ACADEMIC REGULATIONS
COURSE STRUCTURE AND
DETAILED SYLLABUS

CIVIL ENGINEERING

For

M. Tech. (Geotechnical Engineering)
(Two Year Full Time Programme)

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(Autonomous)
Kukatpally, Hyderabad – 500 085, Telangana, India.

2015
### I Year - I Semester

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### I Year -II Semester

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### II Year -II Semester

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JNTUH COLLEGE OF ENGINEERING HYDERABAD  
M.Tech. (Geotechnical Engineering) – Full Time w.e.f. 2015-16
JNTUH COLLEGE OF ENGINEERING HYDERABAD  
M.Tech. (Geotechnical Engineering) – Full Time w.e.f. 2015-16

Elective – 1
1. Engineering of Ground  
2. Theoretical Soil Mechanics  
3. Applied Statistics

Elective – 2
1. Geoenvironmental Engineering  
2. Ground water Hydrology  
3. Geotechnical Exploration Methods

Elective – 3
1. Soil Dynamics and Machine Foundations  
2. Physical Modeling in Geotechnical Engineering.  
3. Offshore Geotechnical Engineering.

Elective – 4
1. Environment and Ecology  
2. Numerical Methods  
3. Disaster Management

Elective – 5
1. Geosynthetics and Soil Reinforcement  
2. Soil - Structure Interaction  
3. Material Characterization and Pavement Engineering

Elective – 6
1. Earth & Rock fill Dams and Slope Stability  
2. Geotechnics for Infrastructure  
3. Construction Management

Elective – 7
1. Rock Mechanics and Engineering  
2. Finite Element Methods  
3. Ground Water Contamination and Remediation

Elective – 8
1. Environmental impact Assessment  
2. Geographical Information Systems  
3. Artificial Intelligence: Techniques
ADVANCED SOIL MECHANICS

Prerequisites: Soil Mechanics or Geotechnical Engineering-I

OBJECTIVE:
To understand the physical and Engineering properties of soil and its behavior under external loads and for different site conditions.

OUTCOME:
Students will be able to understand the soil behavior under external loads, and procedures to measure relevant soil parameters.

UNIT - I
Geostatic Stresses & Stress Paths: Stresses within a soil mass: Concept of stress for a particulate system, Effective stress principle, Geostatic stresses, Soil water hydraulics: Principal stresses and Mohr's circle of stress, Stress paths; At Rest earth pressure, Stress paths for different practical situations.

UNIT - II

UNIT - III
Compressibility and Consolidation: One dimensional compression, Oedometer test, parameters – coefficient of volume change, constrained modulus, compression index, swell or unloading, maximum past consolidation stress, Over consolidation ratio, Primary and secondary compression, consolidation -One, two and three dimensional problems, Consolidation of partially saturated soils, Creep/Secondary Compression in soils.

UNIT - IV
Stress-Strain-Strength Behaviour of soils: Shear strength of soils; Failure criteria, drained and undrained shear strength of soils. Significance of pore pressure parameters; Determination of shear strength; Drained, Consolidated Undrained and Undrained tests; Interpretation of triaxial test results. Behaviour of sands; Critical void ratio; dilation in soils;

UNIT - V
Critical State Soil Mechanics: Critical state parameters; Critical state for normally consolidated and over consolidated soil; Significance of Roscoe and Hvorslev state boundary surfaces; Yielding, Bounding Surfaces.

REFERENCE:
M.Tech. I Year I-Sem (Geotechnical Engineering)  

ADVANCED FOUNDATION ENGINEERING

Prerequisites: Foundation Engineering or Geotechnical Engineering-II

OBJECTIVE:
To determine the bearing capacity of shallow and deep foundations, to estimate settlements of structures subjected to external loads, leading to design of foundations resting on soils.

OUTCOME:
Students should be in a position to design foundations for varieties of structures resting on soil deposits, and appreciate the importance of reliability based design in geotechnical engineering.

UNIT- I
Soil Exploration: Exploration Methods; Planning the Exploration Program; Boring and Sampling; In Situ Tests: Standard & Cone Penetration Tests, Field Vane & Borehole shear tests, Dilatometer, Pressuremeter; Rock Sampling, Core Recovery, RQD; Geophysical Exploration; Preparation of Soil Report.

UNIT- II
Shallow Foundations: Bearing Capacity:- General Formulae; Effect of Water Table; Footings with eccentric or Inclined Loads, Foundations on Layered Soils, on finite layer with a Rigid Base at Shallow Depth, effect of compressibility of soil.

UNIT- III
Settlement: Components – Immediate, Consolidation & Creep, Stresses and Displacements in Homogeneous, Layered and Anisotropic Soils; Consolidation Settlement; One, Two & Three Dimensional Consolidation; Secondary Compression Settlement; Bearing Pressure using SPT, CPT, Dilatometer and Pressuremeter; Settlement of foundations on Sands-Schmertmann and Burland & Busbridge methods; Structure Tolerance to Settlement and Differential Settlements, Rotation of Tall Structures.

UNIT- IV
Deep Foundations: Single Pile: Vertically loaded piles, Static capacity α, β and λ Methods, Dynamic formulae; Point Bearing Resistance with SPT and CPT Results; Bearing Resistance of Piles on Rock; Settlement; Pile Load Test; Uplift Resistance; Laterally Loaded Piles -Ultimate Lateral Resistance; Negative Skin Friction; Batter Piles; Under Reamed Piles; Ultimate Capacity of Pile Groups in Compression, Pullout & Lateral Load; Efficiency; Settlements of Pile Groups; Interaction of Axially & Laterally Loaded Pile Groups.

UNIT- V
Special Topics of Foundation Engineering
Foundations on Expansive Soils: The nature, origin and occurrence, Identifying, testing and evaluating expansive soils, typical structural distress patterns and Preventive design & construction measures.

Introduction to Reliability-Based Design: Methods, LRFD for structural strength requirements, LRFD for geotechnical strength requirements, Serviceability requirements.
REFERENCE:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Geotechnical Engineering)  L T P C

ENGINEERING OF GROUND
(Elective-1)

Prerequisites: Soil Mechanics or Geotechnical Engineering-I

OBJECTIVE:
To understand the importance of ground improvement and to know various ground improvement techniques available, and selecting and designing suitable ground improvement technique for given soil conditions.

OUTCOME:
Depending on the site conditions, students will be able to identify suitable Ground Improvement technique for specific project and its implications.

UNIT- I
Introduction to Engineering Ground Modification: Need and objectives, Identification of soil types, In situ and laboratory tests to characterise problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, and their applications.

UNIT- II
Mechanical Modification – Deep Compaction Techniques- Blasting Vibrocompaction, Dynamic Tamping and Compaction piles.

UNIT- III

UNIT- IV
Physical and Chemical Modification – Modification by admixtures, Shotcreting and Guniting Technology, Modification at depth by grouting, Crack Grouting and compaction grouting, Jet grouting, Thermal Modification, Ground freezing.

UNIT- V
Modification by Inclusions and Confinement - Soil reinforcement, reinforcement with strip, and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

REFERENCE:
5. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons, 1994.
THEORETICAL SOIL MECHANICS  
(Compulsory-I)  
OBJECTIVE:  
To understand the elastic and plastic behavior of soils and to determine the stresses and deformations for various geotechnical structures.  
OUTCOME:  
Will be able to understand the elastic and plastic behavior of soils under various loads. Stress deformation behavior can be determined for various loads and subsoil conditions.

UNIT-I  
Theory of Elasticity: Basic concepts, definitions and notations of stress & strain components – Generalized Hooke’s Law, Equilibrium and Compatible conditions in Cartesian, Polar coordinates – Principal stresses and strains.  
UNIT-II  
UNIT-III  
Stresses and Displacements due to Surface and Subsurface Loads – Boussinesq, Cerutti, Mindlin Solutions, Stresses and Displacements in Finite Layer & Multi-Layered Systems. Stress-path methods; Rotation of Foundations.  
UNIT-IV  
Critical state & constructive behavior of soils – introduction to yield criteria, constructive modeling.  
UNIT-V  
Underground Structures: Stresses and Displacements around Underground Openings unlined and lined tunnels.

REFERENCE:  
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Geotechnical Engineering)                        L   T    P   C
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APPLIED STATISTICS
(Elective- I)

Prerequisites: Mathematics /Probability and Statistics

OBJECTIVE:
A deep understanding of the most important statistical models and analytical tools for practical analysis of complex data, as well as the ability to analyze new types of problems.

OUTCOME:
Upon successful completion of the course, students should be able to apply statistics to a variety of problem from different areas.

UNIT-I
Introduction & Sampling Techniques: Histogram, Frequency diagram, Role of Probability and Statistics in Civil Engineering, Skewness; Kurtosis; Definitions and Applications; Simple random sampling; Stratified sampling; Systematic sampling; Sample Size determination; Collection & Presentation of data, Design of Experiment.

UNIT-II
Statistical Distributions and Probability: Random Variability, conditional probability, Uniform, Binomial, Poisson, Exponential and Normal distributions; Fitting of distributions; Skewness and Kurtosis, Mean and variance; Chi-square test of goodness-of-fit; lognormal, Beta distribution Probability - Laws of Probability; Conditional probability and Independent events; Kolmogorov – Smirnov (K-S test) Laws of expectation.

UNIT-III
Regression And Correlation: Linear/non-Linear and multiple linear correlation analysis, Linear regression and correlation; Multiple correlation; Multiple correlation coefficient; Standard error of estimate; Analysis of Variance; Curvilinear regression;

UNIT-IV
Multi-Variate Data Analysis and Exact Sampling Distributions: Types of data; Basic vectors and matrices; Simple estimate of centroid, Standard deviation, Dispersion, Variance and covariance; Correlation matrices; Principal component analysis; Time series analysis. Exact Sampling Distributions - Chi-square distribution; Students T-distribution;

UNIT-V
Tests Of Significance & Confidence Interval Estimation & Statistical Testing – I & II: Large sample and small sample tests; Tests for single mean, Means of two samples, Proportions, two variances, two observed correlation coefficients, paired T-tests, Applications. Tests Of Significance & Confidence Interval – Intervals for mean, variance and regression coefficients; Tests of Hypothesis, goodness of fit test.

REFERENCE:
GEOENVIRONMENTAL ENGINEERING
(Elective 2)

Prerequisites: Environmental Engineering

OBJECTIVE:
To understand various sources of contamination of ground and to characterize contaminated ground and to find extent of contamination and to get familiarize with various remediation methods.

OUTCOME:
Able to characterize the contaminated ground and identify most appropriate method of remediation for a different sites.

UNIT-I.
Sources and Site Characterization: Scope of Geoenvironmental Engineering, Various Sources of Contaminations, Need for contaminated site characterization; and Characterisation methods.

UNIT-II.
Solid and Hazardous Waste Management: Classification of waste, Characterisation of solid wastes, Environmental Concerns with waste, waste management strategies.

UNIT-III

UNIT-IV
Remediation Techniques: Objectives of site remediation, various active and passive methods, remediation of NAPL sites, Emerging Remediation Technologies.

UNIT-V
Landfills: Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system.

REFERENCE:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Geotechnical Engineering)

GROUND WATER HYDROLOGY
(Elective 2)

Prerequisites: Hydrology

OBJECTIVE:
To understand the basics of groundwater hydrology, it’s hydrologic and engineering aspects, and the mechanics involved in the study of flow of groundwater. Modeling of ground water flow through aquifers.

OUTCOME:
Able to understand the principles of ground water hydrology and movement and yield of ground water aquifer.

UNIT- I
Groundwater: Groundwater hydrologic cycle. Origin of groundwater, quality of groundwater, vertical distribution of groundwater-zone of aeration and zone of saturation; Geologic formations as aquifers; types of aquifers, porosity, specific yield, specific retention; Permeability, Darcy’s law, storage coefficient, Transmissibility.

UNIT- II
Groundwater flow: Groundwater flow in one, two and three- dimensions; Groundwater flow contours and their applications; Steady groundwater flow towards a well in confined and unconfined aquifers- Dupuits’ and Theism’s equations, Formation constants, yield of an open well, interference and well tests; Unsteady flow towards a well – Non-Equilibrium equations – Theis’s solution- Jacob and Chow’s simplifications, Leaky aquifers.

UNIT- III

UNIT- IV
Investigations: Surface methods of exploration - Electrical resistivity and seismic refraction methods. Subsurface methods; Geophysical logging and resistivity logging; hydrologic maps; groundwater balance; contamination.

UNIT- V

REFERENCE:
GEOTECHNICAL EXPLORATION METHODS
(Elective 2)

Objective:
To know about the various subsoil exploration methods and its suitability for the specific site. Evaluation of subsoil properties by penetration and geophysical methods.

Outcome:
Can identify the effective subsoil exploration method for a specific geotechnical project and evaluation of properties of sub soil for various civil engineering projects.

Unit-I
Introduction: Data required for soil investigation - Methods of Exploration - Planning the Exploration Program

Unit-II
Sampling and Programme: Soil Boring - Soil Samplers and Sampling - Underwater Sampling Groundwater Table (GWT) Location - Number and Depth of Borings - Drilling and/or Exploration of Closed Landfills or Hazardous Waste Sites – Preparation of Soil Report

Unit-III
Penetration Tests: Standard Penetration Test - SPT Correlations - Design N Values - Cone Penetration Tests - Field Vane Shear Testing - Borehole Shear Test - Flat Dilatometer Test - Pressuremeter Test.

Unit-IV
Rocks: Rock Sampling – RQD – Strength and modulus from classifications, Classification based on strength & modulus and strength and fracture strain, Geoengineering classification.

Unit-V
Non-Destructive testing: Techniques–sounding techniques, Rader techniques, Ultrasonic pulse wave tests, Bender elements etc.

Reference:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Geotechnical Engineering)  L  T  P  C
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SOIL DYNAMICS AND MACHINE FOUNDATIONS
(Elective 3)

Prerequisites: Foundation Engineering or Geotechnical Engineering-II

OBJECTIVE:
To understand the wave propagation in soils, determine dynamic properties of soil for analyzing and designing foundations subjected to dynamic loading.

OUTCOME:
Able to understand the fundamentals of wave propagation in soil media, evaluate the dynamic properties of soil, and design foundations for centrifugal and reciprocating machines.

UNIT- I

UNIT- II
Wave Propagation and Dynamic Soil Properties: Propagation of seismic waves in soil deposits - Attenuation of stress waves, Stress-strain behavior of cyclically loaded soils, Dynamic soil properties - Laboratory and field testing techniques, Elastic constants of soils, Correlations for shear modulus and damping ratio in sands and clays.

UNIT- III

UNIT- IV

UNIT- V

REFERENCE:
Prerequisites: Soil Mechanics or Geotechnical Engineering-I

OBJECTIVE:
To learn fundamental knowledge and techniques related to physical modeling in geotechnical boundary value problems, including similitude, principles of measurement and test program.

OUTCOME:
Student will be able to understand scaling laws and modeling considerations for physical modeling in geotechnical problems both for static and dynamic conditions.

UNIT-I
Similitude and Modeling Principles: Importance of physical Modeling, scaling laws, small-scale model studies in 1-g and N-g, historical Perspectives.

UNIT-II
Design of physical model and model ground preparation: scale effects, flexible and rigid boundary conditions, preparation of sand/clay bed preparation, wet pluviation, dry pluviation, tamping techniques, slurry consolidation, uniformity of sand/clay beds.

UNIT-III
Model planning and measurement strategy: Selection of Model dimension, model containers, preparation of models to test shallow and deep foundations, pull-out behavior, retaining walls, shaking table studies, vertical and inclined loading system, Perspex walls, markers, digital analysis.

UNIT-IV
Sensors and Data Acquisition: Strain gauges, Load cells, Earth Pressure Transducers, LVDTs, Linear Potentiometers, pore pressure transudes, accelerometers, Hydraulic jack, calibration methods, dead weight calibration, pneumatic calibration, frequency of calibration, calibration charts, calibration factor, In-soil & fluid calibration, data acquisition system.

UNIT-V
Recent Developments in Physical Modelling: Static behaviour of shallow and deep foundations, Piles subjected to lateral loading, behaviour of foundation subjected to earthquake loading, foundations subjected to cyclic loading, use of shaking table, behaviour of foundations on expansive soils.

REFERENCE:
OFFSHORE GEOTECHNICAL ENGINEERING
(Elective-3)

Prerequisites: Soil Mechanics and Foundation Engineering or Geotechnical Engg.-I&II

OBJECTIVE:
To understand differences between the soil and loading conditions of on-shore and offshore structures, various types of offshore foundation systems, and to evaluate the performance of offshore structures.

OUTCOME:
Students should be able to design and evaluate the performance of offshore foundations.

UNIT- I
The nature of Submarine Soils: origin, classification and distribution of marine sediments; in-situ stress state in submarine deposits; inorganic clay deposits; calcareous sediments; siliceous sediments. Offshore Geotechnical Investigations: phases of the investigation, geophysical survey, drilling and sampling procedures, in-situ testing techniques, laboratory testing.

UNIT- II

UNIT- III
Foundations for Jack-up Rigs: foundations types and design loads, Prediction of individual footing performance, prediction of mat footing performance, seabed anchors, load capacity of anchors, breakout forces, anchor systems for floating structures.

UNIT- IV
Offshore Pile Foundations: types of offshore piles, temporary support of piled structures, dynamic analysis of pile driving, axial load capacity, axial deformation analysis, Lateral loading, and dynamic response.

UNIT -V
Seafloor Stability: causes of seafloor instability, geological features of submarine slides, mechanisms of instability, slope stability under gravity forces and wave forces, Effects of soil instability on piles, installation and stability of submarine pipelines.

REFERENCE:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Geotechnical Engineering)

ENVIRONMENT AND ECOLOGY
(Elective-4)

Prerequisites: None

OBJECTIVE:
To develop a conceptual outlook on various ecological facets of environment.

OUTCOME:
Knowledge on Ecosystems and Ecological Balances, An outlook on living and non-living resources as well as energy resources of environment.

UNIT- I
Environment, Ecology and Sustaining the Earth; Nature and Humans: Earth, population, environment.

UNIT- II
Ecosystems; Ecosystem, ecology of populations, human population dynamics – growth and urbanization; environmental economics and politics.

UNIT - III
Ecological Balances – Material cycles in ecosphere, Matter and Energy Resources; Energy flow in ecosystems; bio-geochemical systems.

UNIT- IV
Air, Water and Soil Resources: Air Resources, pollution, global warning, ozone depletion; water resources – surface and groundwater, sources of pollution; soil resources – conservation, contamination, salt water intrusion, hazardous wastes.

UNIT - V
Living Resources Food resources, pesticides, pest control: land resources – forests, wetlands, wilderness, national parks; wild plants and animal resources, Energy and Mineral Exploitation: perpetual and renewable energy; non-renewable energy; non-renewable mineral resources, solid and hazardous wastes.

REFERENCE:
NUMERICAL METHODS
(Elective-4)

Prerequisites: Mathematics

OBJECTIVE:
This course offers an introduction to numerical linear algebra. Topics include direct and iterative methods for linear systems, eigen value problems and numerical solution for differential equations.

OUTCOME:
Will be able to model numerically using one of the method for various problems. Numerical approach enables solution of a complex problem with simple operations.

UNIT-I
Approximations and Errors in Numerical Methods; Solutions of Algebraic and Transcendental Equations, Bisection, False Position, Secant & Iterative Methods, Newton-Raphson, Horner’s Methods; Comparison of Iterative Methods.

UNIT-II

UNIT-III
Matrix Inversion and Eigen value Problems – Power, Jacobi Methods; Calculus of Finite Differences – Differences, Difference Formulae, Difference Table, Factorial Notation; Interpolation – Lagrange’s, Newton’s, Hermite’s, Spline, Inverse Interpolation; Applications.

UNIT-IV
Numerical Differentiation – Derivatives, Maxima and Minima of a Tabulated Function; Numerical Integration – Quadrature, Romberg’s, Euler-Maclaurin, Double Integration; Applications.

UNIT-V

REFERENCE:
2. Indian culture values and professional ethics by PSR Murthy, BS Publications
5. Ethics in Engineering, Mike W.Martin & Roland Schinzinger. TMH Publishers
Prerequisites: None

OBJECTIVE:
To understand the nature of various types of natural disasters and to develop Skills to develop disaster management plans.

OUTCOME:
Knowledge on the causes and effects of natural disasters like floods, cyclones, earthquakes etc. An integrated approach on mitigation and management of disasters and skill for the development of action oriented disaster management plan.

UNIT-I:
Overview of Natural disasters- Tropical cyclones, Floods, Droughts, Earthquakes & Tsunamis, Severe Thunderstorms & Tornadoes- Need for Disaster Management Plan;

UNIT-II:
Cyclone warning system in India- cyclone disaster management plan, Floods-Flood management in India; Warning system for major river basins-Role of Central Water Commission; Water purification technologies in flood affected areas, Droughts-Meteorological drought and agricultural drought; monsoon long range Forecasts- Drought management plan-parameters & assessment; Drought Monitoring

UNIT-III:
Earthquakes-seismity in India- status of prediction and disaster management; Tsunamis; Landslides and Avalanches; Volcanoes

UNIT-IV:
Hazards associated with convective clouds -Thunderstorms-Lightning; Tornadoes Waterspouts-Hail storms, Aviation hazards and safety measures.

UNIT-V:
Key Factors in Disaster management – Early warning, communications, Response by administration, Disaster Management & Mitigation- National Disaster Management Authority (NDMA) Govt of India.

REFERENCE:
1. Natural Disaster Management: New Technologies and Opportunities by Subir Ghosh; Icfai University Press
2. Earth and Atmospheric Disasters Management by N.Pandharinath and C.K.Rajan, BS Publication
3. Natural Hazards and Disaster Management by R.B.Singh; Rawat Publication
ADVANCED GEOTECHNICAL ENGINEERING LABORATORY – I

Prerequisites: Geotechnical Engineering Lab

OBJECTIVE:
To Obtain Physical and Engineering Properties of Various Soil Subjected to various conditions.

OUTCOME:
Enables the Students to learn and conduct appropriate tests on soil, So as to apply the obtained results for a specific civil engineering project.

1. Wet Sieve Analysis
2. Consistency Limits
3. Oedometer Test for $c_e$ and $c_v$.
4. Direct Shear Test
5. Triaxial Tests- UU Test
6. Triaxial Tests- CU Test
7. Block Vibration Test
8. Pollutant Transport using column test
9. Determination of Chlorides and Sulphates in soils
10. Model plate Load test.
JNTUH COLLEGE OF ENGINEERING HYDERABAD

M.Tech. I Year I-Sem (Geotechnical Engineering)

SOFT SKILLS LAB
(Activity-based)

Prerequisites: None

OBJECTIVES

- To improve the fluency of students in English
- To facilitate learning through interaction
- To illustrate the role of skills in real-life situations with case studies, role plays etc.
- To train students in group dynamics, body language and various other activities which boost their confidence levels and help in their overall personality development
- To encourage students develop behavioral skills and personal management skills
- To impart training for empowerment, thereby preparing students to become successful professionals

OUTCOMES

- Developed critical acumen and creative ability besides making them industry-ready.
- Appropriate use of English language while clearly articulating ideas.
- Developing insights into Language and enrich the professional competence of the students.
- Enable students to meet challenges in job and career advancement.

INTRODUCTION

Definition and Introduction to Soft Skills – Hard Skills vs Soft Skills – Significance of Soft/Life/Self Skills – Self and SWOT Analysis and

1. Exercises on Productivity Development
   - Effective/Assertive Communication Skills (Activity based)
   - Time Management (Case Study)
   - Creativity & Critical Thinking (Case Study)
   - Decision Making and Problem Solving (Case Study)
   - Stress Management (Case Study)

2. Exercises on Personality Development Skills
   - Self-esteem (Case Study)
   - Positive Thinking (Case Study)
   - Emotional Intelligence (Case Study)
   - Team building and Leadership Skills (Case Study)
   - Conflict Management (Case Study)

3. Exercises on Presentation Skills
   - Netiquette
   - Importance of Oral Presentation – Defining Purpose- Analyzing the audience- Planning Outline and Preparing the Presentation- Individual & Group Presentation- Graphical Organizers- Tools and Multi-media Visuals
   - One Minute Presentations (Warming up)
   - PPT on Project Work- Understanding the Nuances of Delivery- Body Language – Closing and Handling Questions – Rubrics for Individual Evaluation (Practice Sessions)

4. Exercises on Professional Etiquette and Communication
   - Role-Play and Simulation- Introducing oneself and others, Greetings, Apologies, Requests, Agreement & Disagreement….etc.
• Telephone Etiquette
• Active Listening
• Group Discussions (Case study)- Group Discussion as a part of Selection Procedure- Checklist of GDs
• Analysis of Selected Interviews (Objectives of Interview)
• Mock-Interviews (Practice Sessions)
• Job Application and Preparing Resume
• Process Writing (Technical Vocabulary) – Writing a Project Report- Assignments

5. Exercises on Ethics and Values
Introduction — Types of Values - Personal, Social and Cultural Values - Importance of Values in Various Contexts
• Significance of Modern and Professional Etiquette – Etiquette (Formal and Informal Situations with Examples)
• Attitude, Good Manners and Work Culture (Live Examples)
• Social Skills - Dealing with the Challenged (Live Examples)
• Professional Responsibility – Adaptability (Live Examples)
• Corporate Expectations

Note: Hand-outs are to be prepared and given to students.
Training plan will be integrated in the syllabus.
Topics mentioned in the syllabus are activity-based.

SUGGESTED SOFTWARE:
The following software from ‘train2success.com’
  o Preparing for being Interviewed
  o Positive Thinking
  o Interviewing Skills
  o Telephone Skills
  o Time Management
  o Team Building
  o Decision making

SUGGESTED READING:
12. The Hindu Speaks on Education by the Hindu Newspaper
RETAINING STRUCTURES

Prerequisites: Soil Mechanics & Foundation Engineering or Geotechnical Engineering-I &II

OBJECTIVE:
To study the various retaining structures and design the earth retaining structures used in construction of road/railways/pipe lines/open excavations.

OUTCOME:
Able to design conventional/Reinforced earth retaining walls, sheet pile walls, bracing system for open excavations.

UNIT-I
Earth Pressure Theories: Rankine’s and Coulomb’s Earth pressure theories for cohesive and cohesionless soils, stresses due to compaction and surcharge loads.

UNIT-II
Conventional Retaining Wall: Types of retaining walls, Stability (sliding, overturning, bearing capacity & overall) of gravity and cantilever walls, Proportioning of retaining walls, Backfill material and drainage.

UNIT-III
Flexible Walls: Sheet pile walls, Construction methods- Cantilever and Anchored (Free and Fixed support methods) sheet pile walls in coarse and fine grained soils, moment reduction method.

UNIT-IV
Reinforced Soil Walls/Mechanically Stabilised Earth: - Failure mechanisms-bond and rupture failures, Analysis methods, Limit equilibrium method- Internal and external stability, Static analyses.

UNIT-V
Braced Cuts and Soil Nailing: Lateral earth pressure in braced cuts, Design of various components, Stability of braced cuts, base heave and stability, yielding and settlement of ground surrounding excavation, Diaphragm walls – slurry support; Soil Nailing.

REFERENCE:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

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GEOTECHNICAL EARTHQUAKE ENGINEERING

Prerequisites: none

OBJECTIVE:
To understand the effect of earthquake on soil structures and to design earthquake resistant geotechnical structures.

OUTCOME:
Able to understand the behavior of ground during the earthquakes, so that geotechnical structures can be designed to resist/ sustain the earthquake loading.

UNIT – I
Earthquake Seismology – Causes of earthquake, Plate tectonics, Earthquake fault sources, Seismic waves, Elastic rebound theory, Earthquake, Intensity and magnitudes, Effects of earthquake, Modified Mercalis intensity scale and seismic instruments.

UNIT – II
Earthquake Ground Motion – Characteristics of ground motion, Effect of local site conditions on ground motions, Design earthquake, Design spectra, Development of site specification and code-based design.

UNIT – III
Ground Response Analysis – One-dimensional ground response analysis: Linear approach, Nonlinear approach, Comparison of one dimensional ground response analyses. Two-dimensional ground response analysis: Equivalent linear approach, Nonlinear approach, Comparison of two dimensional ground response analyses.

UNIT – IV
Liquefaction and Lateral Spreading - Liquefaction related phenomena, Liquefaction susceptibility: Historical, Geological, Compositional and State criteria. Evaluation of liquefaction by cyclic stress and cyclic strain approaches, Lateral deformation and spreading, Soil improvement for remediation of seismic hazards.

UNIT – V

REFERENCE:
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GEOSYNTHETICS AND SOIL REINFORCEMENT
(Selective-5)

Prerequisites: Foundation Engineering or Geotechnical Engineering-II

OBJECTIVES:
To impart knowledge on site investigation and soil testing methods and design of different types of foundation appropriate to the type of soil for different structures.

OUTCOME:
The learner will be able to design shallow and deep foundations for railway and highway bridges, and marine structures.

UNIT-I

UNIT-II
Geosynthetics for Soil Reinforcement: Design of reinforced soil wall – internal and external stability with Geotextiles, Geogrids, Geostrips; Design of Gabion wall without and with geosynthetics reinforcement

UNIT-III
Geosynthetics for Slope Stability: Design of reinforced slopes, Embankments; Slope stabilization/protection; Erosion control.

UNIT-IV
Geosynthetics for Foundation Systems: Foundation reinforcement, embankment base reinforcement, geotextiles /grids/ cells for pavement base reinforcement

UNIT-V
Geosynthetics for Landfills: Separation, Filtration, Drainage, Moisture Barrier, Membrane encapsulation, Geomembranes for landfills and ponds; Geosynthetic clay liners; Design of landfills with GCL's.

REFERENCE:
SOIL-STRUCTURE INTERACTION
(Elective-5)

Prerequisites: Soil Mechanics and Foundation Engineering or Geotechnical Engg.-I & II

OBJECTIVE:
To understand the behavior of soil and its interaction analysis with the structure.

OUTCOME:
Can analyze soil-structure interaction considering different Models for various soil conditions and for different structures.

UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Analysis of Axially and Laterally Loaded Piles and Pile Groups: Elastic analysis of single pile, Theoretical solutions for settlement and load distributions, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap, Load deflection prediction for laterally loaded piles, Subgrade reaction and elastic analysis, Interaction analysis, Pile-raft system.

UNIT-V
Ground-Foundation-Structure Interaction: Effect of structure on ground-foundation interaction, Static and dynamic loads.

REFERENCE:
1. Selvadurai, A. P. S. - Elastic Analysis of Soil-Foundation Interaction, 1979
M.Tech. I Year II-Sem (Geotechnical Engineering)  
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MATERIAL CHARACTERIZATION AND PAVEMENT ENGINEERING  
(Elective-5)  

Prerequisites: Foundation Engineering or Geotechnical Engineering-II  

OBJECTIVE:  
To evaluate the physical and mechanical properties of sub grade, and pavement materials, 
and design flexible and rigid pavements subjected to wheel loads.  

OUTCOME:  
Student should be able to understand various pavement material characterization 
techniques, and able to design a suitable pavement for known wheel loading characteristics 
and sub grade soil conditions.  

UNIT-I  
Introduction: Types and component parts of pavements, Factors affecting design and 
performance of pavements. Highway and airport pavements, field CBR, field plate load test, 
modulus of sub grade reaction, Resilient modulus, Suitability of soil, Compaction equipment 
and Compaction Control.  

UNIT-II  
Stresses and strains in flexible pavements: Stresses and strains in an infinite elastic half 
space use of Boussinesq's equations - Burmister's two layer and three layer theories; Wheel 
load stresses, various factors in traffic wheel loads; Equivalent single wheel load of multiple 
wheels. Repeated loads and EWL factors.  

UNIT-III  
Flexible pavement design methods for highways and airports: Empirical, semi-empirical 
and theoretical approaches; Development, principle, design steps of the different pavement 
design methods including AASHTO, Asphalt Institute, Shell Methods. IRC method of 
pavement design.  

UNIT-IV  
Stresses in rigid pavements: Types of stresses and causes; Introduction to Westergaard's 
equations for calculation of stresses in rigid pavement due to the influence of traffic and 
temperature; Considerations in rigid pavement analysis, EWL; wheel load stresses, warping 
stresses, frictional stresses, combined stresses.  

UNIT-V  
Rigid pavement design: Design of cement concrete pavement for highways and runways; 
Design of joints, reinforcements, tie bars, dowel bars. IRC method of design; Design of 
continuously reinforced concrete pavements.  

REFERENCE:  
Prentice-Hall.  
Functional Pavements, Nai C. Yang, McGraw Hill Publications  
7. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science 
Publishers Limited.  
8. IRC: 37 & 58 Codes for Flexible and Rigid Pavements Design.
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M.Tech. I Year II-Sem (Geotechnical Engineering)  
EARTH & ROCKFILL DAMS AND SLOPE STABILITY  
(Effective-6)

Prerequisites: Foundation Engineering or Geotechnical Engineering-II

OBJECTIVE:
Suitability of materials for earth and rockfill dams, causes of failures and to determine slope stability.

OUTCOME:
Able to design earth and rock fill dams, get familiarity with slope stability Calculations and prevention techniques for slope failures.

UNIT-I
Earth and Rockfill Dams: General features, Selection of site; Merits and demerits of the earth and rock fill dams, Classification of earth dams, Causes of failure, Safe design criteria. Instrumentation in earth dams: Pore pressure measurements, Settlement gauges, Inclinometers, Stress measurements, Seismic measurements.

UNIT-II
Failures, Damages and Protection of Earth Dams: Nature and importance of failure, piping through embankment and foundations, Methods of seepage control through embankments and foundations, Design Criteria for filters.

UNIT-III

UNIT-IV

UNIT-V

REFERENCE:
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GEOTECHNICS FOR INFRASTRUCTURE
(Selective 6)

Prerequisites: Foundation Engineering or Geotechnical Engineering-II

OBJECTIVES:
To impart knowledge on site investigation and soil testing methods and design of different types of foundation appropriate to the type of soil for different structures.

OUTCOME:
The learner will be able to design shallow and deep foundations for railway and highway bridges, and marine structures.

UNIT – I
Shallow Foundations: Basic requirements of foundation –Types and selection of foundations. Design of reinforced concrete isolated, combined, eccentric, strip, and strap footings used for infrastructure projects

UNIT – II
Raft Foundations: Types of rafts, Design of slab raft foundation and Design of beam and slab raft foundation used for infrastructure projects.

UNIT – III
Pile Foundations: Introduction, design of piles, pile caps and pile- raft foundation.

UNIT – IV
Design of Retaining walls: Stability Analysis and design of gravity, Cantilever retaining walls.

UNIT – V

REFERENCE:
CONSTRUCTION MANAGEMENT
(Elective-6)

Prerequisites: None

OBJECTIVES:
To know about various construction management techniques available for execution of project.

OUTCOME:
Able to plan, coordination, and control of a project from beginning to completion. Adopting the most effect method for meeting the requirement in order to produce a functionally and financially viable project.

UNIT-I

UNIT-II

UNIT-III
Resource planning - planning for manpower, materials, costs, equipment. Labour, - Scheduling .Forms of scheduling - Resource allocation. budget and budgetary control methods

UNIT-IV

UNIT-V

REFERENCE:
4. Construction Management And Planning by: sengupta, b. /guha, h. tata mcgraw-hill publications.
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M.Tech. I Year II-Sem (Geotechnical Engineering)  
ROCK MECHANICS AND ENGINEERING  
(Elective-7)  

Prerequisites: Soil Mechanics and Foundation Engineering or Geotechnical Engg.-I & II

OBJECTIVE: 
To determine properties and behavior of various types of rock under different loading conditions for underground and open excavations.

OUTCOME: 
Able to determine the required rock properties, determination of bearing capacity of rocks, checking the stability of slopes, and design underground and open excavation.

UNIT-I
Engineering Classification of Rocks: Classification of intact rocks, Rock mass classifications, Rock Quality Designation (RQD), Rock Structure Rating (RSR), Rock Mass Rating (RMR), Norwegian Geotechnical Classification (Q-system), Strength and modulus from classifications, Classification based on strength & modulus and strength and fracture strain, Geoengineering classification.

UNIT-II
Laboratory and In-Situ Testing of Rocks: Physical properties, Compressive strength, Tensile strength, Direct shear test, Triaxial shear test, Slake durability test, Schmidt rebound hardness test, Sound velocity test, In-Situ Tests: Seismic methods, Electrical resistivity method, In situ stresses, Plate loading test, Goodman jack test, Plate jacking test, In-situ shear test, Field permeability test.

UNIT-III

UNIT-IV

UNIT-V
Underground and Open Excavations: Blasting operational planning, Explosive products, Blast Design, Underground blast design, Controlled blasting techniques, blasting damage and control, Safe practice with explosives and shots.
REFERENCE:
FINITE ELEMENT METHODS  
(Elective-7)

Prerequisites: Numerical Methods

OBJECTIVE:
To provide the fundamental concepts of the theory of the finite element method, and apply them to numerically model behaviour of soils subjected to varieties of loading systems.

OUTCOME:
To obtain an understanding of the fundamental theory of the Finite Element Method, and apply the theory to solve soil behavior under external loads.

UNIT-I

UNIT-II
Element Properties: Concept of an element, various element shapes, Displacement models, Generalized coordinates, Shape functions, Convergent and Compatibility requirements, Geometric invariance, Natural coordinate system - area and volume coordinates.

UNIT-III
Generation of Element Stiffness and Nodal Load Matrices, Isoparametric Formulation: Concept, Different isoparametric elements for 2D analysis, formulation of 4-noded and 8-noded isoparametric quadrilateral elements, Lagrangian elements, Serendipity elements.

UNIT-IV
Assemblage of Elements: Discretization of a structure, numbering systems, Aspect ratio its effects, Assemblage, Direct Stiffness method.

UNIT-V
Geotechnical Applications Sequential construction, Excavations and embankments, Bearing capacity and Settlement analysis.

REFERENCE:
5. Tirupati & Belgundu
GROUND WATER CONTAMINATION AND REMEDIATION (Elective 7)

Prerequisites: Geoenvironmental Engineering

OBJECTIVE:
To estimate the movement of contamination in the ground and to know the various remediation methods.

OUTCOME:
Modeling the contaminant transport in the ground and able to identify most appropriate remediation technique for various types of contaminants and ground conditions.

UNIT-I
Introduction: Sources and types of groundwater contamination, Characterisation of contaminated site, Contaminant transport mechanisms.

UNIT-II

UNIT-III

UNIT-IV
Non-Aqueous Phase Liquids: Introduction, Types of NAPLs, NAPL transport- General processes, NAPL transport- computational methods- Fate of NAPLs in the subsurface, characterization.

UNIT-V
Groundwater Remediation Technologies – Methods of remediation of contaminated ground - pump and treat, in-situ flushing, permeable reactive treatment walls, air sparging, soil vapour extraction, natural attenuation, bioremediation and phytoremediation.

REFERENCE:
   Daniel, D. E. - Geotechnical Practice for Waste Disposal
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ENVIRONMENTAL IMPACT ASSESSMENT
(Elective-8)

Prerequisites: Environmental and Engineering

OBJECTIVE:
To develop a methodical approach on assessment of environmental impacts due to developmental activities and a conceptual outlook on sustainable development.

OUTCOME:
Knowledge on prediction and assessment of environmental impacts due to developmental activities, Concepts on various environmental impact assessment methodologies and an outlook on legislations to safeguard environment.

UNIT-I
Basic concept of EIA: Initial environmental Examination, Elements of EIA,- factors affecting EIA IMPACT evaluation and analysis, preparation of Environmental Base maps, Classification of environmental parameters.

UNIT-II

UNIT-III
Assessment of impact and Land use: Assessment of impact of development activities on vegetation and wild life, environmental impact of deforestation- Causes and effects of deforestation.

UNIT-IV
Environmental Audit & Environmental legislation: Objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, on-site activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

UNIT-V

REFERENCE:
1. Anjaneyulu, Y. - Environmental Impact Assessment Methodologies, B. S. Publication, Sultan Bazar, Hyderabad
GEOGRAPHICAL INFORMATION SYSTEMS
(Elective-8)

Prerequisites: Surveying

OBJECTIVE:
To impart knowledge on basic concepts of Remote Sensing and GIS and its application on various aspects of water environment.

OUTCOME:
Development of multilevel conceptual outlook on Remote Sensing and GIS, development of skill based knowledge with reference to image processing, digital elevation models etc. and Specific knowledge related to application of Remote Sensing & GIS concepts for the development of water resources management.

UNIT-I
Introduction: Electromagnetic spectrum, energy sources and Radiation principle, Energy interactions in the atmosphere, energy interactions with earth surface features – Vegetation, Soil and water.

UNIT-II
Data Acquisition: Platforms – sensors used for the remote sensing data acquisition. Data processing – Radiometric, Geometric corrections.

UNIT-III

UNIT-IV
Geographical Information System (GIS): Definition data input and output; Topology, Digital elevation data; Data management – relational data model. Spatial data models – Raster and Vector data Models. GIS analysis – Classification, overlay operation.

UNIT-V
Land use/Land cover Analysis: Classification principles and systems; Applications of soil, water resources, environmental, earthquakes, landslides. Software scenario – watershed modelling, watershed management, environmental modelling.

REFERENCE:
ARTIFICIAL INTELLIGENCE: TECHNIQUES
(Elective-8)

Prerequisites: None

OBJECTIVE:
To impart knowledge on representation of problem and solving by methods of artificial intelligence. To develop intelligent systems by assembling solutions to engineering problems.

OUTCOME:
Asses the applicability, strengths and weakness of problems and methods for particular engineering problem. Can develop intelligent system for particular problem.

UNIT-I
Introduction to Neural Networks: ANN definition, components, input, output and hidden layers, threshold value, weights. Relationship of ANN with other technologies.

UNIT-II
Neural Networks Models: Perceptron model, Feedforward network-back propagation, Hopfield network, Adaline and Madaline models.

UNIT-III
Learning and Training: Objective of learning, Supervised and Unsupervised learning, Hebb’s rule, Delta Rule.

UNIT-IV

UNIT-V

REFERENCE:
2. Artificial Neural Networks by Robert J. Schalokoff.
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ADVANCED GEOTECHNICAL ENGINEERING LABORATORY - II

Prerequisites: Geotechnical Engineering Lab

OBJECTIVE:
To obtain the properties of Rocks and Geosynthetics so as to use for civil engineering applications to solve the Geotechnical problems using the software.

OUTCOME:
Enable to understand the behavior of rocks and Geosynthetics for various loads, in order to use these properties in designs the geotechnical structures. Able to solve various Geotechnical problems using the structure.

1. a) Determination of RQD
   b) Determination of Slake Durability Index
2. Tensile strength of rock by Point Load Test and Brazilian Test
3. In-Plane and Cross-Plane Permeability of Geotextiles
4. Interface Shear Behavior of Soils with Geotextile
5. a) Tensile Strength of Geotextiles
   b) Cone Drop Test on Geotextile
6. Finding FS for slopes using software
7. Finding FS for Reinforced Soil Walls using software
8. Determination of Pile load settlement using software
9. Bearing Capacity and settlement of shallow foundations using software
10. Stability of soil Nailing using software
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M.Tech. I Year II-Sem (Geotechnical Engineering) L T P C

SEMINAR

Prerequisites: None.

OBJECTIVE:
To understand the topic on thrust area by reviewing about 8-10 research papers and relevant books and material in the website and present the topic and prepare technical report.

OUTCOME:
At the end of the course, the student will be able to undertake a critical review of literature on a chosen topic. Present topics of relevance to a group of professionals. Prepare a technical report.
COMPREHENSIVE VIVA VOCE

Prerequisites: None.

OBJECTIVE:
To test the knowledge gained and to evaluate analyzing skills on the subjects studied in the masters programme.

OUTCOME:
The student will be able to undertake a assimilate knowledge of different courses studied, Develop overall comprehension about Geotechnical Engineering, Analyze real life geotechnical problems with theoretical knowledge learned, Interpret and articulate solutions to real life geotechnical problems.

PROJECT PHASE-I

Prerequisites: None.

OBJECTIVE: To identify the topic by reviewing literature (Journal/ Conferences/ Articles etc.) and based on the topic, setting objectives and developing methodology to carryout project thesis work

OUTCOME: The student will be able to identify topics in thrust areas of Geotechnical engineering. Take up critical review of literature on the chosen topic. Carryout independent research work on the topic by experimental / analytical approaches. Documentation and presentation of the research work
Project Phase- II & Dissertation

Prerequisites: None.

OBJECTIVE:
To carry out experimental/analytical programme and critical analysis of results on the identified topic in thrust areas of Geotechnical engineering.

OUTCOME:
Take up critical review of literature on the chosen topic carry out independent research work on the topic by experimental / analytical approaches. Preparation of document and critical analysis of the results of research work and presentation.