

M.Tech. (Soil Mechanics and Foundation Engineering) (2011 Syllabus)

Programme outcomes:

The Students will develop ability

- a) To apply knowledge of mathematics, science, and engineering in analyzing and interpreting real life problems for providing the optimal and achievable solutions.
- b) To develop skills and techniques to use basic concepts and tools in civil engineering especially in geotechnical engineering problems.
- c) To design a system, concept, or process to meet the desired needs in solving practical problems considering its technical, professional, and ethical aspects.
- d) To impart knowledge to students for enabling him/ her in understanding the impact of engineering problems and their solutions in global, economic, environmental, and social context.

Course outcomes:

Name of course	Course outcomes
MMA 1102 – Computational Mathematics	1. Formulate the continuous physical systems using mathematical notations as partial differential equations since most entities in the real world are dependent of several independent entities.
	2. Handle real world dynamic problems with diversity and complexity which leads to boundary value problem
	3. Handle huge amount of problems in science and engineering physics where one has to minimize the energy associated to the problem under consideration.
	4. Gain an understanding of Eigen value problem and gain skills in modelling and solving Eigen value problem.
	5. Solve problems involving differential equations, ordinary and partial with regular as well as irregular boundaries.

	6.	Demonstrate a depth of understanding in advanced mathematical topics
	7.	Enhance and develop the ability of using the language of mathematics in engineering
MCE 1101 – Theory of Elasticity and Plasticity	1.	The students shall be able to demonstrate the application of plane stress and plane strain in a given situation.
	2.	The student will demonstrate the ability to analyze the structure using plasticity.
MCE 1103 – Subsoil Exploration	1.	Students would be able to identify the objects of site investigation; and describe the use of different types of samples and samplers.
	2.	Students would understand the process of soil exploration by different boring methods.
	3.	Students shall be able to perform standard penetration test, static and dynamic cone penetration tests, in-situ vane shear test, geophysical exploration methods.
	4.	Students will be capable of carrying out plate load test, pressuremeter test; using piezometer, slope inclinometer.
	5.	Students would be locate to able to locate ground water table, perform offshore exploration, prepare site investigation report.
MCE 1117 – Dynamics of Soils & Foundations	1.	Develop skill in applying theory of vibrations to basic facets of soil behavior under dynamic loading together with the exposure of the fundamental principles of wave propagation in engineering examples
	2.	Calculate the dynamic properties of soil and perform relevant tests in laboratory and on field for the analysis & design of foundations which can tolerate dynamic loads by
	3.	Recognize & differentiate between the conventional behavior and the behavior under the influence of dynamic loads in the analysis of dynamic earth pressure & bearing capacity
	4.	Evaluate the liquefaction potential using simplified methodology and select appropriate mitigation measures based on nature of vibration which can be isolated and measures for achieving safety of adjacent foundations
	5.	To perform an equivalent-linear site response analysis

MCE 1119 – Prestressed Concrete	1.	At the end of this course the student shall have a knowledge of methods of pre- stressing.
	2.	capability to justify the use of equipment and materials
	3.	Capability to control of the losses involved of pre-stressing concrete and ability to justify advantages and disadvantages.
	4.	Capability of design of pre-stressed concrete elements under codal provisions.
MCE 1123 – Analysis & Design of Pavements	1.	Identify the factors affecting the design and performance of diverse types of highways.
	2.	Evaluate the stresses and strains at various locations of flexible and rigid pavements under various axle load
	3.	Designing flexible and rigid pavements applying various methods.
	4.	Designing longitudinal and transverse joints in rigid and flexible pavements.
MCE 1223 – Rock Mechanics and Tunneling	1.	Students should be conversant with scope and problems of Rock Mechanics
	2.	Students should be exposed with Rock exploration , laboratory testing etc
	3.	Student should be conversant with Deformation characteristics of rocks.
	4.	Student should be conversant with mechanical, thermal and electrical properties of rock mass.
	5.	Student should be conversant with Rock mechanics application, bearing capacity of homogeneous as well as discontinuous rocks, Rock bolting plastic mechanics.
MCE 1102 – Concrete Laboratory	1.	Conduct Quality Control tests on concrete making materials
	2.	Conduct Quality Control tests on fresh & hardened concrete
	3.	Design and test concrete mix
	4.	Conduct Non-destructive tests on concrete
MCE 1104 – Soil Mechanics Laboratory	1.	Able to determine classification parameters and other physical
	2.	Capable of finding out strength properties of soil
MCE 1201 – Advanced Soil Mechanics	1.	Explain the importance of advanced concepts and theories in soil mechanics
	2.	Predict the suitability of clayey soil for various geotechnical applications
	3.	Familiarity with advanced equipments.

	4. Analyze and interpret the state of stress in soil and evaluate various failure criteria for soils
	5. Knowledge on critical state model for the deformation and strength of soils
MCE 1205 – Earth & Earth Retaining Structures	1. Student shall be exposed to aims of stability analysis, natural slopes and its stability man Made slopes, Geomorphology and Slopes, Types of Slope movement and Land slides
	2. Student shall be analyze stability of slope by Fellinius method, Bishop’s method and Morgestern-Price methods, Variational approach, Statistical and Probabilistic analysis.
	3. Student should know about effect of ground water table i.e. Seepage force, hydrostatic force, Excess Pore water pressures, Progressive failure of Slopes, Seismic and Blast vibration effect on slope. Embankment and earth rock dams
	4. Student shall be exposed to rock slope Stability i.e. behavior of rock slope in presence of structural discontinuities, weak and fragmented rock, rock mass rating.
	5. Student shall be conversant with Slope Protection measures like Drum- debris walls, Geo-textiles and Geo-membranes, Geo-grids and Gabions, Re-vegetation mats, Braced coffer dams – walls and supports, bottom heave and piping, Cellular coffer dams, Cantilever sheet pile walls, Anchored Bulkheads with Free and Fixed Earth supports, Rowe’s moment reduction method and Modified equivalent Beam method, Bulkhead anchorages, Failures in Anchored Bulkheads.
MCE 1209 – Analysis of Foundations	1. Student shall be able to choose type of foundations; perform calculations of bearing capacity using different theories; perform calculation of vertical stress and settlement below foundations.
	2. Student would be able to perform design of rectangular and trapezoidal combined footings, strap footing, and raft foundation.
	3. Student will be capable of analyzing the mechanics of load transfer in piles; calculation of pile load carrying capacity; able to design pile groups.

	4.	Student shall be able to calculate load carrying capacity of well foundations; analysis of well foundations based on bulkhead concept; analysis of stability and design of coffer dams; understanding the concept and uses of pier foundations.
	5.	Student can perform analysis of retaining wall failure under earthquake load; computations of earth pressures on retaining walls subjected to dynamic loading.
MCE 1217 – Structural Design of Foundations	1.	Design and carry out the reinforcement detailing for several types of foundations.
	2.	Design special Foundations such as shell foundation, Well foundation etc.
MCE 1221 – Dynamics of Structures	1.	An ability to apply knowledge of mathematics, science, and engineering by developing the equations of motion for vibratory systems and solving for the free and forced response.
	2.	Ability to identify, formulate and solve engineering problems. This will be accomplished by having students model, analyze and modify a vibratory structure order to achieve specified requirements.
	3.	Understanding professional and ethical responsibilities. This will be accomplished by emphasizing the importance of understanding how structural vibrations may affect safety and reliability of engineering systems.
	4.	An ability to use the techniques, skill and modern engineering tools necessary for engineering practice will be accomplished by giving students realistic problems which will require MatLab for solutions.
MCE 1125 – Limit State Design of Structures	1.	Will be able to perform plastic analysis.
	2.	Given any beam loading and support conditions, be able to design and calculate short-term and long-term deflections and check them against code limitations
	3.	Given any set of axial loads and bending moments, be able to use design charts to design a column section to resist those loads
	4.	Given any shape of slab, be able to analyse and design the slab
MCE 1227 – Mining	1.	Student shall be conversant with Mineral History of India.

Engineering	2.	Student will be exposed with rock Slope Engineering like Structural discontinuities and its impact on rock slope stability. Wedge failure, plane failure, Circular failure and toppling failure.
	3.	Student will be exposed with waste dump Stability like External and Internal dump. Diverse types of failure modes in waste dumps. Factors influencing stability of external and internal dumps with case histories of rock slope and waste dump failures.
	4.	Student should be conversant with Air and Noise Pollution and air blast.
	5.	Student should be conversant with Land degradation and Subsidence, preparation of Mine closure plans.
MCE 1202 – Geotechnical Engineering Design (S)	1. 2. 3. 4.	Supervise Field tests Design of Flexible Pavements Analyse the structure of soil Calculation of bearing capacity
MCE 1206 – CAD Laboratory	1.	Students will be able to design Civil Engineering Structure using software package