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.

2018

Vision of the Institution

To be recognized as one of the top 10 institutes in the country offering technical education, sustaining and improving its **repute of UG programmes**, expanding **need based PG and research programmes** with global outlook, synergizing teaching and research for societal relevance.

Mission of the Institution

1. To identify technological advancements and build the **right level of skills at the right Time** contributing to the industrial and national growth.
2. To identify and keep abreast with the **state of the art technology maintaining** its legacy of Striving for excellence in higher education.
3. To promote **world class research** of local relevance to society.
4. With a research community of professors, research fellows and research centres, **expand the Scale and multidisciplinary** character of its research activities.
5. With a **global outlook** strive for collaborations to network with International Universities And National Institutes of Research and Higher Learning.

Vision of the Department

- The Department of Civil Engineering is committed to raise the intellectual tone of the young students in understanding and incorporating emerging technologies, with an objective of enhancing their competence by applying their proficiency and skill for infrastructure and economic development of the society.

- **Mission of the Department:**
  1. To strengthen the teaching tools in order to orient students to acquire necessary skills to perform in the field or to handle industrial projects.
  2. To enhance students into knowledgeable, responsible professionals, successful practitioners and lifelong learners in emerging fields for the betterment of society.
  3. To improve the quality of technological education through training, consultancy, research, and innovation.
  4. To identify, evaluate and implement scientifically proven technological solutions.

Program Educational Objectives

PEO 1	To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and to pursue and to enroll in advanced studies
PEO 2	To Impart basic technical knowledge and skills in Civil Engineering and related fields to cater to the emerging technological needs of society.
PEO 3	To perceive the technical knowhow, adaptability and innovation in their work so as to pursue lifelong learning, and to be leaders, both in their chosen profession and in other activities.
PEO 4	To Provide expertise in carrying out civil engineering projects by using state-of-art of computing and experimental techniques to develop interdisciplinary approach.
PEO 5	To Train the student to possess good communication and presentation skills with ability to work in teams and contributing significantly to the technological development of the Nation.

Program Outcomes

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member **and** leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Out Comes

1. Understand the basics of Science, behavioral mechanics and engineering materials required for Engineering systems.
2. Survey, explore, analyze, formulate, design and manage complete Civil Engineering systems by incorporating socio-cultural and environmental needs
3. Develop social skills required for multidisciplinary and collaborative works
4. Train professionally to understand the ongoing field problems and their solutions.

M.Tech Specialization: GEOTECHNICAL ENGINEERING

COURSE OBJECTIVES

1. To make students learn the principles and applications of soil mechanics. Understand different problems associated with geotechnical engineering. Explain how to select design soil/rock/ geosynthetic parameters for design purpose based on the subsurface exploration. Develop, Analyse and Design various geotechnical structures.

2. Students should gain competency in the design of shallow/deep foundations, earth retaining structures, embankment and earthen dams, underground structures. Can assess stability of slopes and apply preventive measures for stability.

COURSE OUTCOMES (POs):

1. Students will learn soil and substrata behavior. Students will be able to perform various laboratory and in-situ tests on soil/rock/Geosynthetics to find out design parameters.

2. Students can design shallow/deep foundations, earth retaining structures, embankments and earthen dams, tunnel support systems for given site conditions.

3. Student can compute factor of safety to assess stability of slopes and apply preventive measures for stability.

4. Student can develop numerical models to estimate response of various geotechnical structures under different loadings.

5. Students can design ground improvement technique for unsuitable soils

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING
M.Tech. (Geotechnical Engineering) – Full Time w.e.f. 2018-19

COURSE STRUCTURE

Semester –I						
S.No.	**Course Type/ Code**	**Course Name**	**Teaching Scheme**			**Credits**
			Th	**Tuto**	**Lab**	
1.	Core-I	Advanced Soil Mechanics	3	--	--	3
2.	Core-II	Advanced Foundation Engineering	3	--	--	3
3.	Program Elective -I	1. Soil Structure Interaction 2. Ground Improvement Techniques 3. Theoretical Soil Mechanics	3	--	--	3
4.	Program Elective -II	1. Applied Statics 2. Environmental Geotechnology 3. Environmental impact Assessment	3	--	--	3
5.	Core Lab-I	Advance GTE Lab -I	--	--	3	2
6.	Core Lab-II	Geotechnical Computational Laboratory	--	--	3	2
7.	MLC	Numerical Methods for Geotechnical Engineers	2	--	--	2
8.	Audit 1	Audit course -I	0	--	--	0
Total			14		6	**18**

Semester -II						
S.No.	**Course Type/ Code**	**Course Name**	**Teaching Scheme**			**Credits**
			Th	**Tuto**	**Lab**	
1.	Core-III	Soil Dynamics and Machine Foundations	3	--	--	3
2.	Core-IV	Engineering rock mechanics	3	--	--	3
3.	Program Elective -III	1. Offshore Geotechnical Engineering 2. Design of substructures 3. Subsurface investigations and instrumentation	3	--	--	3
4.	Program Elective -IV	1. Earth Retaining Structures 2. Geotechnics for Infrastructures 3. Physical and Constitutive Modeling on Geomechanics	3	--	--	3
5.	Core Lab-III	Rock Mechanics Laboratory	--	--	3	2
6.	Core Lab-IV	Advance GTE Lab -II	--	--	3	2
7.	Core	Mini Project & Seminar	--	--	4	2
8.	Audit 2	Audit course -II	0			0
Total			12		10	**18**

Semester -III						
S.No.	**Course Type/ Code**	**Course Name**	**Teaching Scheme**			**Credits**
			Th	**Tuto**	**Lab**	
1.	Program Elective-V	1. Stability analysis of slopes 2. Pavement Analysis and Design 3. Geotechnical Earthquake Engineering	3	--	--	3
2.	Open Electives	1. Construction Management 2. Finite Element Methods 3. Artificial Intelligence: Techniques 4. Operation Research 5. Industrial Safety	3	--	--	3
3.		Dissertation Stage –I (Preliminary) (to be continued in semester-IV)	--	--	20	10
Total					20	**16**

Semester -IV						
S.No.	**Course Type/ Code**	**Course Name**	**Teaching Scheme**			**Credits**
			Th	**Tuto**	**Lab**	
1.		Dissertation Stage-II (Final) (continued from semester-III)	--	--	32	16
Total					32	**16**

Audit Course 1 &2

1. English for research Paper Writing
2. Disaster Management
3. Research Methodology and I.P.R
4. Sanskrit for Technical Knowledge
5. Value Education
6. Constitution of India
7. Pedagogy Studies

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

ADVANCED SOIL MECHANICS

OBJECTIVES:
To enable the student

- To Analyze the field loading conditions and predict the behavior of soil under loading and unloading condition in drained and untrained conditions of soil
- Prediction of Probable loss of water from the reservoir and for checking the stability of the structure under hydro dynamic conditions
- Determination of various application based parameters of consolidation for safe design of structures on clay soils

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
Flow through soils: Permeability, seepage, mathematical analysis – Finite difference formulae for steady state and transient flows – flow nets – computation of seepage – uplift pressure, and critical hydraulic gradient.

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:

1. Das, B. M.- Advanced Soil Mechanics, Taylor and Francis. 7 edition (2008)
2. Mitchell J.K. - Fundamentals of soil behaviour - John Wiley and Sons, Inc., New York. (third edition) 2005
3. Craig, R. F.- Soil Mechanics, Van Nostrand Reinhold Co. Ltd. (1987)
4. Lambe, T. W. and Whitman, R. V.- Soil Mechanics SI version , John Wiley & Sons.(2011)
5. Muniram Budhu.- Soil Mechanics and Foundations, John Wiley & Sons, Inc.(2007)
6. Atkinson J. H. - An Introduction to the Mechanics of Soils and Foundation - through critical state soil mechanics, McGraw- Hill Co. (1993)
7. Wood, D.M.- Soil Behavior and Critical State Soil Mechanics.cambridge university press (1991)

OUTCOMES:

- To understand the behavior of soils stress paths and to determine the shear parameters under different drainage condition
- To understand Seepage and numerical modeling of State and transient flow condition
- To understand Compressibility characteristics of NCC and OCC soils

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

ADVANCED FOUNDATION ENGINEERING

OBJECTIVES:

Students can expect to

- Develop understanding of choice of design parameters
- Develop deeper understanding of shallow and pile foundation analysis
- Learn about advanced topics of foundation design and analysis

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 Collapsible Soils: Origin and occurrence, Identification, Sampling and Testing, Preventive and Remedial measures.

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:

1. Das, B. M. - Principles of Foundation Engineering 7th Cengage Learning (2013)
2. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012. Phi Learning (2008)
3. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
4. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design john wiley & sons inc (1980-08)
5. Reese, L. C. & Van Impe, W. F. - Single Piles and Pile Groups under Lateral Loading - Taylor & Francis Group (Jan 2000)
6. Tomlinson, M. J. - Foundation Design and Construction - Prentice Hall (2003)
7. Lymon C. Reese, William M. Isenhower, Shin-Tower Wang- Analysis and Design of Shallow and Deep Foundations (2006)
8. Salgado, R. - The Engineering of Foundations McGraw-Hill, Boston (2008)

OUTCOMES:

- Able to plan and select the soil exploration methods
- Determine the Bearing capacity of Soil and settlements for the design of shallow foundations
- To design the deep foundations under different loading conditions
- To design the foundations on problematic soils and reliability based design for shallow and deep foundations

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

SOIL-STRUCTURE INTERACTION
(Elective-1)

OBJECTIVES:

This course will enable students to
- Understand soil structure.
- understand stress-strain characteristics of soils,
- To learn the mechanism of failure, the factors that affects the shear strength.
- To understand structural behavior with soils

UNIT-I
Soil-Foundation Interaction: Introduction to soil-foundation interaction problems, Soil behaviour, Foundation behaviour, Interface behaviour, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic-plastic behaviour, Time dependent behaviour.

UNIT-II
Beam on Elastic Foundation- Soil Models: Infinite beam, Two-parameters models, Isotropic elastic halfspace model, Analysis of beams of finite length, combined footings.

UNIT-III
Plates on Elastic Continuum: Thin and thick rafts, Analysis of finite plates, Numerical analysis of finite plates.

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
2. Rolando P. Orense, Nawawi Chouw & Michael J. Pender - Soil-Foundation-Structure Interaction, CRC Press, 2010 Taylor & Francis Group, London, UK.
3. Soil Structure Interaction – The real behaviour of structures, the institution of structural engineers, London, March 1989.
4. Poulos, H. G., and Davis, E. H. - Pile Foundation Analysis and Design, 1980
5. Scott, R. F. - Foundation Analysis, Prentice Hall, Englewood Cliffs, 1981
6. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
7. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering

OUTCOMES:

- Learn application of different soil response models for specific problem based on the Requirement.
- Students can analyze footings/rafts resting on soil as beams/plates on elastic foundation and work out design bending moments/shear and displacements.
- Learn to compute pile response for various loading condition for design purpose
- To estimate interaction parameters under static and dynamic loading conditions

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

GROUND IMPROVEMENT TECHNIQUES

OBJECTIVES:
To enable the students

- To select suitable ground improvement techniques for problematic soils.
- To select suitable mechanical and hydraulic modifications.
- To select suitable physical and chemical modifications.
- To adept soil reinforcement Techniques.

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
Hydraulic Modification – Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering.Filtration, Drainage and Seepage control with Geosynthetics, Preloading and vertical drains.

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:

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill publications
2. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis
3. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey
4. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
5. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons, 1994.
6. K. Krisch & F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press, Taylor and Francis
7. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

OUTCOMES:

- Able to understand the various ground improvement methods to selection suitable method for soil
- Able to design ground improvement technique suitable for coarse grained soils Through mechanical stabilization and dewatering techniques
- Learn the Suitability and methods such as grouting, Chemical modification and Inclusions to improve the ground

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

THEORETICAL SOIL MECHANICS
(Elective-1)

OBJECTIVES:

- To impart knowledge required for computing stress and settlement at any point in the semi-infinite elastic soil medium, anisotropic medium and layered deposits due to foundation loads.
- To evaluate the stability of foundations, slopes, cuts and retaining structures both for the conditions of undrained and drained loading through theorems of plastic collapses.

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
Theory of Plasticity: Ideal Plastic substance strain hardening – yield criteria – Tresca, & Van Mises, Mohr & Coulomb, Drucker-Prager theories, Critical State Soil Mechanics, – applications to soil mechanics problems.

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:

1. Poulos, H. G. & Davis, E. H. – "Elastic Solutions for Soil and Rock Mechanics, John Wiley and Sons, New York, 1974
2. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004)
3. Harr,M.E. – "Foundations of Theoretical Soil Mechanics" Mc Graw-Hill, 1966.
4. Atkinson J. H. - An Introduction to the Mechanics of Soils and Foundation - through critical state soil mechanics, McGraw- Hill Co. (1993)
5. Wood, D.M.- Soil Behavior and Critical State Soil Mechanics.cambridge university press (1991)

OUTCOME:

- At the completion of the course the students will be able to decide the type of mathematical models to be used for analyzing the behavior of soil mass at critical state
- 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.

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

APPLIED STATISTICS
(Elective- I)

OBJECTIVES:

To enable the students

- To apply statistics in various areas of Environmental /Water Resources Engineering like sampling and analysis, stochastic modeling etc.

- Use the most common statistical tests and understand their assumptions and limitations.
- Formulate and choose a suitable methodology for testing in a given situation.
- Use the most common estimation methods.
- Perform estimation in regression models and evaluate a proposed model.
- Evaluate results from statistical software.

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:

1. Haldar, A.S. & Mahadevan,S., Probability, Reliability, Statistical Methods in Engineering Design, John Wiley and Sons Inc., New York, 2007.
2. Ang, A.H.S. & Tang, W.H. - Probability Concepts in Engineering – Emphasis on Applications to Civil Environmental Engineering, John Wiley and Sons Inc., New York, 2007.
3. Fenton, G.A. and Griffiths, D.V. - Risk Assessment in Geotechnical Engineering, John Wiley and Sons Inc., New York, 2008.
4. Montgomery, D.C. and Runger, G.C. – Applied Statistics

OUTCOMES:

- students able to identify various methods of statistics to solve problems
- able to understand the different methods of probability and regression analysis
- able to analyse multiple data sets and sampling technique in statistics

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

ENVIRRONMENTAL GEOTECHNOLOGY
(Elective 2)

OBJECTIVES:

- To identify various sources of contamination and to characterize contaminated ground.
- To characterize solid and Hazardous waste.
- To model the contaminant transport.
- To identify suitable Remediation technique.
- To study the types of Landfills.

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
Contaminant Transport: Transport process, Mass-transfer process, Modeling, Bioremediation, Phytoremediation.

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:

1. Phillip B. Bedient, Refai, H. S. & Newell C. J. - Ground Water Contamination - Prentice Hall Publications, 4th Edition, 2008
2. Sharma, H. D. and Reddy, K. R. - Geoenvironmental Engineering, John Wiley & Sons (2004)
3. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Handbook, Kluwer Academic, 2001
4. Reddi, L. N. and Inyang, H. I. - Geoenvironmental Engineering Principles and Applications, Marcel. Dekker, Inc., New York (2000).
5. LaGrega, M. D., Buckingham, P. L. and Evans, J. C. - Hazardous Waste Management, New York: McGraw-Hill, 2001

OUTCOME:

- Can identify various sources of contamination of ground
- Characterize contaminated ground and to find extent of contamination
- Understand the various remediation methods for contaminant ground and identify most appropriate method of remediation for different sites..
- Understand the significance of components of landfills

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING
M.Tech. I Year I-Sem (Geotechnical Engineering)

L	T	P	C
3	0	0	3

ENVIRONMENTAL IMPACT ASSESSMENT
(Elective-8)

OBJECTIVES:
The objective of this course is

- To educate the students on the scope, steps involved and various methods related to assessment of environmental impact due to development projects.
- To Impart Knowledge On Environmental Management and Environmental Impact Assessment.

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
E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, Benefit Analysis.

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
The Environmental protection Act, The water Act, The Air (Prevention & Control of pollution Act.). Wild life Act. EIA Report preparation and Case studies. Statement for various industries.

REFERENCE:

1. Anjaneyulu, Y. - Environmental Impact Assessment Methodologies, B. S. Publication, Sultan Bazar, Hyderabad
2. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers, 1999
3. Suresh K. Dhaneja - Environmental Science and Engineering, S.K.,Katania & Sons Publication., New Delhi.
4. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication(P) Ltd, Delhi, 2003.

OUTCOMES:

- Knowledge on prediction and assessment of environmental impacts due to developmental activities
- Concepts on various environmental impact assessment methodologies
- Can have an outlook on legislations to safeguard environment.

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
0	0	3	2

ADVANCED GEOTECHNICAL ENGINEERING LABORATORY– I

OBJECTIVES:

This course will enable students to

- To learn principles and design of experiments.
- To investigate the performance of various soils

1. Classification of soils
2. Hydrometer Analysis
3. Determination of insitu density by core cutter and sand replacement methods
4. Scale effect of permeability
5. Effect of compactive effort on compaction of different soils
6. Variation of CBR values for different soils in soaked and unsoaked conditions
7. Effect of saturation on shear parameters from direct shear tests (tests to be conducted in unsaturated as well as saturated condition)
8. Determination of shear parameters from unconfined compression tests
9. Determination of shear parameters from Triaxial Tests- UU Test
10. Triaxial Tests- CU Test with pore pressure

OUTCOMES:

- Enables the Students to learn and conduct appropriate laboratory tests on soil, so as to apply the obtained results for a specific Civil Engineering project.

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

L	T	P	C
0	0	3	2

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

GEOTECHNICAL ENGINEERING COMPUTATIONAL LAB.

OBJECTIVES:

Using software student should be able

- To determine bearing capacity of substrata and vertical stress distribution
- To Analyze settlements of shallow foundations
- To determine Load carrying capacity of piles
- To check the stability of reinforced soil walls

1. Presentation of field test data and borelog preparation
2. Bearing capacity of shallow foundations using different theories for different soils
3. Determination of Vertical Stress distribution under different loading conditions and planes
4. Settlement analysis of shallow foundations for different soils
5. Determination of Pile load carrying capacity under compression
6. Determination of lateral pile load capacity
7. Design of underreamed pile foundation
8. Design of Reinforced soil walls

OUTCOME:

Students can determine design/ check the stability of Geotechnical structures using software

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
2	0	0	2

NUMERICAL METHODS FOR GEOTECHNICAL ENGINEERS

OBJECTIVES:

- To impart the basic concepts of mathematical modeling of problems in Geotechnical engineering
- To learn procedures for solving different kinds of problems.
- To understand the various numerical techniques which provide solutions to non linear equations, partial differential equations etc that describe the mathematical models of problems.

UNIT- I

Approximations and Errors in Numerical Methods - Solutions of Algebraic and Transcendental Equations, Bisection, False Position, Secant & Iterative Methods, Newton-Raphson, Comparison of Iterative Methods.

UNIT- II

Simultaneous Linear Algebraic Equations – methods of solution using inverse of the matrix, method of successive elimination, Iterative methods – Gauss-Siedel method, Applications.

UNIT- III

Interpolation – Lagrange's, Newton's, Hermite's, Spline, Inverse Interpolation, Applications.
Curve Fitting – Least Square regression

UNIT- IV

Numerical Differentiation & Integration – Finite differences, Newton's difference formulae-Derivatives, Maxima and Minima of a Tabulated Function; Integration – Quadrature, Romberg's, Euler-Maclaurin, Applications.

UNIT- V

Numerical Solution of Ordinary Differential Equations - Modified Euler's, Runge-Kutta's, Predictor-Corrector, Milne's Methods; Partial Differential Equations - Finite Difference Approximations, Elliptic, Laplace, Parabolic, Hyperbolic Equations; Applications.

REFERENCE:

1. Grewal, B. S. - Numerical Methods in Engineering & Science, Khanna Publishers, 1999
2. Desai,C.Sand Christian J.T – Numerical methods in Geotechnical Engineering-McGRAW-Hill
3. Chapra, S. C. & Canade, R. P. - Numerical Methods for Engineers, McGraw Hill publications, 2011
4. by Joe D Hoffman, Hoffman D Hoffman, Steven Frankel, Numerical Methods For Engineers and Scientists Second Edition, 2001

OUTCOMES:

- able to know the approximations in any calculations and give solutions to transcendental & simultaneous equations
- able to formulate equations for given data
- able to calculate differentiation and integration problems using numerical methods
- able to solve ordinary and partial differential equations

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

SOIL DYNAMICS AND MACHINE FOUNDATIONS

OBJECTIVES:

- To study vibration concepts in soils like damping, wave propagation, resonance and effect of modes of vibrations.
- To study dynamic soil properties. Determination of dynamic properties by field and laboratory tests.
- To study the effect of liquefaction and anti liquefaction measures.
- To study vibration isolation, machine foundation design.

UNIT- I
Fundamentals of Vibration: Definitions, Simple harmonic motion, Response of SDOF systems of Free and Forced vibrations with and without viscous damping, Frequency dependent excitation, Logarithmic decrement, Determination of viscous damping, Systems with Two and Multiple degrees of freedom, Vibration measuring instruments.

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
Foundation Vibration Analyses: Types, General Requirements, Permissible amplitude, Allowable soil pressure, Modes of vibration of a rigid foundation block, Vertical vibration of circular foundations resting on Elastic Half Space- Lambs, Reissner, Quinlan & Sungs analogies.

UNIT- IV
Design of Machine Foundations: Analysis and design of block foundations for reciprocating engines, IS code of practice design procedure for foundations of reciprocating and impact type machines. Vibration isolation and absorption techniques.

UNIT- V
Machine Foundations on Piles: Introduction, Analysis of piles under vertical vibrations, Design procedure for a pile supported machine foundation.

REFERENCE:

1. Swami Saran - Soil Dynamics and Machine Foundation, Galgotia Publications Pvt. Ltd. (2010)
2. Prakash, S. - Soil Dynamics, McGraw Hill Book Company (1981)
3. I.Chowdhary and S P Dasgupta - Dynamics of Structures and Foundation, 2009.
4. Arya, S. D, O'Neil, M. and Pincus, G.- Design of Structures and Foundations for Vibrating Machines, Gulf Publishing Co., 1979.
5. Prakash, S. and Puri, V. K. - Foundation for Machines: Analysis and Design, John Wiley & Sons, 1998.
6. Kameswara Rao, N. S. V. - Vibration Analysis and Foundation Dynamics, Wheeler Publication Ltd., 1998.
7. Richart, F. E. Hall J. R and Woods R. D. - Vibrations of Soils and Foundations, Prentice Hall Inc., 1970.
8. Das, B. M. - Principles of Soil Dynamics, PWS KENT publishing Company, Boston.2002
9. Bharat Bhushan Prasad – Advanced Soil Dynamics and Earthquake Engineering, PHI Learning Pvt. Limited, New Delhi, 2011.

OUTCOME:

- Students understands theory of vibration and resonance phenomenon, Amplification.
- Students understand propagation of body waves and surface waves through soil.
- Students learn determination estimation of dynamic soil properties required for design purpose.
- Students can learn the assess liquefaction potential of any site.
- Students apply theory of vibrations to design machine foundation based on dynamic soil properties and bearing capacity.
- Students can Learn the effect of dynamic load /vibration on bearing capacity

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

SUBSURFACE INVESTIGATIONS AND INSTRUMENTATIONS

OBJECTIVES:
Students can expect to

- Learn the soil and rock exploration procedures
- Develop the understanding of different soil and rock parameters required for design of foundations
- Learn about advanced soil exploration methods

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:

1. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
2. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004)
3. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.
4. Goodman – Introduction to Rock mechanics, Willey International (1980).
5. Geotechnical Investigation Methods: A Field Guide for Geotechnical Engineers.Roy.E HUNT, Taylor & Francis, .2006.
6. Handbook of Geotechnical Investigation and Design Tables, Routledge, (2007).

OUTCOMES:

- Students can lean to plan subsurface investigation based on the requirement of Civil Engineering project and site condition. Can finalize depth and number of boreholes
- Students can execute different subsurface exploration tests, collect disturbed/undisturbed samples for laboratory tests and can suggest design parameters.
- Student exposed to different methods for estimation of dynamic soil properties required for design purpose.
- Students can develop instrumentation scheme for monitoring of critical sites

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

OFFSHORE GEOTECHNICAL ENGINEERING
(Elective-3)

OBJECTIVES:

- Understand the type of soil strata available in offshore.
- Develop a structure under different environmental condition.
- Design the anchors in the sea.

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

Foundations for Offshore Gravity Structures: construction, installation, instrumentation of gravity platforms, stability analysis, deformation analysis based on elastic theory, piping and erosion. Design of suction piles for offshore structure.

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:

1. Marine Geotechnics – H.G. Poulos (1988), Prentice Hall Inc.
2. Construction of marine and offshore structures – Ben C Gerwick, jr., CRC Press, Taylor and Francis Group.(2012)
3. Seabed Reconnaissance and Offshore Soil Mechanics (for the installation of petroleum structures) – Pierre LE Tirant (1979), Gulf Publishing Company, Houston, Texas.
4. API (2000) – Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – API, RP2A.
5. Pile design and construction practice – M J Tomlinson, View point Publications, Palladian Publications Limited.(1987)
6. Port Engineering planning, construction, maintenance and security – George P Tsinker, John Wiley & Sons, Inc. (2004)

OUTCOMES:

- understand the marine deposits and their behavior under different loading conditions
- able to design the shallow foundations and study the foundation stability of offshore structures.
- Able to design the piles for offshore structures and submarine pipe lines

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

DESIGN OF SUBSTRUCTURES
(Elective-3)

OBJECTIVES:

- To gain familiarity with different types of foundation.
- To explore the students to the design of shallow foundations and deep foundations.
- To understand the concept of designing shallow and deep foundations, Machine foundations and Special foundations.

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
Machine Foundations: Vibration analysis of machine foundation - Design of foundation for Reciprocating machines and Impact machines - as per I.S. Codes.

REFERENCE:

1. Bowles .J.E., “Foundation Analysis and Design”, McGraw Hill Publishing co., New York, 1986.
2. Tomlinson. M.J, “Foundation Design and Construction”, Longman, Sixth Edition, New Delhi, 1995.
3. Das, B.M., Principles of Foundation Engineering, Design and Construction, Fourth Edition, PWS Publishing, 1999.
4. Narayan V. Nayak, Foundation design manual,Dhanpat Rai & Sons, 2006.
5. Prakash Shamsher and Puri Vijay K, Foundations for Machines, Analysis and Design” John Wiley and Sons, USA, 1988.
6. IS 2911: Part 1: Sec 1: 1979 Code of practice for design and construction of pile foundations: Part 1 Concrete piles, Section 1 Driven cast in-situ concrete piles.

OUTCOME:

- The learner will be able to design shallow and deep foundations for different loading conditions
- Design and check the stability of retaining walls
- Able to design machine foundations

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

ENGINEERING ROCK MECHANICS
(Elective-3)

OBJECTIVES:

Students can expect to

- Selection of type of classification of rock mass based on application tunneling , mining etc.
- Determination of strength parameters based on the nature of the rock man and predicting its behavior under loading condition settlement, bearing capacity etc.
- Check for stability of natural rock slopes & cuts in rock mass- predicting and checking the probable failure modes
- Blasting operations- suitable explosive products and blast determining selection of approximate method of blasting on site location and condition

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

Strength, Modulus and Stresses-Strain Responses of Rocks: Factors influencing rock response, Strength criteria for isotropic intact rocks, Modulus of intact rocks, effect of confining pressure, Uniaxial Compressive strength, Strength criteria for intact rocks, Strength due to induced anisotropy in rocks,. Stress Strain Models: Constitutive relationships, Elastic, Elasto-plastic, Visco-elastic, Elasto-viscoplastic stress-strain models.

UNIT-IV

Stability of Rock Slopes and Foundations on Rocks: Rock slopes, Modes of failure, Rotational failure, Plane failure, Design charts, Wedge method of analysis, Buckling failure, Toppling failure, Improvement of slope stability and protection. Foundations on Rock: Introduction, Estimation of bearing capacity, Stress distribution, Sliding stability of dam foundations, strengthening measures, Settlements in rocks, Bearing capacity of pile/pier in rock, Remedial measures, Foundations located on edge of jointed slope.

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:

1. Goodman – Introduction to Rock mechanics, Willey International (1980).
2. Ramamurthy, T. - Engineering in Rocks for slopes, foundations and tunnels, Prenice Hall of India.(2007)
3. Jaeger, J. C. and Cook, N. G. W. – Fundamentals of Rock Mechanics, Chapman and Hall, London.(1979)
4. Hoek, E. and Brown, E. T. - Underground Excavation in Rock, Institution of Mining and Metallurgy, 1982.
5. Brady, B. H. G. and Brown, E. T. - Rock Mechanics for Underground Mining, Chapman & Hall, 1993.

OUTCOME:

- Able to determine the required rock properties and classify rock mass
- Determination of bearing capacity of rocks,
- Checking the stability of slopes, and design underground and open excavation.
- The students will be able to predict strength of rock mass with respect to various Civil Engineering applications

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

EARTH RETAINING STRUCTURES
(Elective-4)

OBJECTIVES:

To enable the student

- To calculate earth pressure under different loads and conditions
- To check the stability of gravity and cantilever Retaining walls
- To design sheet pile walls and bracings
- To design Reinforced soil walls

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, Soil Nailing.

REFERENCE:

1. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004)
2. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
3. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Hand Book -Springer (2001)
4. Hans Friedrich Winterkorn, Hsai-Yang Fang - Foundation Engineering Handbook, Van Nostrand Reinhold, 1975
5. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

OUTCOMES:

- Able to calculate the earth pressures under different vertical loads and conditions
- Able to design conventional retaining walls and check the stability
- Able to design flexible retaining walls such as sheet pile walls and reinforced earth walls
- To design the supporting systems for excavations

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

GEOTECHNICS FOR INFRASTRUCTURE
(Elective-4)

OBJECTIVES:

- To impart Knowledge on Site investigation and soil testing methods.
- To be able to design types of foundations, suitable for different Structures.
- To identify soil types suitable for construction.

UNIT – 1
Site Investigation for Infrastructure Projects: methods of site investigation, types of soil samples and samplers- Geotechnical field testing – SPT, CPT, Plate Load Test, Pile Load Test.

UNIT – 2
Shallow Foundations for Railway & Highway Bridges and Port & Harbour Structures: types of foundations, design forces, safe and allowable bearing capacity of shallow foundations, settlement computation;

UNIT – 3
Pile Foundations for Railway & Highway Bridges and Port & Harbour Structures: Pile foundations – types, axial and lateral capacity of pile, pile group analysis and pile cap; Introduction to drilled piers, caissons, well foundations.

UNIT – 4
Foundations for Transmission Line, Radar Antenna, Microwave and TV Tower and Chimneys: Introduction, foundations for towers and chimneys, design forces, behaviour of pad and chimney foundations, design of chimney and pad foundations, anchor foundations (rock anchors), design of foundations for towers and chimneys, analysis of raft on pile foundations; design and construction of shallow foundations on rocks.

UNIT – 5
Sheet Piles - introduction, types of sheet pile walls, cantilever sheet pile wall, anchored sheet pile wall, stability analysis of anchored bulkhead by free earth support and fixed earth support method, position of anchorage.
Expansive and Collapsible Soil: Difficult soils- loose granular soils, soft clays and shrinkable soils- identification, swell and swell pressure.

REFERENCE:

1. Soil Mechanics and foundation engineering – P. Purushottama Raj, Pearson Education.
2. Construction of marine and offshore structures – Ben C Gerwick, jr., CRC Press, Taylor and Francis Group.
3. Dynamic soil tests and applications – N S V Kameswara Rao, Wheeler Publishing.
4. Pile design and construction practice – M J Tomlinson, View point Publications, Palladian Publications Limited.
5. IS: 4091 (1979) - Design and construction of foundations for transmission line towers
6. IS: 11233 (1985) - Design and construction of foundations for Radar Antenna, Microwave and TV Tower.
7. Principle of foundation engineering – B.M.Das, CENGAGE Learning, Thomson, Brooks/Cole.
8. Foundation Engineering -Varghese, Prentice Hall of India.
9. Foundation analysis and design – J.E.Bowles, McGraw Hill Books Company

OUTCOMES:

- Able to plan and select the soil exploration method which is to be used in the field
- Estimate the bearing capacity and settlements of shallow foundations for different infrastructure projects
- Design deep foundations under different types of loads
- Design foundations for highrise buildings, towers, chimney etc
- Design foundations on soft or problematic soils and supporting systems for excavations

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
3	0	0	3

PHYSICAL AND CONSTITUTIVE MODELLING ON GEOMECHANICS
(Elective-4)

OBJECTIVES:

To enable the students

- To understand geotechnical modeling considerations
- To select model to simulate field conditions
- To use and acquire data using various instruments
- To compare with recent development geotechnical modelling

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:

1. David muir wood, Geotechnical Modelling, Spon Press, Taylor & Francis, 2004.
2. Madabhushi, G. - Centrifuge Modeling for Civil Engineers, CRC Press, Taylor and Francis Group, 2015.
3. Taylor, R.N. Geotechnical Centrifuge Technology, Taylor and Francis Publication, 1995.
4. Charles Ng, Zhang,L.M., and Wang, Y.H. (2006) : Proceedings of 6th International Conference on Physical Modeling in Geotechnics, Hong Kong.
5. S. Springman, J. Laue & L. Seward, Proceedings of the 7th International Conference on Physical Modelling in Geotechnics, Zurich, Switzerland, 2010.
6. Gaudin, C. & White, D. The Proceedings of the 8th international conference on Physical modeling in Geotechnics, Perth, Australia, 2014.

OUTCOMES:

- Student will be able to understand scaling laws and modeling considerations for physical modeling in geotechnical problems both for static and dynamic conditions.
- Able to comprehend physical modeling, scale effects, simulation of field conditions, conceptualization and fixing boundary conditions etc.
- Data acquisition for all the conditions
- Able to know new improvements in physical modeling

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
0	0	3	2

ROCK MECHANICS LABORATORY

OBJECTIVES:

To enable students to

Rock Mass:

- To learn determination of the parameters required for classification
- Strength & Modules determination Directly and indirectly for the design purpose

Geotextiles:

- To determine the strength and other properties required for geotextile when used for different applications in roads, RE walls, sand wicks etc.

1. Determination of basic properties of rock –
   a) Unit weight from mercury displacement method for irregular samples
   b) Determination of unit weight for core samples
   c) Void ratio, porosity and specific gravity of rock specimens
2. Determination of RQD
3. Determination of Slake Durability Index
4. Point Load Tests – Determination of point load index value, compressive strength and tensile strength for both core and irregular samples
5. Tensile strength of rock by Brazilian Test
6. Uniaxial compressive strength of rock and determination of modulus of elasticity
7. Determination of hardness of rock
   a) Rebound Hammer Test (insitu)
   b) Los Angeles abrasion test (Road materials)
8. Determination of toughness of rock material (road material)
9. Determination of V_p & V_s – Through rock Sample

OUTCOMES:

- Enable to understand the behavior of rocks and Geosynthetics for various loads, in order to use these properties in designs the geotechnical structures.

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

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

L	T	P	C
0	0	3	2

ADVANCED GEOTECHNICAL ENGINEERING LABORATORY - II

OBJECTIVES:
To enable students to

- Conduct Field tests & Model field tests for interpretation of result and to understand the testing procedure
- To determine containment transport studies to understand various transport processes involved and the determination of parameters required for prediction of contamination

1. Preparation of borelog & Soil Investigation Report for a) SPT b)DCPT
2. Model Plate Load Test.
3. Model Pile Load Test.
4. Pressuremeter Test
5. Block Vibration Test & Hammer Test
6. MASW Test
7. Pollutant Transport using column test (Determination of R)
8. Determination of Chlorides in soils
9. Determination of Sulphates in soils
10. Study of pollutant transport under instant and continuous source (Determination of D_x)
11. Batch tests (Determination of K_d)
12. Tests on Geotextiles
    a) Tensile Strength of Geotextiles
    b) Cone Drop Test on geotextile
    c) Interface friction between geotextile and soil
    d) In-Plane and Cross-Plane Permeability of Geotextiles

OUTCOMES:

- Students can conduct appropriate field tests on soil, so as to apply the obtained results for a specific Civil Engineering project.
- Can determine the dynamic soil properties of sub-soil
- Able to determine the chemical properties present in the soil

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. II Year III-Sem (Geotechnical Engineering)

L	T	P	C
3	0	0	3

STABILITY ANALYSIS OF SLOPES
(Program Elective-5)

OBJECTIVES:

To study

- . The basic concepts of stability.
- To make the students aware of various causes of failures of slopes and study the remedial measure

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

Slope Stability Analysis: Types of Failure: Failure surfaces - Planar surfaces, Circular surfaces, Non-circular surfaces, Limit equilibrium methods, Total stress analysis versus effective Stress analysis, Use of Bishop's pore pressure parameters, Short term and Long term stability in slopes. Taylor Charts.

UNIT-IV

Methods of Slope Stability: Method of Slices, Effect of Tension Cracks, Vertical Cuts. Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure Surfaces: Janbu Analysis, Sliding Block Analysis, Introduction to Seismic stability, Stabilization of slopes: Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete).

UNIT-V

Slope Protection and Rockfill Dams: Stabilization of slopes: Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete). Requirements of compacted rockfill, Shear strength of rockfill, Rockfill mixtures, Rockfill embankments, Earth-core Rockfill dams, Stability, Upstream & Downstream slopes.

REFERENCE:

1. Sherard, Woodward, Gizienski and Clevenger. Earth and Earth-Rock Dams. John Wiley &. Sons. 1963. Bharat Singh and Sharma, H. D. – Earth and Rockfill Dams, 1999.
2. Sowers, G. F. and Salley, H. I. – Earth and Rockfill Dams, Willams, R.C., and Willace, T.S. 1965.
3. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilisation methods – John Wiley & sons. (2002).
4. Bromhead, E. N. (1992). The Stability of Slopes, Blackie academic and professional, London.

OUTCOMES:

- Can select Suitable materials for earth and rockfill dams, causes of failures
- Student will be able to check the stability of earthen dams,
- safety measures to be undertaken to prevent the instability of slopes, earthen dams and embankments

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. II Year III-Sem (Geotechnical Engineering)

L	T	P	C
3	0	0	3

PAVEMENT ANALYSIS AND DESIGN
(Program Elective-5)

OBJECTIVES:

This course will enable students to

- Identify the type of pavement and to know the stress distribution
- Learn the deflection criteria in soils for different pavements
- To know the characteristics of the rigid pavements and flexible pavements
- To carry out design and evaluation of flexible and rigid pavements in varied field 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:

1. Atkins, N. Harold, Highway Materials, Soils and Concretes, Fourth Edition, 2002, Prentice-Hall.
2. Yang H Huang - Pavement Analysis and Design, 2nd Edition, Pearson Education
3. Yoder.J. & Witzorac Mathew, W. Principles of Pavement Design, John Wiley & Sons Inc
4. Kerbs Robert D. and Richard D. Walker, Highway Materials, McGraw-Hill, Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
5. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers
6. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.
7. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
8. IRC: 37 & 58 Codes for Flexible and Rigid Pavements Design.

OUTCOMES:

- Student will be able to understand various pavement material characterization techniques
- Estimate the stresses and strains in pavements under different wheel load configurations and other conditions
- Design of flexible and rigid pavements as per specification such as Morth &IRC

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. II Year III-Sem (Geotechnical Engineering)

L	T	P	C
3	0	0	3

GEOTECHNICAL EARTHQUAKE ENGINEERING
(Program Elective-5)

OBJECTIVES:

- To understand the dynamics of earth and its response, effect on earth structure and measures to mitigate the effects
- Students are able to develop the design ground motion for a site by suitable response analysis
- To analyze and design geotechnical structures.

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

Seismic Design of Foundations, Retaining Walls & Slopes - Seismic design requirements for foundation, Seismic bearing capacity, Seismic settlement, Design loads. Seismic slope stability analysis - Internal stability and weakening instability, Seismic design of retaining walls: Dynamic response of retaining walls, Seismic displacement of retaining walls.

REFERENCE:

1. Kramer S. L - Geotechnical Earthquake Engineering, Prentice Hall, 1996.
2. Bharat Bushan Prasad- Advanced Soil Dynamics and Earthquake Engineering, PHI Learning Pvt. Ltd., New Delhi, 2011.
3. R. W. Day - Geotechnical Earthquake Engineering Handbook, McGraw-Hill, 2002.
4. Naeim, F. - The Seismic Design Handbook, Kluwer Academic Publication, 2nd Edition, 2001.
5. Bolt, B. A. - Earthquakes, W. H. Freeman and Company, 4th Edition, 1999.
6. Lourie, W. - Fundamentals of Geophysics, Cambridge University press, 1997.
7. Kamalesh Kumar - Basic Geotechnical Earthquake Engineering – New Age International Publishers, 1st Edition, 2008
8. Dowrick - Earthquake Resistant Design, John Wiley & Sons.(2009)

OUTCOMES:

- Students will know the causes and quantification of earthquake.
- To carryout ground response analysis
- To find liquefaction susceptibility and remedial measures for seismic hazards
- Design of foundations considering earthquake loads

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. II Year III-Sem (Geotechnical Engineering)

L	T	P	C
3	0	0	3

CONSTRUCTION MANAGEMENT
(Open Elective)

OBJECTIVES:

- To know about the various Construction Management Techniques available for execution of project.
- To understand Resource planning, different types of contract.
- To learn the occupational and safety Hazard Assessment.

UNIT -I

Management process- Roles. Management theories. Social responsibilities. Planning and strategic management. Strategy implementation. Decision making: tools and techniques – Organizational structure. Human resource management- motivation performance- leadership.

UNIT-II

Classification of Construction projects, Construction stages, Resources- Functions of Construction Management and its Applications .Preliminary Planning- Collection of Data- Contract Planning – Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.

UNIT-III

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

UNIT-IV

Contract - types of contract, contract document, and specification, important conditions of contract – tender and tender document - Deposits by the contractor - Arbitration . negotiation - M.Book - Muster roll -stores.

UNIT-V

Management Information System - Labour Regulations: Social Security - welfare Legislation - Laws relating to Wages, Bonus and Industrial disputes, Labour Administration - Insurance and Safety Regulations - Workmen's Compensation Act -other labour Laws - Safety in construction: legal and financial aspects of accidents in construction. occupational and safety hazard assessment. Human factors in safety. Legal and financial aspects of accidents in construction. Occupational and safety hazard assessment

REFERENCE:

1. Ghalot, P.S., Dhir, D.M., Construction Planning and Management, Wiley Eastern Limited,1992.
2. Chitkara,K.K., Construction Project Management¸ Tata McGraw Hill Publishing Co, Ltd., New Delhi,998.
3. Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, New Delhi,1987.
4. Sengupta, B. & Guha, H, Construction Management And Planning by: Tata McGraw-hill publications.

OUTCOMES:

- 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.

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. II Year III-Sem (Geotechnical Engineering)

L	T	P	C
3	0	0	3

FINITE ELEMENT METHODS
(Open Elective)

OBJECTIVES:

This course will enable students to

- Understand in general how finite elements obtain approximate solutions to differential equations
- Appreciate the structure of a typical finite element program
- Gain experience of finite element analysis applied to classical geotechnical problems (e.g. settlement, seepage, consolidation, slope stability)
- Gain insight into the soil properties needed for finite element analysis

UNIT-I
Introduction: Concepts of FEM, Steps involved in Finite Element Analysis Procedure, Merits and Demerits. Principles of Elasticity: Stress equations, Strain-Displacement relationships in matrix form, Plane stress, Plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.

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:

1. Desai, C. S. and J.F. , Abel, Introduction to the Finite Element Method, Van Nostrand Reinhold Company (1972).
2. Reddy, J. N. - Introduction to the Finite Element Method - McGraw-Hill Publishers, 1993.
3. Krishna Murthy, C. S. - Finite element analysis - Theory and programming, Tata McGraw-Hill,1994
4. Zienkiewicz, O. C. - Finite element Methods, McGraw-Hill Publishers, 1971.
5. Tirupati & Belgundu

OUTCOMES:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. II Year III-Sem (Geotechnical Engineering)

L	T	P	C
3	0	0	3

ARTIFICIAL INTELLIGENCE: TECHNIQUES
(Open Elective)

OBJECTIVES:

To introduce the students,

- Neural network characteristics, development of neural network principles.
- Learning methods and neural network models, types of learning, supervised, unsupervised, reinforced learning etc
- Recurrent back propagation, introduction to counter propagation networks
- The concepts of Fuzzy logic, Applications in water resource engineering.

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, Hopfeild network, Adaline and Madaline models.

UNIT-III

Learning and Training: Objective of learning, Supervised and Unsupervised learning, Hebb's rule, Delta Rule.

UNIT-IV

Fuzzy Logic: Crispness, Uncertainty, Vagueness, Fuzzyness, Fuzzy sets, Fuzzy Relations, Fuzzy association memory, Fuzzy events, Means, Variances.

UNIT-V

Applications in Water Resources: Applications of fuzzy logic in neural networks, Applications of fuzzy logic and neural networks in water resources engineering with case studies.

REFERENCE:

1. Neural Networks and Fuzzy Systems by Bart. Kosko, pretence hall of India, 1994.
2. Artificial Neural Networks by Robert J. Schalokoff.
3. Fuzzysets Uncertainity an information by George.J.Klir and Tina, Pretence Hall of India, New Delhi.

OUTCOMES:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. II Year III-Sem (Geotechnical Engineering)

L	T	P	C
3	0	0	3

OPERATION RESEARCH
(Open Elective)

OBJECTIVES:

- Aims to introduce students to use quantitive methods and techniques for effective decisions–making; model formulation and applications that are used in solving business decision problems.
- To introduce Decision and Game Theory concepts for scientific study of strategic decision making.

UNIT-I
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

UNIT-II
Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

UNIT-III
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT-IV
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT-V
Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

REFERENCE:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008 4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

OUTCOMES:

- Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
- Students should able to apply the concept of non-linear programming
- Students should able to carry out sensitivity analysis
- Student should able to model the real world problem and simulate it.

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. II Year III-Sem (Geotechnical Engineering)

L	T	P	C
3	0	0	3

INDUSTRIAL SAFETY
(Open Elective)

OBJECTIVES:

- To provide information regarding different elements of industrial water pollution and Methods of treatment.
- To expose students to the various industrial applications, maintenance, preventive measures taken against wear and tear**.**

UNIT-I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT-II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working andapplications,

i. Screw down grease cup,
ii. Pressure grease gun,
iii. Splash lubrication,
iv. Gravity lubrication,
v. Wick feed lubrication
vi. Side feed lubrication,
vii. Ring lubrication,

Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT-IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like,

i. Any one machine tool,
ii. Pump
iii. Air compressor
iv. Internal combustion engine,
v. Boiler,
vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electricalmotor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of:

i. Machine tools,
ii. Pumps,
iii. Air compressors,
iv. Diesel generating (DG) sets,

Program and schedule of preventive maintenance of mechanical and electrical equipment, Advantages of preventive maintenance. Repair cycle concept and importance

REFERENCE:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

OUTCOMES:

- Student can know how to take safety measures in executing works
- Can identify the need for maintenance (or) replacement of equipment
- Can understand the need for periodic and preventive maintenance

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. I Year (Geotechnical Engineering) **L T P C**
3 0 0 3

ENGLISH FOR RESEARCH PAPER WRITING
(AUDIT 1 and 2)

OBJECTIVES:

Students will be able to:

- Understand that how to improve your writing skills and level of readability .
- Learn about what to write in each section.
- Understand the skills needed when writing a Title

UNIT- I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT- II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT- III

Review of the Literature, Methods, Results, Discussion, Conclusions, Final Check.

UNIT- IV

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

UNIT- V

Skills are needed when writing the methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions

UNIT- VI

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

REFERENCE:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

OUTCOMES:

- To improve writing and readability levels for English.
- How to write and what to write according to section .
- To Acquire Skills in title writing .

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. I Year (Geotechnical Engineering)

DISASTER MANAGEMENT
(AUDIT 1 and 2)

OBJECTIVES:

To make student understand
- The nature of various types of Natural and Manmade Disasters.
- The concept of Disaster Risk Reduction(Global level, National level ,Local level.)
- Disaster Mitigation Strategies(Structural and non Structural Mitigation measures)

UNIT- I

Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT- II

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, Manmade disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT- III

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

UNIT- IV

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.

UNIT- V

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

UNIT- VI

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.

REFERENCE:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “’New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.),” Disaster Mitigation Experiences and Reflections”, Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies”, Deep & Deep Publication Pvt. Ltd., New Delhi.

OUTCOMES:

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in Specific types of disasters and conflict situations.
- 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.

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. I Year (Geotechnical Engineering)

SANSKRIT FOR TECHNICAL KNOWLEDGE
(AUDIT 1 and 2)

OBJECTIVES:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world.
- Learning of Sanskrit to improve brain functioning .
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

UNIT- I

- Alphabets in Sanskrit,
- Past/Present/Future Tense,
- Simple Sentences

UNIT- II

- Order
- Introduction of roots
- Technical information about Sanskrit Literature

UNIT- III

- Technical concepts of Engineering-Electrical, Mechanical,
- Architecture, Mathematics

REFERENCE:

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

OUTCOMES:

- Understanding basic Sanskrit language.
- Ancient Sanskrit literature about science & technology can be understood.
- Being a logical language will help to develop logic in students

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. I Year (Geotechnical Engineering)

Research Methodology and IPR
(AUDIT 1 and 2)

OBJECTIVES: To expose the student to,

- The scientific research process and the various steps involved
- Formulation of research problem and research design
- Thesis preparation and presentation.
- Research proposals, publications and ethics
- Important research methods in engineering.

UNIT- I
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT- II
Effective literature studies approaches, analysis Plagiarism, Research ethics.

UNIT- III
Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT- IV
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT

UNIT- V
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT- VI
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

REFERENCE:

1. Stuart Melville and Wayne Goddard, “Research methodology: an Introduction for science & engineering students
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd, 2007.
5. Mayall, “Industrial Design”, McGraw Hill, 1992.
6. Niebel, “Product Design”, McGraw Hill, 1974.
7. Asimov, “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.
9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

OUTCOMES:

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics Understand that today’s world is controlled by Computer, Information
- Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. I Year (Geotechnical Engineering)

VALUE EDUCATION
(AUDIT 1 and 2)

OBJECTIVES:

Students will be able to

- Understand value of education and self- development .
- Imbibe good values in students.
- Know the importance of character.

UNIT- I

- Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.
- Moral and non- moral valuation. Standards and principles.
- Value judgements

UNIT- II

- Importance of cultivation of values.
- Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.
- Honesty, Humanity. Power of faith, National Unity.
- Patriotism. Love for nature ,Discipline

UNIT- III

- Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.
- Punctuality, Love and Kindness.
- Avoid fault Thinking.
- Free from anger, Dignity of labour.
- Universal brotherhood and religious tolerance.
- True friendship.
- Happiness Vs suffering, love for truth.
- Aware of self-destructive habits.
- Association and Cooperation.
- Doing best for saving nature

UNIT- IV

- Character and Competence –Holy books vs Blind faith.
- Self-management and Good health.
- Science of reincarnation.
- Equality, Nonviolence ,Humility, Role of Women.
- All religions and same message.
- Mind your Mind, Self-control.
- Honesty, Studying effectively

REFERENCE:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

OUTCOMES:

- 1.Knowledge of self-development
- 2.Learn the importance of Human values
- 3.Developing the overall personality

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. I Year (Geotechnical Engineering)

CONSTITUTION OF INDIA
(AUDIT 1 and 2)

OBJECTIVES:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT- I
History of Making of the Indian Constitution:
History Drafting Committee, (Composition & Working)

UNIT- II
Philosophy of the Indian Constitution:
Preamble
Salient Features

UNIT- III
Contours of Constitutional Rights & Duties:

- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

UNIT- IV
Organs of Governance:

- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions
- Executive
- President
- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

UNIT- Vw
Local Administration:

- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.
- Pachayati raj: Introduction, PRI: ZilaPachayat.
- Elected officials and their roles, CEO ZilaPachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy

UNIT- VI
Election Commission:

- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

REFERENCE:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

OUTCOMES:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

JNTUH COLLEGE OF ENGINEERING HYDERABAD
DEPARTMENT OF CIVIL ENGINEERING

M.Tech. I Year (Geotechnical Engineering)

PEDAGOGY STUDIES
(AUDIT 1 and 2)

OBJECTIVES:

- Develop and document their own personal learning networks.
- Develop a project based lesson plan that emphasis students exploration ,interaction creation and feedback cycles.
- To articulate a personal philosophy for teaching and learning.

UNIT- I

Introduction and Methodology:

- Aims and rationale, Policy background, Conceptual framework and terminology
- Theories of learning, Curriculum, Teacher education.
- Conceptual framework, Research questions**.**
- Overview of methodology and Searching.

UNIT- II

- Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
- Curriculum, Teacher education.

UNIT- III

- Evidence on the effectiveness of pedagogical practices
- Methodology for the in depth stage: quality assessment of included studies.
- How can teacher education (curriculum and practicum) and the school
- curriculum and guidance materials best support effective pedagogy?
- Theory of change.
- Strength and nature of the body of evidence for effective pedagogical practices.
- Pedagogic theory and pedagogical approaches.
- Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV

- Professional development: alignment with classroom practices and follow-up support
- Peer support
- Support from the head teacher and the community.
- Curriculum and assessment
- Barriers to learning: limited resources and large class sizes

UNIT- V.
Research gaps and future directions

- Research design
- Contexts
- Pedagogy
- Teacher education
- Curriculum and assessment
- Dissemination and research impact.

REFERENCE:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2):245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read'

OUTCOMES:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy