ENSC-207: MINERAL RESOURCES & ENVIRONMENTAL SUSTAINABILITY (THEORY) (02 Credit hrs)

PRE-REQUISITE: ENSC-

LEARNING OUTCOMES

- This course will provide an introduction to the Soil to the students.
- The students will learn about the Soil and Rock Mechanics.
- They will have the knowledge about the Geological and Engineering Classification of Soil..
- The students will get used to the design of foundation of Dams, Highways and Civil Structures.

CONTENTS

Unit-I: Sieve Analysis

1.1. Introduction and Definition of Soil
1.2. Function of Soil
1.3. Soil Profile
1.4. Soil Horizons
1.5. Compaction, Permeability and Capillarity of Soil
1.6. Stress and Stress Distribution of Soil, Consolidation and Consolidation Settlement.

Unit-II: Soil properties

2.1. Soil Colors
2.2. Soil Processes
2.3. Composition of Soils
2.4. Soil Formation
2.5. Shear Strength of Soil, Laboratory Measurements of Soil Properties,

Unit-III: Soil and its role

3.1. Soil Fertility
3.2. Physical Properties of Soil
3.3. Soil Moisture
3.4. Soil Gas
3.5. Bearing Capacity of Soils, Shallow and Pile Foundation

Unit-IV: Soil Chemistry

4.1. Soil Matrix
4.2. Soil Chemistry
4.3. Soil Nutrients
4.4. Soil Organic Matter
4.5. Soil Improvement, Embankment Dams, Dynamic Loading of Soil

Unit-V: Soil types and movement

5.1. Soil Classification
5.2. Soil Uses
5.3. Soil Degradation
5.4. Soil Reclamation
5.5. Environmental Geotechnology

Unit-VI: Soil pollution

6.1. Soil Pollution
6.2. Geological Classification of Soil
6.3. Soil Structure
6.4. Soil Texture

Unit-VII: Rocks and soils

7.1. Rocks as an Aggregates
7.2. Description and Classification of Aggregates
7.3. Occurrences and Associations of Sources,
7.4. Field Investigation of Deposits.

Unit-VIII: Soil aggregates

1.1. Extraction of Aggregates
1.2. Sampling and Testing of Aggregates
1.3. Aggregates for Concrete
1.4. Processing of Aggregates
1.5. Environmental Issues related to Aggregates

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Sani, G.(2021) *Recycled Aggregates; Materials and Uses,* Nova Science Publishers.
2. Kumar, R., Kumar, R., and Kumar, S. (2017) *Rock as Construction Material,* Haldia Institute of Technology, India.
3. Brady, N.C. and Weil, R.R. (2013) *The Nature and Properties of Soils,* Dorling Kindersley, 14th Edition, India, pp.1-194.
4. Reddy, R.N. (2010) *Soil Engineering*: Testing, Design and Remediation, Gene-Tech Books, New Delhi, pp.1-271.
5. Raj, P.P (2009) *Soil Mechanics and Foundation Engineering*, Dorling Kindersley, India, pp.1-797.

ENSC-207: MINERAL RESOURCES & ENVIRONMENTAL SUSTAINABILITY (PRACTICAL) (01 Credit hrs)

PRE-REQUISITE: ENSC-111

LEARNING OUTCOMES

- This course will provide an introduction to the Laboratory Test of Soil to the students.
- The students will learn about the Gradation and Density of the Soil.
- They will have the knowledge about the Engineering Test of Soil..
- The students will get used to the design of foundation of Dams, Highways and Civil Structures.

CONTENTS

Unit-I: Sieve Analysis of Soil

1.1. Definition and Apparatus of Sieve Analysis
1.2. Procedure, Results, Methods of Sieve Analysis
1.3. Types of Gradation, Types of Sieves
1.4. Limitations of Sieve Analysis, Properties and Engineering Applications of Sieve Analysis

Unit-II: Moisture Content Test of Soil

2.1. Definition and Apparatus of Moisture Content Test
2.2. Procedure, Results, Methods of Moisture Content Test
2.3. Measurements, Classification and Uses in Aggregates

Unit-III: Organic Content Test of Soil

3.1. Definition and Apparatus of Organic Content Test
3.2. Procedure, Results, Methods of Organic Content Test
3.3. Soil Organic Matter, Sources, Composition of Vegetal Detritus Decomposition
3.4. Humus and Function in Carbon Cycling

Unit-IV: Specific Gravity and Water Absorption Test of Soil

4.1. Definition and Apparatus of Specific Gravity and Water Absorption Test
4.2. Procedure, Results, Methods of Specific Gravity and Water Absorption Test

Unit-V: Liquid Limit Test of Soil

5.1. Definition and Apparatus of Liquid Limit Test
5.2. Procedure, Results, Methods of Liquid Limit Test

Unit-VI: Plastic Limit Test of Soil

6.1. Definition and Apparatus of Plastic Limit Test
6.2. Procedure, Results, Methods of Plastic Limit Test

Unit-VII: Modified AASHTO Soil Density Test

7.1. Definition and Apparatus of Modified AASHTO Soil Density Test
7.2. Procedure, Results, Methods of Modified AASHTO Soil Density Test
7.3. History and Theory of Soil Compaction
7.4. Comparison of Tests, Alternative Compaction Testing

Unit-VIII: Sand Replacement Method

8.1. Definition and Apparatus of Sand Replacement Method
8.2. Procedure, Results, Methods of Sand Replacement Method

Unit-IX: Core Cutter Method

9.1. Definition and Apparatus of Core Cutter Method
9.2. Procedure, Results, Methods of Core Cutter Method

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
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RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Mir, B.A.(2021) *Manual of Geotechnical Laboratory Soil Testing*, CRC Press, India.
2. Monnet, J. (2015) *In Situ Tests in Geotechnical Engineering*, Wiley, pp.1-398.