



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 18.01.2021

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

Course No	: CE F243
Course Title	: Soil Mechanics
Instructor-in-Charge	: NISHANT ROY
Lecture Instructor	: Nishant Roy
Tutorial Instructors	: Nishant Roy, Anuj Adhikary
Practical Instructors	: Nishant Roy, Kamalesh Kumar, Ankit Singh Mehra, Raghavendra K Raya, Anuj Adhikary, Danish Fayaz

1. Course Description: Soil Formation and Composition, Index Properties, Soil Classification, Soil Structure, Compaction, Effective Stress, Permeability, Seepage, Stress due to Applied Load, Consolidation, Shear Strength, Settlement Analysis, Soil Exploration, Important Case Histories, Software for Geotechnical Analysis

2. Scope and Objective of the Course: Soil Mechanics deals with the study of soil as foundation/construction material, its behavior and engineering properties under stresses. The present course is intended to cover the most essential aspects of soil as an engineering material. The fundamental concepts in soil mechanics will be presented and their application to the analysis and design of various geotechnical structures will be highlighted.

On successful completion of the course, the student will be able to:

- Develop a fundamental understanding of the behavior of the soil
- Understand the procedure for the characterization of soil
- Appreciate the importance of effective stress principle and its application for the stability assessment of Geotechnical Structures
- Appreciate the role of compaction in earthwork for highways, railways, airports and other retaining structures
- Assess the rate of flow of water through soil and its implication on the stability of the infrastructure
- Assess the magnitude and the rate of consolidation settlement
- Compute the shear strength of soil
- Develop the skill-sets required to take up further study in Geotechnical Engineering

3. Text Books:

T1. Muni Budhu. "Soil Mechanics and Foundation", Third Edition, Wiley India, 2016.

T2. Gopal Ranjan, and A. S. R. Rao. "Basic and Applied Soil Mechanics", New Age International Publishers, 3rd Edition, 2016.

4. Reference Books:

R1. J.A. Knappett and R.F. Craig. "Craig's Soil Mechanics", CRC Press, 8th Edition, 2012.



5. Course Plan:

Module No.	Lecture Session	Reference	Learning outcomes
	Introduction to the Course	Lecture Notes/PPT	General idea of the course
I: Soil Formation and Composition	Formation and Types of Soil, Soil Distribution in India	T1, T2	Geological origin and soil formation, soil deposits of India
II: Index Properties and Soil Classification	Constituents of Soil, Three Phase and Two Phase System, Grain Size Distribution, Coarse Grained and Fine Grained Soil, Influence of Water on Soil Behavior	T1, T2, PPT	Phase diagram and index properties of soils, Different soil classification systems
III: Soil Structure		T1, T2	Soil structure and fabric, clay mineral and behavior of soil
IV: Compaction	Importance of Soil Compaction, Proctor Compaction, Field Compaction, Quality Control Tests	T1, T2, PPT	Laboratory and field compaction
V: Effective Stress	Effective Stress Principle, Total Stress, Pore Pressure, Effective Stress, Capillarity	T1, T2, PPT	Effective stress principle, total and effective stress
VI: Permeability and Seepage	Darcy's law, Permeability Tests, Seepage, Flow Net Analysis, Quick Condition	T1, T2, PPT	Darcy's law, permeability of soil and its measurement, Seepage forces, flow net, and filter design
VII: Stress due to Applied Load	Stress Distribution due to Applied Load	T1, T2, PPT	Boussinesq equations, Newmark chart, and Westergaard's equation
VIII: Consolidation and Settlement Analysis	One-dimensional consolidation, settlement, rate of consolidation, laboratory and field consolidation, Vertical drains	T1, T2, PPT	Components of total settlement, compressibility, Terzaghi theory of consolidation, consolidation test, settlement computation, Components of settlement, immediate settlement, secondary consolidation settlement, vertical sand drains
IX: Shear Strength	Shear Stress, Drained and Undrained Shear Strength, Mohr-Coulomb, Laboratory Tests	T1, T2, PPT	Stress at a point, coulomb equation of shear strength, shear strength measurement, shear strength of clays and sands, p-q diagram, pore pressure parameters
X: Soil Exploration	Soil Investigations and Reports	T1, T2	Open excavation, boring, subsurface sounding, geophysical methods



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6. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of component (Close Book/ Open Book)
Mid-Semester Test	90 Min.	30	<TEST_1>	Open Book
Comprehensive Examination	3 h	40	<TEST_C>	Open Book
Tutorials		20		Open Book
Laboratory Work (Quiz)		10		Open Book

7. Chamber Consultation Hour: Saturday (10-11 am)

8. Notices: Notices, if any, will be communicated by e-mail.

9. Make-up Policy: Genuine cases will be considered provided it is intimated before the examination.

10. Note (if any):

Instructor-in-charge
Course No. CE F243