

**Advanced Soil Mechanics**
**OMGT102 (PC)**

**Objective of the Course:** Objectives of introducing this subject at first year level in Masters of civil engineering are:

- To understand the engineering properties of soil and identify the problematic soils
- To evaluate the soil shear strength for different types of soil and in different conditions of weather
- To analyse the soil behavior under loading and the stresses developed within soil mass for saturated and unsaturated conditions
- To apply the knowledge of soil compressibility and consolidation theory in practice to estimate settlement

**Credit Earned:5**

**Students learning outcomes:**

After successful completion of the course it is expected that student will be able to..

1. Identify the type of soil and understand the numerical value-ranges of its engineering properties
2. Analyse the stresses produced in the soil for given foundation shape and soil type
3. Analyse and compute the soil settlement for given structure and soil conditions
4. Apply the knowledge of consolidation theories and accelerate the consolidation process for quick construction
5. Analyse the seepage through hydraulic structures

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (M)	Internal (I)	Viva (V)	Term Work (TW)	
4	0	2	5	50	30	20	25	25	150

**Detailed Syllabus**

Sr No.	Title of the unit	Number of hours
<b>1</b>	<b>Fundamentals of soil mechanics</b>	
	Soil origin and types based on formation, Soil index properties,	1
	Soil classification	2
	Engineering properties of soil: strength and compressibility, permeability, CBR, OMC/MDD relationship	4
<b>2</b>	<b>Soil stresses and deformation</b>	
	Idealization of soil as an elastic material	1
	Normal, shear and principal stresses in soils	2
	Mhor's circle of stresses for various failure conditions of soil	2
	Stress due to various types of loading & shapes of footing	2
	effects of anisotropy on the soil Stresses	1
<b>3</b>	<b>Soil shear strength</b>	
	Soil shear strength parameters and its evaluation under different drainage conditions, Triaxial UU,CU,CDtest, stress path	5
	Shear strength of various types of soils,	2
	Pore pressure measurement for saturated and unsaturated soils	3
	Effect of anisotropy on shear strength	1
<b>4</b>	<b>Soil compressibility and consolidation</b>	
	Determination of Cv for NC & OC soils	3
	Radial consolidation	2
	Estimation of settlement	4
	Methods of accelerating consolidation settlement	2
<b>5</b>	<b>Fluid flow in soil</b>	
	Clay structures and packing models in granular materials	1
	Laplace equation for fluid flow through soil in 2D & 3D	2
	Flow nets & its applications	1
	Permeability and seepage in anisotropic and non homogenous medium	2
	Quick sand & piping	1

**Suggested lists of experiments**

1. Basics tests of consistency and sieve analysis for classification
2. Filed identification of soil
3. Co-efficient of permeability for layered soil
4. Triaxial test CD, CU & UU test
5. Unconfined compression test
6. Direct shear test
7. Consolidation test

**Suggested Theory Distribution**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	15%	10%	35%	20%	10%

**Instructional Method and Pedagogy:**

1. Use of Learning Management system like canvas
2. Demonstration through ppt and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

**Recommended Study Material:****Reference Book:**

1. Das, B.M. (2008). Advanced Soil Mechanics. Taylor and Francis Group, London, Second edition
2. Terzaghi, K., Peck, R.B. and Mesri, G. (1996). Soil Mechanics in Engineering Practice.
3. Helwany, S. (2007). Applied Soil Mechanics with ABAQUS Applications, John Wiley & Sons, INC, New Jersey, USA.
4. Wood, D.W. (2004). Geotechnical Modelling. Spon Press, Taylor and Francis Group, London, First edition.
5. Powrie, W. (2002). Soil Mechanics concepts and applications. Spon Press, Taylor and Francis Group, London, Second edition.
6. Alam Singh, Modern Geotechnical Engineering, Env. Geo.Acadamica
7. Debashis Moitra Geotechnical engineering, University press
8. B.C.Punamiya Soil mechanics & foundation engineering, Laxmi publications

**Web Resources****Advanced Geotechnical engineering NPTEL course:**

[http://nptel.ac.in/courses/nptel\\_download.php?subjectid=105101001](http://nptel.ac.in/courses/nptel_download.php?subjectid=105101001)

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