



M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: SOIL ENGINEERING - I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	prac	Total
3	1	0	4	4	60	40	25	-	125

A. DETAILED SYLLABUS

Problems in Geotech. Engg., Concept of point, line and plane, Idealized concept soil based on particle size, orientation, crystal structure, electrical imbalance, viscosity, Stokes' law, Concept of effective diameter, clay minerals, soil water consistency, activity, sensitivity and thixotropy, IS soil classification

Basic concept of flow through porous media; Darcy's law its limitation for use in real soils; Effective stress concept; suction potential and capillary flow, seepage, flow nets and phreatic lines

Description of state of stress and strain at a point, Stress distributions, Problems in elastic half-space; familiarity with Boussinesq's, Westergaard's, Burmister's and Mindlin's problems, distribution of contact pressure

Soil compaction, compressibility of soil, consolidation, one, two and three dimensional problems; Consolidation of partially saturated soils; determination of over consolidation pressure, Settlement computations.

PREREQUISITES/ SELF-STUDY:

Soil as three phase system, weight and volume relations, Soil Classification Systems,

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Soil Mechanics – D. W. Taylor
2. Soil Engineering – M. G. Spangler
3. Soil Mechanics – Means & Parcher
4. Advanced Soil Mechanics – B. M. Das
5. Soil Physics – Baver
6. Principles of Soil Mechanics – R. F. Scott



M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: ADVANCED FOUNDATION ENGINEERING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	-	125

A. DETAILED SYLLABUS

- Planning of subsoil exploration of major civil engineering projects, deriving characteristic strength deformation parameters from soil exploration report, calculation of safe bearing capacity for various soil types from shear as well as settlement criteria, pull out resistance of foundations, extrapolation of plate load test and pile load tests.
- Proportioning of isolated footings, combined footings, raft, floating foundations for different load combinations,
- Design of pile foundation for axial load – compression and pull out, lateral loads, negative skin friction, group action in piles, design of piles cap
- Foundations for water tanks, chimney, transmission line towers, antenna etc.
- Free and fixed cantilever sheet pile walls, anchored bulkheads

PREREQUISITES/ SELF-STUDY:

- Methods of drilling/boring and sampling.
- Field Test Procedures as per IS Code: SPT, SCPT, Plate Load Test, Pile Load Test
- Laboratory Test Procedures as per IS Code: Classification Tests, Shear Tests, Consolidation Test, Swell Tests,
- Bearing Capacity as per IS 6403 for Shallow Foundations, Settlement Calculations for Sand and Clay soils as per IS 8009.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Analysis and design of foundation - J. E. Bowles
2. Soil mechanics & foundation engg. vol-II - V.N.S. Murthy
3. Principles of foundation Engg. - Braj M. Das
4. Foundation Engineering - M.J. Tomlinson
5. Analysis and Design of Substructures - Swami Saran
6. Foundation Design - Coduto
7. Design Aids in Soil Mechanics and Foundation Engg. - Kaniraj
8. SP 36, pt 1 and 2, IS 6403, IS 8009 pt.1, IS 2911 (all),



M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: SOLID MECHANICS WITH FINITE ELEMENT METHODS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	-	125

A. DETAILED SYLLABUS

- Linear elasticity; stress, strain, constitutive relations; Boundary conditions; Description of an elasticity problem as a boundary value problem, Plane stress, strain, axial symmetrical problems.
- Introduction to plasticity, Yield condition; ideal elasto-plastic material.
- Analysis of Continuum and discrete structures, finite element principle and solution for continuum problems, steps in finite element analysis, principles of discretization, formulation of element stiffness matrix based on direct, variation principles, shape functions, numerical integration, convergence, 2-D formulations for plane stress, plane strain, axisymmetric including isoperimetric elements, introduction to 3D brick elements for Continuum problems.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Finite Element Analysis - Krishnamurthy
2. Finite Element Method - Desai & Ables
3. The Finite Element Method - Rockey, Evans & others
4. The Finite Element Method - Zienkiewicz
5. Concepts and Application of Finite Element Analysis - Cook
6. Advance Mechanics of Solids - Srinath



M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: SUBSURFACE EXPLORATIONS: CONCEPT TO CONCLUSION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	3	3	40	0	25	-	65

A. DETAILED SYLLABUS

For Soil as well as Rock : Problems and phases of foundation investigations, planning of subsurface exploration program, defining no. of boreholes, depth of boreholes, insitu tests and sampling frequency for each borehole, other insitu tests, samples to be collected, type and no. of lab. test to be carried out on various samples, tendering and specifications, soundings and drilling, sample requirements, sampling, methods and equipment, Handling, preservation and Transportation of samples, sample preparation, insitu testing, analysis of the results of insitu and lab testing, characteristic strength deformation parameters for geotechnical design, detailed reporting for various geotechnical problems. Use of software for Report preparation in subsurface explorations.

Insitu testing includes SPT, SCPT, DCPT, Static and Cyclic plate load test as well as Pile Load test, Block Vibration test, Electrical resistivity test, Seismic refraction tests, Ground penetration radar, high strain and low strain nondestructive testing of pile etc.

PREREQUISITES/ SELF-STUDY:

- Methods of drilling/boring, sampling
- Field Test Procedures as per IS Code: SPT, SCPT, Plate Load Test, Pile Load Test
- Laboratory Test Procedures as per IS Code: Classification Tests, Shear Tests, Consolidation Test, Swell Tests,
- Bearing Capacity as per IS 6403 for Shallow Foundations, Settlement Calculations for Sand and Clay soils as per IS 8009.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Earth Manual – USDI Publications
2. Compendium of Indian standards on soil Engineering part II, 1988.
3. IRC- 78
4. Subsurface Explorations – Handy
5. Foundation Engineering Handbook – Witerkorn and Fang
6. Foundation engineering Handbook – Sowers and Sowers
7. Foundation Engineering Handbook – Leonards
8. Principles of Foundation Engg. – B. M. Das
9. Analysis and design of foundation – J. E. Bowles
10. Foundation design Manual – N. V. Nayak
11. Handbook of Geotechnical engg. – R. K. Rowe



M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: GEOTECH. LAB TESTING PRACTICE

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	0	4	4	2	0	0	50	50	100

A. DETAILED SYLLABUS

Laboratory Tests on Soil: sample preparation, testing, analysis and reporting as per IS Code, uncertainty analysis of test results,

Grain size distribution for coarse grain soil, fine grain soil: dry sieve analysis, wet sieve analysis, hydrometer analysis, liquid limit, plastic limit, shrinkage limit, free swell test

Light compaction test, heavy compaction test, unconfined compressive strength, direct shear test, triaxial compression test, vane shear test

Constant head and falling head permeability test, One dimensional consolidation test, swell pressure test

Rock core sample preparation, rock tests,

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Head, H.K Manual of laboratory testing: Vol: 1 to 3,1981
2. Compendium of Indian standards on soil Engineering part I, 1987
3. Lab. Soil Testing – Lambe T. W.



M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: ELECTIVE PAPER - I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	0	3	40	0	25	0	65

SUBJECT OPTIONS:

1. ENVIROMENTAL GEOTECHNOLOGY

Introduction to environmental geotechnique, source, production and classification of wastes; soil-pollution interaction, effects of pollutant on soil properties, foundation problems on contaminated clays, hazardous waste management, criteria for selection of sites for waste disposal facilities, subsurface disposal techniques, passive containment systems, monitoring and performance of waste facilities.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Proceeding of the Workshop on Geotechnical Hazardous Waste Management at DDU Nadiad
 2. Criteria for Hazardous Waste Landfills: CPCB Publication, Feb. 2001.
 3. Geotechnology of Waste Management - Oweis I, S. and Khera R.P.
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2. ROCK MECHANICS

Physical and structural geology of rocks, classification of rocks, mapping of joints, Classification of inferential testing, transitional materials, engineering property evaluation; laboratory methods and insitu tests, friction in rocks, elasticity and strength of rocks, insitu stress determination, application of rock mechanics in engineering and underground openings, slope stability and foundation problems.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Rock Mechanics – Goodman, F. E.
 2. Rock Engineering – Ohn, A. Franklin and Maurice B. Dusseault,
 3. Rock Mechanics in Engineering Practical – Stagg K G & Zienkiewicz O C
 4. Rock Mechanics – Muller
 5. Engineering in Rocks for Slopes, Foundation and tunnels – Ramamurthy T.
 6. Engineering Rock Mechanics – An Introduction to the Principles – Hudson J A and Harrison J P
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3. NUM. METHODS & APPLICATION TO GEOTECHNICAL ENGG.

A. DETAILED SYLLABUS

Advanced Matlab Applications for:

Solution of non – linear algebraic equations, , numerical solutions of ordinary differential equations and partial differential equations, its applications to structural engineering problems. Solution of Eigen value problems, iterative methods & transformation methods. Use of software for transformation methods. Computer oriented algorithms

Correlation and regression, Principles of least squares

Euler's equation -Functional dependent on first and higher order derivatives

Laplace transform methods, Laplace equation -Properties of harmonic functions -Fourier transform methods for Laplace equation.

Application : Excel spread sheets for the design of shallow foundations, laboratory testing applications, settlement calculations, pile foundations etc.

Constitutive modeling of soil, Software Usage: Applications of Geo4, Z-soil, Plaxis, STAAD, STRAP etc. for Soil Structure Interaction and geotechnical design problems.

B. RECOMMENDED TEXT / REFERENCE BOOKS

Reference Books:

- | | |
|---|--------------------------|
| 1) Numerical methods in Engineering | Salvadori & Baron |
| 2) Numerical Methods in Finite Element Analysis | Bathe & Wilson |
| 3) Numerical Analysis | Scarborough |
| 4) Numerical Methods in Geotechnical Engg. | Desai C.s. and Christian |
| 5) Foundation Design | Bowles J. E. |



M. TECH. SEMESTER – I (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: AUDIT COURSE – I: DISASTER MANAGEMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	0	0	0	0	0	0	0	0

A. DETAILED SYLLABUS

1. Introduction
Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.
2. 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, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.
3. 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
4. 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.
5. 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.
6. 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.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Disaster Management in India: Perspectives, issues and strategies - R. Nishith, Singh AK
2. Disaster Mitigation Experiences and Reflections - Sahni, PardeepEt.Al.
Disaster Administration and Management Text and Case Studies - Goel S. L.



M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: SOIL ENGINEERING - II

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	0	2	5	4	60	40	25	0	65

A. DETAILED SYLLABUS

Shear strength of cohesionless and cohesive soils, physic-chemical aspects, experimental determination of shear strength, failure theories yield criteria. Influence on failure conditions of intermediate principal stress, history, drainage; rate of stress applications ets;

Platic equilibrium in soils, Mohr diagram, active and passive states, theories of earth pressure on retaining walls, effect of wall friction on the shape of sliding surface, theories of arching, bearing capacity, concepts of general and local shear failure, critical height of vertical banks,

Various methods of computation of slope stability, earth pressure on tempering of cuts and on free and anchored bulkheads.

Geological classification of rock, basic terminologies, Index Properties of rock, Classification of rock for engineering purposes, Strength classification of intact rocks, Laboratory tests of rocks, modes of failure of rocks

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Theoretical Soil Mechanic – Karl Terzaghi
2. Advanced Soil Mechanics – B. M. Das
3. Soil Mechanics – Whitlow
4. Foundation of Theoretical Soil Mechanics- , Harr M. E.



M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: DYNAMICS AND GEOTECHNICAL EARTHQUAKE ENGINEERING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. DETAILED SYLLABUS

Elements of Soil Dynamics, Free and forced vibrations with and without damping for single degree of freedom.

Wave Propagation: Waves in elastic half space, Elements of seismic methods, Steady state vibrations, Influence of soil condition on shaking intensity and associated structural damage and land slides.

Elastic Properties of Soil: Field and laboratory methods, Stress strain characteristics of soil under dynamic loads, damping properties, bearing capacity and earth pressure of soil under dynamic/seismic loads by pseudo static analysis.

Liquefaction and Ground Improvement: Mechanism, Laboratory methods, Evaluation of liquefaction in the field, Factors affecting liquefaction, Anti liquefaction measures, Introduction to Ground improvement in cohesionless soils

Machine foundation - types, general criteria, Natural frequency of foundation soil system, dynamic soil parameters, lumped mass parameters, elastic half space theory, block type machine foundation, foundation for high speed machinery, Vibration isolation.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Richart, F.E., Wood, R. D. and Hall, J. R., Vibrations of Soils and Foundations, Pentice Hall, 1970
2. Steven, Kramer, Geotechnical Earthquake Engineering, Pearson Education, 2003
3. Day, Robert, W, Geotechnical Earthquake Engineering Hand Book, Mc Graw Hill – 2002.
4. Handbook of Machine Foundation – P. Srinivashulu and C. V. Vaidyanathan
5. Das, B. M. – Fundamentals of Soil Dynamics, Elsevier Scientific Pub.- NY -1983
6. Prakash S. and Puri V. K. – Foundations for machines. Mc Graw Hill - 1987
7. Swami Saran – Analysis and Design of Foundations and Retaining Structures subjected to Seismic Loads, IK International Pub. – New Delfi - 2012



M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: SOIL STRUCTURE INTERACTION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4	60	40	25	0	125

A. DETAILED SYLLABUS

- Critical study of conventional methods of foundation design; Nature of complexities of soil structure interaction; Application of advanced techniques of analysis such as the finite element method, finite differences, relaxation and interaction for the evaluation of soil-structure interaction for different types of structures under various conditions of loading and subsoil characteristics;
- Preparation of comprehensive design-oriented computer programs for specific problems.
- Interaction problems based on the theory of sub-grade reaction such as beams, footings, rafts bulkheads etc, Analysis of different types of framed structures founded on stratified natural deposits with linear and non-linear stress-strain characteristics.
- Determination of axial and lateral pile capacities; group action of piles considering stress-strain characteristics of real soils.

B. RECOMMENDED TEXT / REFERENCE BOOKS

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|---|---|-----------------------|
| 1 | Analysis and design of foundation | - J. Bowles |
| 2 | Numerical Methods in Geotechnical Engg. | - Desai & Christian |
| 3 | Elastic Analysis of Soil Foundation Interaction | - A P S Selvadurai |
| 4 | Advanced Geotechnical Engineering | - C S Desai, M. Zaman |



M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: ELECTIVE PAPER -II

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	1	0	0	3	40	0	25	0	65

SUBJECT OPTIONS:

1. GEOPHYSICAL EXPLORATIONS

A. DETAILED SYLLABUS

1. Introduction,

An overview of geophysical methods of exploration; classification – major /minor; artificial / natural; applications and limitations, need for integrated surveys. Physical properties, rocks-density, susceptibility, resistivity and elastic wave velocities, factors controlling the properties, numerical values for important rock types, concept of physical property contrast. Role of geophysics in understanding the internal structure of the earth and plate tectonics.

2. Gravity Methods

Earth's gravity field, origin, variation with elevation and depth, temporal and transient variations, international gravity formula, geoid, spheroid. Principle of gravity exploration, concept of gravity anomaly; gravimeters, gravity surveys, reduction of data, free air, Bouguer and topographic correlations; concepts of regional and residuals; contamination and derivative maps. Quantitative interpretation of anomaly maps, identification of faults, folds and contacts, principles of quantitative interpretation with reference to spheres, cylinders and thin horizontal sheets; concepts of modeling and inversion.

3. Magnetic Methods

Earth's magnetic field, origin; magnetic elements, interrelationships, transient and temporal variations; IGRF; principle of magnetic method, origin of anomalies, induced and remanant magnetizations; magnetometers, proton precession and fluxgate; plan of magnetic surveys, reduction of data; anomaly maps, identification of structures; familiarization of magnetic anomalies over spheres, sheets and dykes; interpretation of magnetic anomalies of sheets and dykes. Airborne magnetometry, plan of surveying and presentation of results.

4. Electrical and Electromagnetic Methods

Self-potential method, origin of SP; resistivity method, concept of apparent resistivity, Werner, Schlumberger and Dipole-dipole configurations; electrical sounding, interpretation through curve matching, electrical profiling; elements of electromagnetic methods, in phase, out of phase components, identification of conductors from EM anomalies. Telluric and magneto methods, application in oil exploration.



5. Seismic Methods

Elastic propagation in rocks, Hooke's Law, acoustic impedance; Snell's Law, principles of seismic refraction method, travel time curves over horizontal interfaces and faults, interpretation of results; principles of seismic reflection method, travel time curves, over horizontal and dipping layers, interpretation; concept of RMS interval and average velocities; seismic data acquisition on land and sea, sub-bottom profilers, seismic sources, air gun, etc., processing of seismic reflection data, single channel and multi channel seismic data interpretation methods, pitfalls, seismic stratigraphy, velocity pull ups, bright spots etc., Technological advances in seismic data processing, modern survey techniques; GPS; reservoir characterization.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. M.B.R.Rao, (1993). Outlines of geophysical prospecting, English Book Depo, Dehradun.
 2. Radhakrishna Murthy, I.V., (1998). Gravity and magnetic interpretation in exploration geophysics. Geol. Soc. India, Bangalore.
 3. Jhon, Milsom (2003). Field Geophysics, 3rd Edn. John Wiley, London.
 4. Dobrin, M.B. and Savit, C.H. (1988). Introduction to geophysical prospecting, 4th Edn., McGraw Hill, New York.
 5. Saha, J. G. Seismic data processing manual, ONGC Pub. Dehradun.
 6. Coffeen, J.A. 1986. Seismic exploration fundamentals and seismic techniques for finding oil, 2nd Edn. Pennwell Pub. Co., Tulsa, Oklahoma.
 7. Domenico, S.N. 1983. Modern Seismic Exploration concepts. Tulsa, Oklahoma.
 8. Macquillin, R. Bacon, M.(eds). 1984. An introduction to seismic interpretation, reflection seismics in petroleum exploration, Grahmam, Trot.
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2. EARTH DAM ENGINEERING

A. DETAILED SYLLABUS

Factors influencing design of earthdams, types of earthdams, Control of pore pressure within the dam and foundation, critical study of earthdam failures, embankment settlement during and after construction, differential settlement and cracks, construction pore pressures and control, seepage analysis, various methods of construction of flownets, methods of foundation treatment, critical evaluation of methods of stability analysis, dams with impervious membranes of manufactured materials like reinforced concrete, steel plates and asphaltic concrete, embankment construction procedures, equipment, methods of quality control, measuring instruments, performance observations, aseismic design, slope protection, rockfill construction.



B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Sherrared - Earth Dam Engg.
2. Creager W. P. - Engineering for dams, Wiley, 1967.
3. Singh, B. - Earth and Rockfill dam, Sarita Prakashan, 1973.
4. Sowers G. I. - Earth and Rockfill dam engineering,
5. Earth Manual, - USBR Publication.
6. Arcold - Volume on earth and rockfill dams.
1. Sharma H. D., Embankment Dams, Oxford and IBH Pub., 1991.
2. Design of Small Dams, USDI, Oxford and IBH, 1976.

3. GROUND IMPROVEMENT TECHNIQUES

A. DETAILED SYLLABUS

Weak deposits- identification, problems associated with weak deposits, Mitchel chart for applicability of treatment methods

In situ compaction of cohesionless soil, injection grouting, soil stabilization, vibroflotation, reloading, sand drains, prefabricated vertical drains, stone columns, dynamic consolidation, blasting, compaction piles

Ground water control methods, diaphragm walls, well point system

Geo-reinforcement applications

Techniques for expansive soils, loess,

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Construction and Geotechnical Methods in Foundation Engg. – Koerner R. M.
2. Foundation Engineering in Difficult Subsoil Conditions - Zeevart L.
3. Foundation Engineering in Difficult Ground – Bell F. G.
4. Engg. Principles of Ground Modifications – Hausman M. R.
5. Earth Reinforcement and Soil Structure – Jones J E P.
6. An Intro. To Ground Improvement Engg. – Satyendra mittal



M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: REINFORCED EARTH AND GEOTEXTILES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	0	0	3	3	60	0	0	0	60

A. DETAILED SYLLABUS

Basic introduction to the elements of ground engineering characteristics of reinforcing materials, definition of reinforced and advantage of RE, Soil reinforcement interaction, behaviour of reinforced earth walls, basis of wall design, the coulomb force method, the rankine force method, internal and external stability condition, field application of RE, randomly reinforced earth and analysis of reinforced soils, testing of soil reinforcements.

Definitions, functions, properties and application of geotextiles, design of geotextile applications, definitions, functions, properties and application of geo membranes, design of geo membranes applications, geo textiles associated with geo membranes, testing on geo textiles, environmental efforts, ageing and weathering.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Reinforced Earth & Geotextiles : Koerner
2. Reinforced Earth & Geotextiles : G. V. Rao
3. Reinforced Soil and its Engg. Applications – Swami saran
4. An Intro. To Soil reinf. And Geosymthetics – G. L. Sivakumar Babu



M. TECH. SEMESTER – II (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: RESEARCH METHODOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	0	2	2	40	0	0	0	40

A. DETAILED SYLLABUS

1. 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
2. Effective literature studies approaches, analysis Plagiarism , Research ethics
3. Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee
4. Nature of Intellectual Property - Patents, Designs, Trademark 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.
5. Patent Rights - Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.
6. 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.

B. RECOMMENDED TEXT / REFERENCE BOOKS

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



M. TECH. SEMESTER –II (CIVIL-GEOTECHNICAL ENGINEERING)

SUBJECT: AUDIT COURSE – II: PEDAGOGIC STUDIES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	0	0	0	0	0	0	0	0

A. DETAILED SYLLABUS

1. 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.
2. Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.
3. 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.
4. Professional development: alignment with classroom practices and followup support Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes
5. Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

B. RECOMMENDED TEXT / REFERENCE BOOKS

1. Culture and pedagogy: International comparisons in primary education. - Alexander RJ
2. Read India: A mass scale, rapid, 'learning to read' campaign - Chavan M