SHRI VENKATESHWARA UNIVERSITY

EVALUATION SCHEME

M.TECH (Structural Engineering)

(Two Years Post Graduation Programme)

(w.e.f. 2019-20)

SCHOOL OF ENGINEERING & TECHNOLOGY

Evaluation for M.Tech (Structural Engineering)

SEMESTER-II													
Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	MSE-201	FEM in Structural Engineering	3	0	0	20	10	30		70		100	3
2	MSE-202	Structural Dynamics	3	0	0	20	10	30		70		100	3
3	MSE-031	Advanced Steel Design	3	0	0	20	10	30		70		100	3
4	MSE-041	Design of Advanced Concrete Structures	3	0	0	20	10	30		70		100	3
5	MSE-211	Model Testing Lab	0	0	4				25		25	50	2
6	MSE-212	Numerical Analysis Lab	0	0	4				25		25	50	2
7	MSE-221	Mini Project	0	0	4				50		50	100	2
8	AUD-102	Disaster Management	2	0	0								0
		Total										600	18

M.TECH SE Semester II

MSE-201 - Finite Element Method in Structural Engineering(Credits- 3:0:0 = 3)

Teaching Scheme Lectures: 3 hrs/week

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

1. Use Finite Element Method for structural analysis.
2. Execute the Finite Element Program/ Software.
3. Solve continuum problems using finite element analysis.

Syllabus Contents:

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

Reference Books:

- 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.

MSE-202 – Structural Dynamics (Credits - 3:0:0 = 3)

Teaching Scheme Lectures: 3 hrs/week

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

1. Analyze and study dynamics response of single degree freedom system using fundamental theory and equation of motion.
2. Analyze and study dynamics response of Multi degree freedom system using fundamental theory and equation of motion.
3. Use the available software for dynamic analysis.

Syllabus Contents:

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

Reference Books:

- Dynamics of Structures, Clough R. W. and Penzien J., Mc Graw 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 Publication.
- Dynamics of Structures, Hart and Wong

MSE-031– Advanced Steel Design (Credits - 3:0:0 = 3)

Teaching Scheme Lectures: 3 hrs/week

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

1. Design steel structures/ components by different design processes.
2. Analyze and design beams and columns for stability and strength, and drift.
3. Design welded and bolted connections.

Syllabus Contents:

- **Properties of Steel:** Mechanical Properties, Hysteresis, Ductility.

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

- **Design of Steel Structures**: Inelastic Bending Curvature, Plastic Moments, Design Criteria Stability, Strength, Drift.
- **Stability of Beams:** Local Buckling of Compression Flange &Web, Lateral Torsional Buckling.
- **Stability of Columns:** Slenderness Ratio, Local Buckling of Flanges and Web, Bracing of Column about Weak Axis.
- **Method of Designs:** Allowable Stress Design, Plastic Design, Load and Resistance Factor Design;
- **Strength Criteria:** Beams - Flexure, Shear, Torsion, Columns - Moment Magnification Factor, Effective Length, PM Interaction, Biaxial Bending, Joint Panel Zones.

Drift Criteria: P Effect, Deformation Based Design;
Connections: Welded, Bolted, Location Beam Column, Column Foundation, Splices.

Reference Books:

- 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

MSE-041 – Design of Advanced Concrete Structures (Credits - 3:0:0 = 3)

Teaching Scheme Lectures: 3 hrs/week

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

1. Analyse the special structures by understanding their behaviour.
2. Design and prepare detail structural drawings for execution citing relevant IS codes.

Syllabus Contents:

- Design philosophy, Modeling of Loads, Material Characteristics.
- 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.
- Steel Structures -- Stability Design, Torsional Buckling - Pure, Flexural and Lateral, Design ofBeam-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, SubramaniamN., 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 ofSteel Structures - Vol. II, Ramchandra. Standard Book House, Delhi.

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

MSE-211 Testing Lab (Credits- 0:0:4 = 2)
Teaching Scheme Lectures: 2 hrs/week,

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

1. Understand the response of structures.
2. Prepare the models.
3. Conduct model testing for static loading
4. 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.

MSE-212 Numerical Analysis Lab (Credits- 0:0:4 = 2)
Teaching Scheme Lectures: 2 hrs/week

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

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

Syllabus Contents:

- 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.

MSE-221 Mini Project (Credits- 0:0:4 = 2)

Teaching Scheme Lectures: 4hrs/week
Course Outcomes: At the end of the course, the student will be able to:

1. Identify structural engineering problems reviewing available literature.
2. Study different techniques used to analyze complex structural systems.
3. work on the solutions given and present solution by using his/her technique applying engineering principles.

Syllabus Contents:

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 Sem and End Sem will be monitored by the departmental committee.

AUDIT 2: DISASTER MANAGEMENT AUD 102

Course Objectives: -Students will be able to:

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. 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.

SYLLABUS CONTENTS

Introduction
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.
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.
Disaster Prone Areas In India
Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics
Disaster Preparedness And Management
Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.
Risk Assessment

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Disaster Mitigation

Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. 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