

**Honours in Geotechnical Engineering (HC)**

S. No.	Course Code	Course Name	Semester	Credits	Course Type	Recommended Class Strength
1		Landfill Engineering (210)	V	3	Core	10 to 30
2		Earth Dams (210)	V	3	Core	10 to 30
3		Ground Improvement Techniques (210)	VI	3	Core	10 to 30
5		Earth Retaining Structures (210)	VI	3	Core	10 to 30
6		Soil Dynamics (300)	VII	3	Core	10 to 30
8		Advanced Foundation Design (210)	VIII	3	Core	10 to 30

*Noble*

*Sharma*

<b>UG/PG:</b> UG	<b>Department:</b> Civil Engineering
<b>Course Code:</b>	<b>Course Name:</b> Landfill Engineering
<b>Credit:</b> 3	<b>L-T-P:</b> 2-1-0
<b>Course Type:</b> HC	
<b>Pre-requisite Course:</b>	
<p><b>Syllabus</b></p> <p>Landfill method of solid waste disposal; Landfill classification, types, and methods; Principles and Planning of Landfill Soil geochemistry; contaminant transport; Leachate: Composition, formation, movement, and control of leachate in landfills Surface water management on landfills – drainage ditches; Environmental monitoring; Landfill operation, closure and post-closure Landfill gas: Composition and characteristics, Generation, movement and control of landfill gases Leachate control: liner systems, Geomembranes, CCL, GCL, Waste containment liner systems; leachate collection and removal; collection pipes, pumps, Landfill gas control: final cover systems; gas collection and management; extraction wells; manifold collection systems, condensate collection facilities, vacuum blower facilities, flaring facilities Geometric design: Base grades, Slopes, and berming, Costs, Construction aspects and Site Selection of Landfill Stability of Slopes and Settlement of Landfills Monitoring infrastructure: groundwater monitoring wells; perimeter drains, Bioreactor landfills; Hazardous waste landfills; Inactive waste disposal sites: site assessment and quantification of problem, Introduction to soil and groundwater remediation technologies; cut-off walls; Permeable reactive barriers</p> <p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. Sharma &amp; Reddy, "Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies", Wiley.</li> <li>2. Daniels, "Geotechnical Practice for Waste Disposal", Chapman and Hall</li> <li>3. Koerner, "Designing with Geosynthetics", Prentice Hall.</li> <li>4. Reddi and Inyang, "Geoenvironmental Engineering: Principles and Applications", Marcel Dekker Inc Publication</li> </ol>	

*Sharma*

*Moh*

<b>UG/PG:</b> UG	<b>Department:</b> Civil Engineering
<b>Course Code:</b>	<b>Course Name:</b> Earth Dams
<b>Credit:</b> 3	<b>L-T-P:</b> 2-1-0
<b>Course Type:</b> HC	
<b>Pre-requisite Course:</b>	
<p><b>Syllabus</b>  Permeability; seepage principles; flownet construction; filter and drain design; seepage control in earth dams and levees; foundation dewatering and drainage; slope stabilization with drainage; drainage for surface facilities; structural drainage; drainage for waste disposal facilities; performance monitoring and rehabilitation of seepage control measures; remedial seepage control; design of earth dams and berms; relief wells; pipelines crossing embankments; embankment instrumentation.</p> <p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. Cedergren, "Seepage, Drainage, and Flownets", Wiley-Interscience, 3rd Edition</li> <li>2. Reddy, "Seepage in Soils: Principles and Applications", Wiley</li> <li>3. Harr, "Groundwater and Seepage", Dover Publications</li> </ol>	

*Sharma*

*Mahil*

<b>UG/PG:</b> UG	<b>Department:</b> Civil Engineering
<b>Course Code:</b>	<b>Course Name:</b> Ground Improvement Techniques
<b>Credit:</b> 3	<b>L-T-P:</b> 2-1-0
<b>Course Type:</b> HA + HC	
<b>Pre-requisite Course:</b> Geotechnical Engineering - II	
<p><b>Syllabus</b></p> <p>Need for Ground Improvement, Different types of problematic soils, Emerging trends in ground Improvement, Shallow and deep compaction requirements, Principles and methods of soil compaction. Shallow compaction and methods, properties of compacted soil and compaction control, deep compaction and vibratory methods, dynamic compaction. Ground Improvement by drainage, Dewatering methods, Design of dewatering systems, Preloading, Vertical drains, vacuum consolidation, Electro-kinetic dewatering, design and construction methods. Cement stabilization and cement columns, Lime stabilization and lime columns, Stabilization using bitumen and emulsions, Stabilization using industrial wastes. Construction techniques and applications, Permeation grouting, compaction grouting, jet grouting, different varieties of grout materials, grouting under difficult conditions, Soil nailing, rock anchoring, micro-piles, design methods, construction techniques, Case studies of ground improvement projects. Soil Reinforcement and Geosynthetics, design principles and influencing factors, Use of geosynthetics for filtration, drainage, roads, and landfills.</p> <p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. Ground Improvement Techniques by Dr. P. Purushottam, Laxmi Publications, New Delhi</li> <li>2. Construction and Geotechnical methods in foundation engineering, by Koerner, MGH</li> <li>3. Engineering with Geo-synthetics, by GV Rao &amp; GVSS Raju, Tata McGraw Hill, New Delhi.</li> <li>4. G. Venkatappa Rao, "Geosynthetics an Introduction", Sai Master Geoenvironmental Pvt Ltd.</li> <li>5. Nainan P. Kurian, "An Introduction to Modern Techniques in Geotechnical and Foundation Engineering", Narosa Publishing House, New Delhi.</li> <li>6. G.L. Sivakumar Babu, "An Introduction to Soil Reinforcement and Geosynthetics", Universities Press (India) Pvt Ltd, Hyderabad, A.P, India.</li> </ol>	

*Sh*

*N*

<b>UG/PG:</b> UG	<b>Department:</b> Civil Engineering
<b>Course Code:</b>	<b>Course Name:</b> Earth Retaining Structures
<b>Credit:</b> 3	<b>L-T-P:</b> 2-1-0
<b>Course Type:</b> HC	
<b>Pre-requisite Course:</b>	
<p><b>Syllabus</b></p> <p>General design considerations; forces on walls; structure stability; foundation analyses; design and construction details and causes of unsatisfactory performance; flood walls; concrete gravity walls; cantilever reinforced concrete walls; alternate retaining walls; coffer dams: planning, layout, elements, geotechnical considerations, analysis and design, instrumentation and example problems; design of sheet pile walls: general considerations, geotechnical investigations, system loads and stability, structural design and analysis, construction and special design considerations; Soil and rock anchors; Braced excavations.</p> <p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. US Army Corps of Engineers, "Retaining and Flood Walls", USACE</li> <li>2. Brooks, "Basics of Retaining Wall Design: A Design Guide for Earth Retaining Structures", HBA Publications, 11th Edition</li> <li>3. Clayton, et al., "Earth Pressure and Earth Retaining Structures", CRC Press, 3rd Ed</li> <li>4. Markandaya, "The Cofferdams", Hamilton</li> <li>5. Anderson, "Underwater Construction using Cofferdams", Best Pub Co</li> <li>6. Lindahl, Warrington, "Sheet Pile Design by Pile Buck", Pile Buck</li> </ol>	

*Bh*

*Mahl*

<b>UG/PG:</b> UG	<b>Department:</b> Civil Engineering
<b>Course Code:</b>	<b>Course Name:</b> Soil Dynamics
<b>Credit:</b> 3	<b>L-T-P:</b> 3-0-0
<b>Course Type:</b> HC	
<b>Pre-requisite Course:</b>	
<p><b>Syllabus</b>  Introduction to soil dynamics; Seismology and earthquakes; Theory of Vibrations- Dynamics of discrete systems; Strong ground motion - Measurement, characterization and estimation; Seismic hazard analysis - DSHA &amp; PSHA; Dynamic soil properties - small and large strain; Wave propagation in elastic media; Ground response analysis; Soil-structure Interaction; Local site effects; Liquefaction of soil and its remediation.</p> <p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. S. L. Kramer, "Geotechnical Earthquake Engineering", PHI, 2006</li> <li>2. B. M. Das and G.V. Ramana, "Principles of Soil Dynamics", Cengage, 2<sup>nd</sup> Ed</li> <li>3. B. B. Prasad, "Fundamentals of Soil Dynamics and Earthquake Engineering", PHI, 2011</li> <li>4. I. Towhata, "Geotechnical Earthquake Engineering", Springer, 2008</li> <li>5. T. Kokusho, "Innovative Earthquake Soil Dynamics", CRC Press. 2018</li> </ol>	

*Shy*

*Mali*

<b>UG/PG:</b> UG	<b>Department:</b> Civil Engineering
<b>Course Code:</b>	<b>Course Name:</b> Advanced Foundation Design
<b>Credit:</b> 3	<b>L-T-P:</b> 2-1-0
<b>Course Type:</b> HB + HC + MC	
<b>Pre-requisite Course:</b> Geotechnical Engineering – II	
<p><b>Syllabus</b></p> <p>Introduction, Foundation Choice, Definitions, Requirements, Types of foundations, Shallow foundations, Types of failures, bearing capacity, Settlement analysis, Contact stress beneath foundations, Beams on elastic foundations, Modulus of subgrade reaction, Special foundations, Foundations in expansive soils (CNS concept), Underreamed pile foundations, Remedial measures for cracked buildings. Foundation of transmission line towers, Underpinning of foundations, Importance and situations for underpinning, methodology, Typical examples of underpinning, Pile Foundation, Bridge substructures, Maximum depth of scour, Depth of foundation, Allowable bearing pressure, loads to be considered, Well Foundation, Lateral stability of well foundation, Design of pier cap, Design of pier, Sinking stresses in wells, Design of well components, Reinforced earth.</p> <p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. A.P.S. Selvadurai, "Elastic Analysis of Soil-Foundation Interaction", Elsevier Scientific Publishing Company</li> <li>2. B. M. Das, "Principles of Foundation Engineering", PWS Publishing Company</li> <li>3. Joseph Bowles, "Foundation Analysis and Design", McGraw-Hill.</li> <li>4. V.N.S. Murthy, "Advanced Foundation Engineering", CBS Publishers and Distributors, New Delhi.</li> <li>5. Tomlinson, M.J. " Foundation Design and Construction", English Language Book Society, Longman.</li> <li>6. Swami Saran, "Analysis and Design of Substructures", Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.</li> </ol>	


