



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Institute of Technology  
Semester-4 (Diploma)

**Subject:** Geotechnical Engineering - DETCV14209

**Type of course:** Major core

**Prerequisite:** Knowledge of Basic Sciences, Strength of Materials, Basic Geology

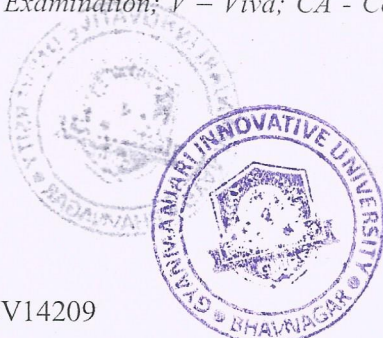
**Rationale:**

The study of geotechnical engineering is essential for determining different soil properties both empirically and conceptually using the laws of mechanics. Any civil engineering construction needs a solid foundation, which is dependent on knowing the characteristics and behavior of the soil as well as identifying soil strains and settlements, among other things. A solid foundation system design for any kind of infrastructure project requires a full understanding of geotechnical engineering and its ramifications. Understanding geotechnical engineering will help students transition into numerous other civil engineering programs by enabling them to engage with this subject in multidisciplinary contexts.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*





**Course Content:**

Sr. No	Course Content	Hrs.	% Weightage
1	<b>Introduction to Index Properties &amp; Interrelationship</b> Discuss soil formation cycle & general characteristics of soil. List structures where soil is used as Construction material. Describe soil-formation in Geological cycle. State the types of failures due to soil in Civil Engineering structure. Explain phase diagram of Soil. Discuss various index properties of soil for the purpose of their classification & Use. Describe interrelationship between different index properties.	10	25
2	<b>Soil Classification and its Compaction</b> Discuss methods of Classification. Describe method of I.S. Classification of Soil. Classify Soil based on Consistency Limits. Comprehend the principle and methods of compaction of soil. Differentiate between compaction and consolidation with examples. Determine MDD & OMC of soil by conducting appropriate tests.	10	30
3	<b>Permeability &amp; Seepage</b> Explain the concept of permeability & its implications with respect to use of soil. Determine 'permeability' of given soil. Comprehend the concept of Seepage Analysis in relation to 'quick sand condition' with examples.	10	15
4	<b>Shear Strength &amp; Bearing Capacity of soil</b> Explain different terms used in the context of 'shear strength' of soil. Evaluate shear parameters of various types of soil, with their practical significance. Explain the concept of bearing capacity of soil. Describe various methods to determine bearing capacity of soil. Explain the concept & occurrence mechanism effect of 'Liquefaction' of soil.	10	20
5	<b>Soil Investigation &amp; Its Exploration</b> Discuss various methods & appropriate use for investigation & exploration of soil.	5	10





**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1	<b>Calculations based on Soil Index Properties &amp; its Interrelationship:</b> For soil samples derive the relation between terms and solve one numerical based on each derivation. Write down the derivations & numerical based on it, in file pages and upload it on GMIU Web Portal.	10
2	<b>Evaluation based on methods of compaction of soil:</b> Solve ten numericals based on OMC and MDD, Coefficient of Curvature, Uniformity Coefficient, Plasticity Index, Liquidity Index and Consistency Index. Write down the numerical in file pages and upload it on GMIU Web Portal.	10
3	<b>PowerPoint presentation on concepts of Bearing capacity of soil:</b> Prepare a PPT on any topic related to: Understanding the concept of Determining the Bearing capacity of soil using various methods and upload it on GMIU Web Portal.	10
Total		30

**Suggested Specification table with Marks (Theory):60**

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	10%	30%	30%	30%	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table





**Course Outcome:**

After learning the course, the students should be able to:	
CO1	Explain various engineering properties of soil with respect to construction and engineering applications
CO2	Conduct different laboratory tests for determining engineering properties of a soil.
CO3	Evaluate engineering properties of soil for their suitability to construction of engineering structures.
CO4	Compute bearing capacity of soil and earth pressure and interpret results.
CO5	Clarify essential features and requirements of site investigation with respect to soil.

**List of Practical: -**

Sr. No	Descriptions	Unit No	Hrs.
1	Determine field moisture content of soil.	1	02
2	Determine bulk density and dry density of soil by core cutter method.	1	04
3	Determine specific gravity of sand by pycnometer	1	02
4	Determine bulk density and dry density of soil by sand replacement method.	1	04
5	Conduct Sieve analysis of given soil for its classification.	1	04
6	Determine consistency Limits i.e. Liquid limit, Plastic limit, Shrinkage limit.	1	04
7	Determine OMC and MDD by Proctor Test	1	04
8	Determine shear parameters of soil by box shear test.	3	02
9	Determine permeability of soil by constant head method.	3	02
10	Determine permeability of soil by falling head method	3	02



The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

[1] Soil Mechanics & Foundation Dr. B C Punamia Standard Book House.  
[2] Modern Geo Technical Engineering Dr. Alam singh Jodhpur University.  
[3] Textbook of Soil Mechanics & Foundation Engineering V N S Murthy UBS Publisher.  
[4] Soil Sampling & Testing Manual Dr A K Duggal NITTTR ,Chandigarh.

