Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NCEC537	Geoenvironmental Engineering	3	1	0	4

Course Objective

The course deals with the behavior of soils, rocks and groundwater when they interact with contaminants and addresses problems of waste management, Land fill & tailing storage facilities.

Characterization and management of Industrial wastes as a sustainable geomaterial for development.

Learning Outcomes

Upon successful completion of this course, the students should be able to know:

- Various geoenvironmental problems, Fundamental background needed to understand and address geoenvironmental problems,
- Management of wastes through engineered landfills and impoundments,
- Siting ,Design & operation & closure of tailing storage facilities
- Beneficial use of waste and recycled materials

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1.	Geoenvironmental Problems and Geoenvironmental Engineering	3L+1T	Need of Geoenvironmental Engineering
2.	Fundamental Background Needed for Geoenvironmental Engineering; Geotechnical properties, Flow through porous media, contaminant transport.	6L+2T	Basic backgrounds on Geoenvironmental, relevant soil properties, geochemistry and contaminant transport
3.	Site Remediation: Contaminated Site Characterization, Risk Assessment and Remedial Strategy.	7L+2T	Characterization and Risk assessment techniques for contaminated site and its remediation.
4.	Landfills and Impoundments: Waste Characterization and Properties: Landfill impoundments and their analysis and design. (i) Tailing storage facilities, (ii) Liner Systems, Leachate Collection/Removal Systems. (iii) Final Cover Systems	11L+4T	Types of on surface impoundments, tailing storage facilities. Analysis and design of different components.
5.	Towards Sustainable Development: Beneficial Use of Waste/Recycled Materials, End Use of Closed Landfill Sites, Green and Sustainable Remediation	6L+2T	Characterization of different wastes for its reuse. Rehabilitation of contaminated sites.
6.	Special Topics: Sustainable used of Mining and Industrial wastes;	4L+1T	Case studies on reuse of mining and industrial wastes and monitoring.
7.	Special Topics: Siting, Design & operation & closure of tailing storage facilities.	5L+2T	With examples and computer analysis
Total Contact hours		**42L+14T**	

Text Books:

1. Sharma, H.D., and Reddy, K.R., (2004) Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies, John Wiley & Sons, Inc. New Jersey, 992p. (ISBN: 0-471-21599-6).
2. J. K. Mitchell and K, Soga (2005), Fundamentals of Soil Behavior, John Wiley and Sons, New Jersey, USA.

Reference Books:

1. Mohamed, A.M.O., Paleologos, E.K., Singh, D.N. and Guimarães, V. (2017) Fundamentals of Geoenvironmental Engineering: Understanding Soil, Water, and Pollutant Interaction and Transport, Butterworth-Heinemann.
2. Global Industry Standard for Tailing Management (2020) International Council on Mining & Metals