JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

Kakinada-533003, Andhra Pradesh, India

M.Tech in **STRUCTURAL ENGINEERING**

Vision of the Department

To produce competent civil engineers with the capacity to handle challenges in the field of civil engineering and also to perform innovative research for societal needs with professional ethics.

Mission of the Department

M1: To produce high-quality learners who are globally competent and professionally skillful in the field of civil.

M2: To offer educational programs that impart inventive knowledge with high levels of ethics and human.

M3: Provide a platform to acquire and implement innovative ideas in research and development.

M4: To build up state-of-the-art laboratories and centres of excellence in different areas of civil engineering.

M5: To train the students and faculty to update their knowledge in emerging technologies to meet industrial requirements.

Program Educational Objectives (PEO)

PEO1: Impart basic technical knowledge and skills for specialized careers in Civil Engineering related fields that cater to global needs.

PEO2: Provide expertise in carrying out project works by using state-of-the-art basic computing and experimental techniques and preparing them to take up Masters and jobs.

PEO3: Train the student to possess good communication and presentation skills with the ability to work in teams contributing significantly to the technological development of responsible Civil Engineers.

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Program Outcomes (PO'S)

PO 1: Able to Solve Mathematical/Numerical Problems

PO 2: Able to Analyze Trusses, Beams, Frames

PO3: Estimation of Forces, Analysis of Multi-Degree of Freedom Systems using Mathematical Approaches Such as Static Quasi-Static and Dynamic methods.

PO 4: Design of Structures to Contribute in The Development of the Society.

PO 5: Application of Experimental Techniques on Structural Evaluation

PO 6: Able to Analyze and design of structure under different type of Loads

PO 7: Optimization of structures and presentation of the project done with Ethic

Course Code	
MSEI-1	**THEORY OF ELASTICITY**

Course Outcomes:

At the end of the course, the student will be able to

CO1 Know the definition of stress and deformation and how to determine the components of the stress and strain tensors.
CO2 Apply the conditions of compatibility and equations of equilibrium.
CO3 Understand how to express the mechanical characteristics of materials, constitutive equations and generalized Hook law.
CO4 Use the equilibrium equations stated by the displacements and compatibility conditions stated by stresses

CO5 Understand index notation of equations, tensor and matrix notation and define state of plane stress, state of plane strain
CO6 Be able to analyze real problem and to formulate the conditions of theory of elasticity applications
CO7 Determine the boundary restrictions in calculations. Solve the basic problems of the theory of elasticity by using Airy function expressed as bi- harmonic function.

Course Code	**STRUCTURAL DYNAMICS**
R19 MSEI- I 1102	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Understand the response of structural systems to dynamic loads
CO2 Realize the behavior and response of linear and nonlinear SDOF and MDOF structures with various dynamic loading
CO3 Understand the behavior and response of MDOF structures with various dynamic
CO4 loading.
CO5 Possess the ability to find out suitable solution for continuous system
CO6 Understand the behavior of structures subjected to dynamic loads under free vibration
CO7 Understand the behavior of structures subjected to dynamic loads Harmonic excitation and earthquake load.
CO8

Course Code	**MATRIX ANALYSIS OF STRUCTURES**
R19 MSEI- I 1103a	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent displacements, force and equilibrium methods
CO2 Perform structural analysis using the stiffness method.
CO3 Solve multiple degree of freedom two- and three-dimensional problems involving trusses, beams, frames and plane stress
CO4 Understand basic finite element analysis.

Course Code	**EXPERIMENTAL STRESS ANALYSIS**
R19 MSEI- I 1103b	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Understand the fundamentals of the theory of elasticity
CO2 Implement the principles and techniques of photo elastic measurement
CO3 Obtain the principles and techniques of strain gage measurement
CO4 Adopt the principles and techniques of moiré analysis
CO5 Apply the principles and techniques of holographic interferometer
CO6 Apply the principles and techniques of brittle coating analysis Understand the fundamentals of the theory of elasticity.

Course Code	**SUB STRUCTURE DESIGN**
R19 MSEI- I 1103c	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Attain the perception of site investigation to select suitable type of foundation based on soil category
CO2 Capable of ensuring design concepts of shallow foundation
CO3 Can be efficient in selecting suitable type of pile for different soil stratum and

in

CO4 evaluation of group capacity by formulation
CO5 Design different types of well foundation.

Course Code	**STRUCTURAL OPTIMIZATION**
R19 MSEI- I 1103d	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Basic theoretical principles in optimization
CO2 Formulation of optimization models
CO3 Solution methods in optimization
CO4 Methods of sensitivity analysis and post processing of results
CO5 Applications to a wide range of engineering problems.

Course Code	**BRIDGE ENGINEERING**
R19 MSEI- I 1104 a	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Design theories for super structure and substructure of bridges
CO2 Design Culvert, R.C.C T Beam Bridge.
CO3 Understand the behavior of continuous bridges, box girder bridges.
CO4 Possess the knowledge to design prestressed concrete bridges.
CO5 Design Railway bridges, Plate girder bridges, different types of bearings,

abutments, piers and various types of foundations for Bridges

Course Code		**REPAIR AND REHABILITATION OF STRUCTURES**
R19 MSEI- I 1104 b		

Course Outcomes:

At the end of the course, the student will be able to

CO1 Recognize the mechanisms of degradation of concrete structures and to design durable concrete structures.
CO2 Conduct field monitoring and non-destructive evaluation of concrete structures.
CO3 Design and suggest repair strategies for deteriorated concrete structures including
repairing with composites.

CO4 Understand the methods of strengthening methods for concrete structures
CO5 Assessment of the serviceability and residual life span of concrete structures by Visual inspection and in situ tests
CO6 Evaluation of causes and mechanism of damage
CO7 Evaluation of actual capacity of the concrete structure Maintenance strategies.

Course Code	**ANALYSIS AND DESIGN OF TALL STRUCTURES**
R19 MSEI- I 1104 c	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Know design principles and different types of loading
CO2 Understand various structural systems used for tall structures.
CO3 Capable of analyzing the tall structures and design of structural elements for secondary effects
CO4 Execute stability analysis, overall buckling analysis of frames, Analysis for various secondary effects –such as Creep, Shrinkage and Temperature

Course Code	**ADVANCED REINFORCED CONCRETE DESIGN**
R19 MSEI- I 1104 d	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Estimate the deflection of Concrete beams and slabs
CO2 Estimate crack width and its affects
CO3 Design flat slabs, bunkers, silos and chimneys
CO4 Understand the thermal effect on concrete members

Course Code	**ADVANCED CONCRETE LABORATORY**
R19 MSEPI- I 1107	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Conduct various laboratory tests on Cement, Aggregates
CO2 Know strain measurement
CO3 Non-destructive testing

CO4 Chemical analysis on concrete and Aggregate and Sand.

Course Code	**ADVANCED STRUCTURAL ENGINEERING LABORATORY**
R19 MSEPI- I 1105	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Conduct various laboratory tests on Cement, Aggregates
CO2 Know strain measurement
CO3 Non-destructive testing
CO4 Chemical analysis on concrete and Aggregate and Sand.

Course Code	**FINITE ELEMENT METHOD**
R19 MSEII-1 1201 **SEII-1**	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Develop finite element formulations of 1 degree of freedom problems and solve

them

CO2 Understand any Finite Element software to perform stress, thermal and modal analysis

CO3 Compute the stiffness matrices of different elements and system

CO4 Interpret displacements, strains and stress resultants.

Course Code	**EARTH QUAKE RESISTANT DESIGN**
R19 MSEII-2 1202	

Course Outcomes:

At the end of the course, the student will be able to

CO1 To learn the fundamentals of seismology and basic earthquake mechanisms, tectonics types of ground motion, and propagation of ground motion.

CO2 Understand qualitative and quantitative representations of earthquake magnitude

CO3 Determine the natural frequency of a single degree of freedom dynamic system
for given mass, stiffness and damping properties.

CO4 Determine the maximum dynamic response of an elastic vibrating structure to a
given forcing function

CO5 Learn the fundamentals of building code based structural design

CO6 Determine the static design base shear based on the type of structural system, irregularity, location and occupancy.

CO7 Distribute the static base shear to the structure based on vertical distribution of mass horizontal distribution of mass, and centers of rigidity.

CO8 Recognize special conditions such as irregular buildings, building separation, P-delta.

Course Code	**STABILITY OF STRUCTURES**
R19 MSEII-3 1203 a	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Analyze different types of structural instabilities
CO2 Execute and work out the inelastic buckling using various methodologies.
CO3 Examine the behavior of beam columns and frames with and without side sway
using classical and stiffness methods

CO4 To be well versed in the lateral buckling, torsional buckling, Flexural torsional buckling of various beams and non-circular sections.

Course Code	**MECHANICS OF COMPOSITE MATERIALS**

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R19 MSEII-3 1203 b	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Identify the fiber types and classify the composite material.
CO2 Relate the stress –strain properties, longitudinal and transverse properties of composites lamina.

CO3 Analyze the laminated composites and compute the lamina strength.
CO4 Find the failure criterion and fracture mechanics of composites.
CO5 Apply the load deformation relation, residual stresses for the design of composites.

Course Code	**FRACTURE MECHANICS**
R19 MSEII-3 1203 c	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Predict material failure for any combination of applied stresses.
CO2 Estimate failure conditions of a structures
CO3 Determine the stress intensity factor for simple components of simple

geometry

CO4 Predict the likelihood of failure of a structure containing a defect.

Course Code	**ANALYSIS OF OFFSHORE STRUCTURES**
R19 MSEII-3 1203 d	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Perform concept development of offshore structure
CO2 Find the wave force on vertical cylinder
CO3 Perform static and dynamic analysis of fixed offshore structure.
CO4

Course Code	**THEORY OF PLATES AND SHELLS**
R19 MSEII-3 1204 a	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Have a knowledge about various plate theories due to bending
CO2 Gain the knowledge of Navier's solution, Levy's solution and solve for the rectangular and square plates
CO3 Analyze circular plates with various boundary conditions.
CO4 Focus on the finite difference method of solving plate problems.

CO5 Ability to realize the potential energy principle and find the solution of rectangular plates for various loadings
CO6 Understand the behavior of folded plates and shells.

Course Code	**PRECAST AND PREFABRICATED STRUCTURES**
R19 MSEII-3 1204 b	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Analyze the prefabricated load carrying members
CO2 Analyze the production technology of prefabrication
CO3 Design and detailing of precast UNIT for factories
CO4 Design single storied simple frames

Course Code	**EARTH RETAINING STRUCTURES**
R19 MSEII-3 1204 c	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Quantify the lateral earth pressures associated with different earth systems
CO2 Evaluate the mechanical properties of geosynthetics used for soil reinforcement
CO3 Identify the merits and demerits of different earth retaining systems.
CO4 Select the most technically appropriate type of retaining wall for the application from a thorough knowledge of available systems
CO5 Design of retaining structures using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods
CO6 Aware of current guidelines regarding the design of earth retaining structures.
CO7 Design retaining structures considering both external and internal stability aspects.

Course Code	**INELASTIC DESIGN OF SLABS**
R19 MSEII-3 1204 d	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Perform elastic theory of analysis
CO2 Perform yield line theory
CO3 Analysis of rectangular/Square slabs by principle of virtual work
CO4 Design of of rectangular/Square slabs for different boundary conditions.

Course Code	**COMPUTER AIDED DESIGN LABORATORY**

R19 MSEMC-1205	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Develop Computer Programs for Analysis and Design of various Structural Elements

CO2 Use different Structural Engineering software's to solve various civil Engineering programs.

Course Code	**STRUCTURAL DESIGN LABORATORY**
R19 MSEMCP-2 1206	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Develop Computer Programs for Analysis and Design of various Structural Elements

CO2 Use different Structural Engineering software's to solve various civil Engineering Programs.

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Course Code	**SEMINAR**
R19 MSEPII 1207	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Collect research material on some topic and to summaries it reports and give to present the same.

Course Code	**DESIGN PROJECT**

Course Outcomes:

At the end of the course, the student will be able to

CO1 Analyze, design and prepare a report on Special Design topic related to Structural Engineering.

Course Code	**DISSERTATION/ THESIS**

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Course Outcomes:

At the end of the course, the student will be able to

CO1 Identifying the topic after thorough review of literature on chosen topic and Can able to do the Project either Experimental Work or analytical Work.

Course Code	**PLASTIC ANALYSIS AND DESIGN**
R19 MSEIII-1 2101a	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Understand Concepts of stress and strain – relation of steel Moment curvature relation.

CO2 Carryout limit analysis of simply supported, fixed beams and continuous beams,

CO3 Effect of partial fixity and end, invariance of collapse loads.

CO4 Study basic theorems of limit analysis, rectangular portal frames, gable frames, grids, superposition of mechanisms.

CO5 Understand Limit design Principles to solve continuous beams and simple frames designs using above principles.

CO6 Develop Load deflection relations for simply supported beams, deflection of simple pin based and fixed based portal frames, method of computing deflections.

CO7 Carryout Minimum weight Design using Foulkes theorems and its geometrical analogue and absolute minimum weight design.

Course Code	**PRE-STRESSED CONCRETE**
R19 MSEIII-1 2101 b	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Explain the principle, types and systems of prestressing and analyze the deflections.
CO2 Determine the flexural strength and design the flexural members, end blocks.
CO3 Analyze the statically indeterminate structures and design the continuous beam.
CO4 Design the tension and compression members and apply it for design of piles.
CO5 Analyze the stress, deflections, flexural and shear strength and apply it for the design of bridges.
CO6 Analyze the Composite construction of Pre-stressed and in-situ concrete

Course Code	**INDUSTRIAL STRUCTURES**
R19 MSEIII-1 2101 c	

Course Outcomes:

At the end of the course, the student will be able to

CO1 Plan the functional requirements of structural systems for various industries.
CO2 Get an idea about the materials used and design of industrial structural elements.
CO3 Realize the basic concepts and design of power plant structures.
CO4 Design power transmission structures.
CO5 Possess the ability to understand the design concepts of Chimneys, bunkers and silos

SEMINAR

Course Outcomes:

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DESIGN PROJECT

Course Outcomes:

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