 judgments.

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. 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 IV

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

References

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

Audit II

MTAD-102 A	**Constitution of India**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
2	**0**	**0**	**0**	**-**	**100**	**100**	**3 Hrs.**

Program Objective (PO)	*Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective and 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.*
Course Outcomes (CO)	
CO1	*Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.*
CO2	*Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.*
CO3	*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.*
CO4	*Discuss the passage of the Hindu Code Bill of 1956.*

Unit I

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

Unit 2

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.

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

Unit 3

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

Unit 4

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.

References

- The Constitution of India, 1950 (Bare Act), Government Publication.

- Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
- M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
- D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Audit-II

MTAD-104 A	Pedagogy Studies						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
2	**0**	**0**	**0**	**-**	**100**	**100**	**3 Hrs.**
Program Objective (PO)	*Review existing evidence on the review topic to inform programme design and policy making undertaken by the DFID, other agencies and researchers and Identify critical evidence gaps to guide the development*.						
Course Outcomes (CO)							
CO1	*What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?*						
CO2	*What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?*						
CO3	*How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?*						
CO4	*What is the importance of identifying research gaps?*						

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

Unit II

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 school 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 III

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

Unit IV

Research gaps and future directions: Research design, Contexts , Pedagogy, Teacher

education Curriculum and assessment, Dissemination and research impact.

References

- Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
- Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
- Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
- 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.
- Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
- Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.

Audit II

MTAD-106 A	**Stress Management by Yoga**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
2	**0**	**0**	**0**	**-**	**100**	**100**	**3 Hrs.**
Program Objective (PO)	To achieve overall health of body and mind and to overcome stress						
Course Outcomes (CO)							
CO1	*Develop healthy mind in a healthy body thus improving social health.*						
CO2	*Improve efficiency*						
CO3	*Learn the Yog asan*						
CO4	*Learn the pranayama*						

Unit I

Definitions of Eight parts of yog (Ashtanga).

Unit II

Yam and Niyam, Do`s and Don't's in life; Ahinsa, satya, astheya, bramhacharya and aparigraha; Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.

Unit III

Asan and Pranayam, Various yog poses and their benefits for mind & body,

Unit IV

Regularization of breathing techniques and its effects-Types of pranayam.

References

- 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur
- "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

Audit II

MTAD-108 A	**Personality Development through Life Enlightenment Skills**						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Sem. Evaluation**	**Mid Sem. Evaluation**	**Total**	**Time**
2	**0**	**0**	**0**	**-**	**100**	**100**	**3 Hrs.**
Program Objective (PO)	To learn to achieve the highest goal happily To become a person with stable mind, pleasing personality and determination To awaken wisdom in students						
Course Outcomes (CO)							
CO1	*Students become aware about leadership.*						
CO2	*Students will learn how to perform his/her duties in day to day work.*						
CO3	*Understand the team building and conflict*						
CO4	*Student will learn how to become role model for the society.*						

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); Verses: 52, 53, 59 (don's); Verses: 71, 73, 75, 78 (do's).

Unit II

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 III

Statements of basic knowledge; Shrimad Bhagwad Geeta: Chapter-2: Verses: 56, 62, 68; Chapter-12: Verses: 13, 14, 15, 16, 17, 18.

Unit IV

Personality of Role model; Shrimad Bhagwad Geeta: Chapter-2: Verses: 17; Chapter-3: Verses: 36, 37, 42: Chapter-4: Verses: 18, 38, 39; Chapter-18: Verses: 37, 38, 63.

References:

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

MTSE-209 A Dissertation Phase – I

(Credits 0 : 0 : 20 =10)

Teaching Scheme

Lab work : 20 hrs/week for Dissertation Phase- I
Mid Semester Evaluation weightage- 30% and End Semester Evaluation weightage- 70%

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

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

Syllabus Contents:

The dissertation-I will have mid semester presentation and end semester presentation. The mid semester presentation will include identification of problem based on literature review on the topic referring to latest literature available.
End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individual contribution.
Continuous assessment of Dissertation-I and Dissertation-II at mid semester and end semester will be monitored by the departmental committee.

MTSE-202 A Dissertation Phase – II
(Credits 0 : 0 : 32 =16)

Teaching Scheme

Contact Hours : 3 hrs/week for Dissertation Phase- II

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

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

Syllabus Contents:

Dissertation-II will be extension of the work on the topic identified in Dissertation-I Continuous assessment should be done of the work done adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be pre-submission seminar at the end of academic term. After the approval the student has to submit the detailed report and external examiner is called for the viva-voce to assess along with guide.

……..

Guidelines for Dissertation Phase – I and Phase-II

As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.

The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.

After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Civil Engineering, Structural Engineering and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.

Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.

Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.

Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.

During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in

reputed journals and reviewed focused conferences OR IP/Patents.

Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, A record of continuous progress.

Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work

……