Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NGLD509	Geotechnical Engineering	3	0	0	3

Course Objective

The student will gain a brief knowledge for the application of various aspects of geotechniques related to settlements, energy and natural resources and environment.

Learning Outcomes

Upon completion of the course, students will be able to:

- Classify various kinds of geological strata in geotechnical purview.
- Apply the geotechnical concepts in various field related to infrastructures and developments.
- Identify problems related to geotechnical aspects in energy sectors and environment fields.
- Determine expected loads and design and evaluate anchoring systems

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	**Geotechnical Engineering**: Introduction, definition and phase relations	3	Introduction to Geotechnical Engineering
2.	**Geotechnical ground and construction materials:** Needs, parameters, types of ground, types of materials, parameters, testing, cement-aggregates reactions.	4	Learn about ground and construction materials
3.	**Water–rock interaction**: weathering indices, durability indices, and chemical reactions.	3	Learn about water-rock interaction
4.	**Geotechnical investigations for settlements and groundfoundation interaction:** Identification of sites, new alignments, parameters, ground- foundation interaction, differential settlement.	5	Learn about identifying sites for engineering constructions
5.	**Underground spaces and ground control problems:** definition, elements, parameters, and classification, geotechnical investigation, types of ground, geotechnical problems, subsidence, convergence, etc	4	Learn about underground space
6.	**Loads and anchoring of strata**: parameters, methods, grouting, bolting, wire meshing, etc.	3	Learn about anchoring of strata
7.	**Geotechniques of cold region:** characteristics and behaviour of ground, ground control problems, and mitigation measures	3	Cold region geotechnical engineering
8.	**Geotechnical aspects of resources:** mineral and water exploration and extraction.	3	Learn about geotechnical aspects of resources
9.	**Energy Geotechniques:** Geothermal energy, fuels, Coal Bed Methane (CBM) exploration and extraction, hydropower.	4	Learn about energy geotechniques
10.	**Environmental Geotechniques:** types of waste, carbon dioxide sequestration, geotechnical application in waste management, natural hazards,	4	Learn about environment geotechniques
11.	**Rivers and Quaternary Geotechniques**: land forms,neotectonics, river hydraulics and associate problems, geotechnical applications	3	Learn about rivers and Quaternary geotechniques
12.	**Shoreline geotechniques:** Erosion, shore dynamics, geotechnical condition of ground, problems, shore stability, design and mitigation measures	3	Learn about shoreline geotechniques
	Total Classes	42	

Text Books:

1. Rahm, P.H (1985). Engineering Geology. An Environmental Approach, Elsevier, XI.
2. Jaeger, J.C. and Cook, N.G.W. (1986). Fundamentals of Rock Mechanics. 2nd Ed, John Wiley and Sons.

Reference Books:

1. Gripps, J.C.et al., (1993). Engineering Geology of Weak Rocks. Geol. Soc. London, A.A Balkema.
2. Hudson, J.A. and Harrison, J. (2000). Engineering Rock mechanics: an introduction to the principles, Elsevier .
3. Dentefratta, et al., (2017). Introduction to soil mechanics Laboratory testing, CRC Press.
4. Blinderman, M and Klimenko, A (2017). Underground coal gasification and combustion, Woodhead Pbl.