MASTER OF TECHNOLOGY (GEOTECHNICAL ENGINEERING)

Civil Engineering Department

Semester - I

Course Scheme

Course Code	Course Name	Lecture hours	Tutorial hours	Practical hours	Credit
CE215001	Advanced Soil Mechanics	3	1	0	4
CE215002	Geotechnics for Ground Modification	3	1	0	4
CE215003	Soil-Structure Interaction	3	1	0	4
CEXXXXX	Elective – I	3	0	0	3
CEXXXXX	Elective – II	3	0	0	3
	Total	**15**	**3**	**0**	**18**

Civil Engineering Department

Semester : I

<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">CE215001</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Advanced Soil Mechanics</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>IV</td><td>Prerequisite(If any forthe student)</td><td colspan="4">Soil Mechanics/Geotechnical Engineering</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">

Introduction
One and three dimensional consolidation theories and applications, Shear strength parameters of cohesion less and saturated cohesive soils, Principles of Effective stress condition, creep effect, introduction to soil constitutive modelling.
Mohr’s Circle and Stress paths
Stress-Strain relationship, failures states in soils, different stress paths with drainage and loading variation.
Consolidation and Shear Strength
Immediate and consolidation settlement evaluation, Estimation of Pre-consolidation pressure, Secondary consolidation, Effect of rate of stress on shear parameters, Skempton's Pore pressure coefficients, Effect of over consolidation on shear parameters.
Introduction to Critical State Soil Mechanics
Introduction to the elasto-plastic modeling of soils, Critical state concept. Behavior of normally/over consolidated clays, and loose/dense sands. Critical state and constant volume. Stress dilatancy.
Introduction to Unsaturated Soil Mechanics
Concept of unsaturated soil behavior, suction in soil, soil-water characteristics curve, applications of unsaturated soil mechanics.

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<tr><td>VI</td><td>Text/References</td><td colspan="4">

Knappett J. A. and Craig R. F., Craig’s Soil Mechanics, Spon Press, Taylor and Francis Group, New York.
Scott R. F., Principles of Soil Mechanics, Addison-Wesley Publishing Company, Inc., USA. 3. Das, B.M., Advanced Soil Mechanics, Cengage Learning
Gopal Ranjan & A.S.R. Rao, Basic and Applied Soil Mechanics, New Age Publishers
Murthy, V.N.S., Soil Mechanics and Foundation Engineering, CRC Press
Recent technical literature on related topics

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Semester : I

I	Course Code	**CE 215002**			
II	Course Title	**Geo technics for Ground Modification**			
III	Credit Structure	L	T	P	C
		3	1	0	4
IV	Prerequisite(If any forthe student)	Soil Mechanics/Geotechnical Engineering			
V	Course Content	• **Introduction -** Need for ground modification/improvement, State-of-the-art trends, Types of problematic soils, Classification and selection of ground modification methods. • **Mechanical modification -** Principles and methods of soil compaction, In-situ shallow compaction, Properties of compacted soil and compaction control, Deep compaction methods – dynamic compaction, blasting, vibro-compaction, vibro-replacement, stone columns. • **Hydraulic modification -** Preloading, Vertical drains, Vacuum consolidation, Dewatering methods, Electro-kinetic dewatering. • **Physical and Chemical Modification -** Admixtures, Grouting, Thermal modifications. • **Other Innovative methods -** Overview of ground improvement by inclusions and confinement. Ground improvement case studies.			
VI	Text/References	1. D.T. Bergado, L.R. Anderson, N. Muira and A.S. Balasubramaniam, Soft Ground Improvement in Low Land and Other Environment, ASCE Press. 2. M.P. Mosely and K. Kirsch, Ground Improvement, Spon Press. 3. Manfred R. Hausmann, Engineering Principles of Ground Modification, McGraw-Hill. 4. N.R. Patra, Ground Improvement Techniques, Vikas Publishing. 5. P. Purushothama Raj, Ground Improvement Techniques, Laxmi Publications. 6. P.G. Nicholson, Soil Improvement and Ground Modification Methods, Elsevier. 7. P.P. Xanthakos, L.W. Abramson and D.A. Bruce, Ground Control and Improvement, John Wiley and Sons.			
VII	Any other Remarks				

Civil Engineering Department

Semester : I

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<tr><td>I</td><td>Course Code</td><td colspan="4">CE 215003</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Soil Structure Interaction</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>IV</td><td>Prerequisite(If any forthe student)</td><td colspan="4">Soil Mechanics/Geotechnical Engineering</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">

Introduction to Soil-structure interaction:
Importance of soil-structure interaction, factors affecting soil-structure interaction, examples of soilstructure interaction problems, concept of rigid and flexible foundations, contact pressure, settlement and differential settlement, theory of modulus of subgrade reaction
Soil-structure interaction problems
Soil-rigid foundation interaction in clay and sand, soil-flexible foundation interaction in clay and sand, soil-pile interaction, soil-piled-raft interaction, earth pressure distribution on rigid wall, reinforced earth structure and sheet pile, braced excavation, arching in soil, analysis of rigid and flexible conduits, soilfoundation interaction for special structures such as tanks, chimneys and silos
Soil-structure interaction models
Winkler’s model, beams and plates on elastic foundation, elastic continuum models, finite difference and finite element solutions for soil-structure interaction problems, laterally loaded piles supported on elastic medium
Dynamic soil-structure interaction
Vibration of single and multiple degree of freedom systems, dynamic soil properties, wave propagation mechanism, seismic soil-foundation-structure interaction, examples of dynamic soilstructure interaction problems, numerical modelling of dynamic soil-structure interaction
Recent advancements Recent research advancements in soil structure interaction studies

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<tr><td>VI</td><td>Text/References</td><td colspan="4">

Bowles, J. E., Foundation Analysis and Design, McGraw Hill International Ed.
Desai C. S. and Christian J. T., Numerical Methods in Geotechnical Engineering, McGraw Hill Book Co. New York.
Wolf J. P, Dynamic Soil structure interaction, Prentice – Hall
Potts D. M and Zdravkovic L., Finite Element Analysis in Geotechnical Engineering: Theory, Thomas Telford Publishers, London.
Potts D. M and Zdravkovic L., Finite Element Analysis in Geotechnical

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		Engineering: Application, Thomas Telford Publishers, London. 6. Das, B.M., Principles of Foundation Engineering, Cengage Learning 7. Tomlinson M and Woodword J, Pile Design and Construction Practice, Taylor and Francis 8. Das, B. M. and Ramana, G. V, Principles of Soil Dynamics, Cengage Learning 8. Gopal Ranjan & A.S.R. Rao, Basic and Applied Soil Mechanics, New Age Publishers 9. Recent technical literature on related topics
VII	Any other Remarks	