

Course Code	Course Name	L-T-P-Credits	Year of Introduction
CE465	GEO-ENVIRONMENTAL ENGINEERING	3-0-0-3	2016

Pre-requisite: CE 305 Geotechnical Engineering- II

Course objectives:

- To create a awareness in the field of Geo-Environmental Engineering
- To impart the knowledge on Geotechnical aspects in the disposal of waste materials and the remediation of contaminated sites
- To familiarise design of landfill and know the effect of change in environment on soil properties.

Syllabus :

Introduction and Soil-water-environment interaction, Geotechnical applications of waste materials, Geotechnical characterization of waste and disposal, Site characterization, Landfill Components its functions and design, Compacted clay liner, selection of soil, methodology of construction, Geosynthetics in landfill- types and functions, geosynthetic clay liners - Leachate and Gas Management, Soil remediation, Investigation of contaminated soil, insitu/exiture mediations, bio remediation, thermal remediation, pump and treat method, phyto remediation and electro kinetic remediation, Leachate disposal and Post closure of landfill, Variation in properties of soil due to change in environment

Expected Outcomes:

The students will be able to:

- i. Deal with geoenvironmental engineering problems
- ii. Utilize waste in Geotechnical applications
- iii. Design Landfill
- iv. Mange leachate and landfill gas
- v. Do investigation on contaminated site and soil remediation
- vi. Assess variation in engineering properties of soil due to change in environment

Text Books / References

1. Daniel, D.E. (1993). Geotechnical Practice for Waste Disposal. Chapman, and Hall, London.
2. Koerner, R.M. (2005). Designing with Geosynthetics. Fifth Edition. Prentice Hall, New Jersey.
3. Reddi L.N and Inyang HI (2000) Geoenvironmental Engineering: Principles and Applications, Marcel Dekker Inc Publication
4. R. N. Yong (2000) Geoenvironmental Engineering: Contaminated Soils, Pollutant Fate, Mitigation Lewis Publication.
5. Dr. G V Rao and Dr. R S Sasidhar (2009) Solid waste Management and Engineered Landfills, Saimaster Geoenvironmental Services Pvt. Ltd. Publication.
6. Ayyar TSR (2000) Soil engineering in relation to environment, LBS centre for Science and Technology, Trivandrum.
7. Hari D. Sharma, Krishna R. Reddy (2004) Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies, Publisher: John Wiley & Sons Inc.
8. Donald L. Wise, Debra J. Trantolo, Hilary I. Inyang, Edward J. Cichon (2000) Remediation Engineering of Contaminated Soils, Publisher: Marcel Dekker Inc.

COURSE PLAN			
Module	Contents	Hours	Sem. Exam Marks %
I	Introduction and Soil-water-environment interaction : Introduction to geoenvironmental Engineering, Soil-water-environment interaction relating to geotechnical problems, Waste:-source, classification and management of waste, Physical, chemical and geotechnical characterization of municipal solid waste, Impact of waste dump and its remediation	6	15
II	Geotechnical application of waste and disposal: Geotechnical use of different types such as Thermal power plant waste, MSW, mine waste, industrial waste. Waste disposal facilities, Parameters controlling the selection of site for sanitary and industrial landfill. Site characterization. MoEF guidelines.	7	15
FIRST INTERNAL EXAMINATION			
III	Landfill Components :Landfill layout and capacity, components of landfill and its functions. Types and functions of liner and cover systems, Compacted clay liner, selection of soil for liner, methodology of construction.	6	15
IV	Leachate, Gas Management and Geosynthetics: Management of Leachate and gas. Various components of leachate collection and removal system and its design., gas disposal/utilization. Closure and post closure monitoring system Geosynthetics- Geo membranes - geosynthetics clay liners -testing and design aspects.	6	15
SECOND INTERNAL EXAMINATION			
V	Soil remediation : Investigation of contaminated soil, sampling, assessment Transport of contaminants in saturated soil. Remediation of contaminated soil- in-situ / exit remediation, bio remediation, thermal remediation, pump and treat method, phyto remediation and electro-kinetic remediation	9	20
VI	Change in engineering properties due to change in environment. Variation in Engineering properties of soil –atterberg limit, shear strength, permeability and swelling due to change in environment/pore fluid.	8	20
END SEMESTER EXAMINATION			

QUESTION PAPER PATTERN (End semester examination)

Maximum Marks :100

Exam Duration: 3 Hrs

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

Note : 1.Each part should have at least one question from each module

2.Each question can have a maximum of 4 subdivisions (a, b, c, d)

