Marwadi University

Master of Technology

Geotechnical Engineering

Environmental Geotechnique
01GT1301 (PEC)

Objective of the Course: Objectives of introducing this subject at second year level in Masters of civil engineering are:

1. Explain the effects of pollutants in soil properties
2. Awareness about the adverse effects of soil and ground water contaminants
3. Analyse and apply the various techniques for remediation of the contaminants

Credits Earned: 3

Students learning outcomes:

After the successful completion of the course student will be able to..

1. Analyse the soil contamination concentration and type
2. Monitor and analyse quality of ground water
3. Suggest the steps to remediation of soil and groundwater
4. Design the landfill site

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (M)	Internal (I)	Viva (V)	Term Work (TW)	
3	0	0	3	50	20	30	25	25	150

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Detailed Syllabus

Sr No.	Title of the unit	Number of hours
1	**Soil Contamination and its movement**	**8**
	Introduction to Geo environmental engineering sources, production and classification of waste factors governing soil-pollutant interaction Contaminant transport in sub surface : advection, diffusion, dispersion, governing equations	
2	**Groundwater contamination**	**10**
	Water quality standards , Sources of contamination, Hydro chemical behavior of contaminants - Trace metals - Trace nonmetals - Nitrogen, organic substances - Measurement of parameters - Velocity - Dispersivity - chemical partitioning	
3	**Remediation of contaminants from soil and Ground water**	**8**
	contaminant transformation: sorption, biodegradation, ion exchange, precipitation, exsitu and insitu remediation – solidification, bio–remediation, soil washing, electro kinetics, soil heating, verification, bio venting, Ground water remediation – pump and treat, air sparging, reactive well.	
4	**Solid waste disposal and stabilization**	**8**
	Hazardous waste control and storage system, mechanism of Stabilization, incineration, organic and inorganic stabilization reutilization of solid waste for soil improvement.	
5	**Engineered landfill**	**8**
	Site selection, dumping, Design of landfill: CNS layer, lechate and air collection units, Case studies	

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	15%	15%	30%	20%	15%

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through ppt and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

Recommended Study Material:

Reference Books:

1. Zheng C., "Applied Contaminant Transport Modeling", John Wiley & sons, First edition
2. Daniel, B.E., Geotechnical Practice for waste disposal, Chapman and Hall, London, 1993.
3. Fried, J.J., Ground Water Pollution, Elsevier, 1975.
4. Wentz, C.A., Hazardous Waste Management, McGraw Hill, Singapore, 1989.
5. Hsai-Yang Fang, "Introduction to Environmental Geotechnology", CRC Press, New York
6. Proceedings of the International symposium of Environmental Geotechnology (Vol.I and II), Environmental Publishing Company, 1986 and 1989.

Web Resources:

1. *nptel.ac.in/courses/105103025/*
2. *nptel.ac.in/courses/105999901/*
3. https://onlinecourses.nptel.ac.in/noc17_ce27/preview

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