

M.Tech. (Soil Mechanics and Foundation Engineering) (Revised in 2018)

Programme Educational Objectives:

PEO 1: To impart students with strong knowledge base through theory courses & sessional in Soil Mechanics & Foundation Engineering that makes them suitable for industries, academics, research & consultancies.

PEO 2: To enrich research and practices, by inspiring the leaders of tomorrow to take on the challenge with ease and confidence.

PEO 3: To train the students on developing practical, efficient & cost-effective solutions on problems & challenges on Soil Mechanics & Foundation Engineering.

PEO 4: To implant sensitivity towards ethics, public policies, and their responsibilities towards the society.

Programme outcomes:

PO1: An ability to independently carry out research /investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: To apply in-depth knowledge gained during the PG Soil Mechanics and Foundation Engineering program in analysing and interpreting real life problems for providing the optimal and achievable solutions considering its technical, professional, and ethical aspects.

PO5: To enable him/ her in identifying & understanding the impact of Geotechnical Engineering problems and their solutions in global, economic, environmental, and social context.

PO6: To learn and unlearn throughout his professional career, and be willing to learn new techniques, methods and processes related to Geotechnical Engineering from simple to complex, with an understanding of the associated limitations.

Course outcomes:

Course code: CE501

Course title: ADVANCED SOLID MECHANICS

CO1	Understand the theory of elasticity including strain/displacement and Hooke's law relationships
CO2	Analyse principal stresses and strains using theories of failure
CO3	Analyse the two-dimensional problems using Airy's stress function
CO4	Solve linearly elastic bodies using Hooke's law
CO5	Calculate torsional stresses developed in thin walled sections
CO6	Apply various failure criteria for general stress states at points

Course code: CE515

Course title: ADVANCED SOIL MECHANICS

CO1	Able to explain the importance of advanced concepts and theories in soil mechanics
CO2	Able to predict the suitability of clayey soil for various geotechnical applications
CO3	Familiar with advanced equipment
CO4	Able to analyse and interpret the state of stress in soil and evaluate various failure criteria for soils
CO5	Able to develop critical state model for the deformation and strength of soils

Course code: CE516

Course title: ADVANCED FOUNDATION ENGINEERING

CO1	Student shall be able to choose type of foundations; perform calculations of bearing capacity using different theories; perform calculation of settlement below foundations.
CO2	Student would be able to perform design of rectangular and trapezoidal combined footings, strap footing, and raft foundation.
CO3	Student will be capable of analysing the mechanics of load transfer in piles; calculation of pile load carrying capacity; able to design pile groups.
CO4	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.
CO5	Student would be able to design foundation in expansive soil

Course code: CE518

Course title: DYNAMICS OF SOILS & FOUNDATIONS

CO1	Develop skill in applying theory of vibrations to basic facets of soil behaviour under dynamic loading together with the exposure of the fundamental principles of wave propagation in soil.
CO2	Evaluate the dynamic properties of soil and be able to perform relevant tests in laboratory and in the field for the proportioning of foundations which can tolerate dynamic loads.
CO3	Apply the general principles for the design of machine foundation & familiarize with site improvement techniques like dynamic compaction, foundation isolation.
CO4	Recognize & differentiate between the conventional behavior and the behavior under the influence of dynamic loads for the analysis of dynamic earth pressure & bearing capacity.
CO5	Predict the liquefaction potential of sites and select appropriate mitigation measures for achieving safety of them.

Course code: CE519

Course title: SUB-SURFACE INVESTIGATION

CO1	Students would be able to identify the objects of site investigation; and describe the use of different types of samples and samplers.
CO2	Students would understand the process of soil exploration by different boring methods.
CO3	Students shall be able to perform standard penetration test, static and dynamic cone penetration tests, in-situ vane shear test, geo physical exploration methods.
CO4	Students will be capable of carrying out plate load test, pressure-meter test; using piezometer, slope inclinometer; able to locate ground water table.
CO5	Students would be able to perform offshore exploration, prepare site investigation report.

Course code: CE 520

Course title: EARTH & EARTH RETAINING STRUCTURES

CO1	Student shall be exposed to aims of stability analysis, natural and man-made slopes
CO2	Student shall be able to analyse stability of slope by different methods
CO3	Student should know about effect of ground water table in embankment and earthen dams.
CO4	Student shall be exposed to rock slope Stability, structural discontinuity and rock mass rating
CO5	Student shall be conversant with Slope Protection measures like Drum- debris walls, Geo-textiles and Geo-membranes, Geo-grids and Gabion walls etc.

Course code: CE523

Course title: ROCK MECHANICS AND TUNNELLING

CO1	Students should be conversant with scope and problems of Rock Mechanics
CO2	Students should be exposed with Rock exploration, laboratory testing etc.
CO3	Students should be conversant with Deformation characteristics of rocks.
CO4	Student should be conversant with mechanical, thermal and electrical properties of rock mass
CO5	Student should be conversant with Rock mechanics application, bearing capacity of homogeneous as well as discontinuous rocks, Rock bolting plastic mechanics

Course code: CE553

Course title: EARTH AND ROCK FILL DAM

CO1	Able to decide the suitable site and type of earth and rock fill dams at a location.
CO2	Able to understand the behaviour and performance of the earth and rock fill dams.
CO3	Able to analyse the stability and problems associated with operation and construction in the dam.
CO4	Able to design and construct an earth and rock fill dams.

CO5	Able to monitor the performance of the dam.
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Course code: CE554

Course title: ENVIRONMENTAL GEOTECHNIQUE

CO1	Able to know the role of soil in geo-environmental applications and impact of ground contamination on geo-environment
CO2	Able to understand the concept of soil water interaction, unsaturated soil and its importance in geo-environmental problems and factors effecting retention and transport of contaminants
CO3	Able to have an idea on role of soil in waste containment, different components of waste containment system and its stability and able to design waste containment facilities
CO4	Able to plan site remediation methods
CO5	Able to characterize soil using advanced methods

Course code: CE555

Course title: ENVIRONMENTAL IMPACT ASSESSMENT AND SUSTAINABLE

DEVELOPMENT

CO1	Identify the international sustainable development initiatives
CO2	Understand the status of global environment
CO3	Understand the process of Environmental Impact Assessment
CO4	Analyse and document environmental project reports
CO5	Identify and mitigate impacts and prepare management plans

Course code: CE506

Course title: FINITE ELEMENT METHOD

CO1	Use Finite Element Method for structural analysis.
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CO2	Execute the Finite Element Program/ Software.
CO3	Solve complex continuum problems using finite element analysis.

Course code: CE556

Course title: FLOW THROUGH POROUS MEDIA

CO1	Find solution of groundwater flow problems.
CO2	Apply conformal transformation in solving groundwater flow problems.
CO3	Solve the problems of well hydraulics.
CO4	Develop groundwater flow models.

Course code: CE557

Course title: GEOTECHNICAL EARTHQUAKE ENGINEERING

CO1	Capable to predict the wave characteristics and to conduct different experiments to study the dynamic soil properties.
CO2	Able to perform analyses to analyse ground response, and recommend different ground improvement techniques to strengthen the ground.
CO3	Capable to predict the liquefaction susceptibility of soils.
CO4	Able to calculate the seismic earth pressures on retaining wall.
CO5	Analyse the stability of slopes under seismic loading.

Course code: CE558

Course title: GROUND IMPROVEMENT TECHNIQS

CO1	Familiarize with difficult ground conditions which require improvement.
CO2	Comprehend the principles of mechanical, hydraulic, chemical & thermal improvements of poor soil conditions.
CO3	Study the mechanism of soil reinforcements.

CO4	Suggest appropriate methods of improvement for weak site conditions.
CO5	Assess the degree of improvement attained by application of different site suitable ground improvement techniques.

Course code: CE 559

Course title: MINING ENGINEERING

CO1	Student shall be conversant with Mineral History of India. Geological aspects controlling selection of mining methods opencast and underground mining.
CO2	Student will be exposed with rock Slope Engineering and Structural discontinuities and its impact on rock slope stability.
CO3	Student will be exposed with waste dump Stability like External and Internal dump
CO4	Student should be conversant with Air and Noise Pollution and blast vibration
CO5	Student should be conversant with Land degradation and Subsidence, preparation of Mine closure plans

Course code: CE560

Course title: REMOTE SENSING, GIS & GPS

CO1	Understand working principles of remote sensing, history of satellite development Procurement of India and global satellite data
CO2	Interpret satellite images, verify and derive conclusions
CO3	Apply processing tools to classify land use and land cover using softwares
CO4	Apply GIS knowledge in solving real time problems.
CO5	Understand the extent and applications of remote sensing techniques

Course code: CE561

Course title: SEDIMENT TRANSPORT

CO1	Able to analyse the scouring and deposition phenomenon in open channels.
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CO2	Able to apply the empirical laws in mobile bed channels/rivers
CO3	Able to determine the regime of the channel.
CO4	Able to determine the stability of hydraulic structures.
CO5	Able to demonstrate the transport phenomenon of sediment particles at channel bed.

Course code: CE548

Course title: SOIL STRUCTURE INTERACTION

CO1	Able to model structure, soil and boundary.
CO2	Able to solve problem on wave propagation for SSI
CO3	Able to solve dynamic stiffness matrix for out of plane and in-plane motion..
CO4	Able to analyse soil and structure considering nonlinearity in material of soil and structure.
CO5	Able to analyse SSI for engineering application like nuclear power plant, bridges, dams, multi storey buildings etc.

Course code: CE562

Course title: STABILITY ANALYSIS OF SLOPES

CO1	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
CO2	Student shall be analyse stability of slope by Fellinius method, Bishop's method, Effect of ground water table i.e. Seepage force, hydrostatic force, , Seismic and Blast vibration effect on slope. Embankment and earth rock dams. behaviour of rock slope in presence of structural discontinuities, weak and fragmented rock, rock mass rating
CO3	Students should understand different geo-engineering parameters influencing stability of internal dump, external dump and rock slope
CO4	Student shall be able to determine Factor of Safety of internal dump, external dump and rock high-wall of opencast mines
CO5	Student shall be conversant with Slope Protection measures like Geo-textiles and Geo-membranes, Geo-grids and Gabions, 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.
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