SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Master of Technology
Environmental Engineering

M. Tech. I Semester II

Subject Name: Environmental Monitoring **Subject Code:** MTEN14204

Type of course: PE IV

Prerequisite: Students should have basic understanding of Environment components & different existing pollutants in the environment.

Rationale: Students will able to understand the standard procedures adopted for the monitoring and analysis for Air, water, wastewater & soil components. With monitoring the identification of physical, Chemical and microbial contaminants which may be natural as well as man-made is important. Application of digital sources like Remote Sensing & GIS will help in preparation of map showing monitoring locations and important data.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	**Introduction** Purpose of monitoring, Scales of observation, Environmental characteristics, Representative units, Sampling Location, Types of environmental monitoring, Sampling plan, Analytical data quality requirements: Precision and Accuracy, Detection limits, Reporting data	6	14%
2.	**Statistics In Environmental Monitoring** Samples & Population Random Sampling, Sample support, Frequency Distribution & Probability Density Function : Mean , Variance , Standard Deviation , Gaussian Variable, Sample size & Confidence interval, Co variance & Correlation, Liner Regression, Interpolation & Spatial Distribution	8	16%
3.	**Air Quality Monitoring Type Of Air Quality Monitoring** Ambient Air Quality Monitoring , Source Air Quality monitoring, Ambient Air Quality Monitoring- Selection of monitoring sites , Sampling time, Frequency & mode of sampling,	6	14%
4.	**Water and Soil Quality Monitoring** Sampling techniques, Preservation of water sample, Physical	6	14%

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	Properties of water & it's monitoring: Temperature, Conductivity, Turbidity etc., Chemical Properties of water & its monitoring, Electrometric method: pH, Colorimetric method, Spectroscopy method, Standardization & calibration of monitoring instruments. Soil Quality Monitoring: Soil Quality Parameters, Physical, Chemical & Cation Exchange properties, soil sampling & testing procedure, Soil Quality Standards		
5.	**Environmental Microbial Properties** Processes Benefits of environmental microbes, Microorganism in soil, Sampling procedure for microbial characterization, Methods for characterizing microorganisms & microbial properties in water & soil.	6	14%
6.	**Physical, Chemical And Microbial Contaminants Physical Contaminants** Naturally occurring particulates, Human made particulates, Mechanisms and control of particulate, Chemical contaminant:- Type of contaminants, Sources of Contaminants, contaminant transport and fate, Microbial contaminants:- Environmentally transmitted pathogens, concept of indicator organisms, sample processing and storage.	6	14%
7.	**Map, Gis & Remote Sensing In Environmental Monitoring Maps** Principals of mapping, Location and Land – Partitioning systems, topographic maps, Global positioning systems, Geographic Information System(GIS):- GIS and Geographic Information Systems Data, Remote Sensing: Physical Principles of Remote Sensing, optical properties of earth surface materials, remote sensing at landscape scale, applications of remote sensing in environmental health & toxicology	6	14%

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
25	20	25	15	10	10

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels **(Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Environmental	Janick F Artiola, Ian	Elsevier Academic	2004	1st

	monitoring and characterization	L Pepper, Mark Brusseau	Press, ISBN: 0-12-064477-0		
2.	Chemistry for Environmental Engineering & Science	Sawyer & McCarty	McGraw Hill Education, ISBN-10: 9780070532441 ISBN-13: 978-0070532441	2017	5th
3.	Real time Environmental Monitoring Sensors & Systems	Miguel F. Acevedo	CRC Press, Taylor & Frances Group, ISBN: 978-1-4822-4034-4	2016	1st
4.	Environmental Monitoring	G. Bruce Wiersma	CRC Press, ISBN: 1-55670-641-6	2004	1st
5.	Applied Statistics for Civil and Environmental Engineers	Kottegoda N.T. and Rosso R.	McGraw-Hill, International Edition	2008	1st
7.	Statistical Methods in Water Resources	Helsel D.R. and Hirsch R.M.	U.S. GEOLOGICAL SURVEY	2002	1st
8.	Soil Sampling, Preparation, and Analysis	Kim H. Tan	CRC Press	2005	2nd

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	To understand the importance and general procedure of monitoring. (U-Cognitive Level)	20
CO-2	To understand and carry out monitoring of environmental components: Air, Water and soil. (R & U-Cognitive Level)	20
CO-3	Characterization of Microbial properties of microorganisms in different environment. (U-Cognitive Level)	15
CO-4	Identification of natural & man-made physical, chemical & biological contaminants.(U-Cognitive Level)	25
CO-5	Application of GIS & Remote Sensing in preparation of maps after monitoring. (A & N-Cognitive Level)	20

FOR LAB SESSIONS:

List of Tasks:

Students will be shown a variety of experiments on Air, Water, Wastewater & Soil sampling for monitoring purpose**.**

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Major Equipments:

1. BOD incubator
2. COD digester
3. Hot air oven
4. Muffle furnace
5. Electronic Balance (Accuracy: 1mg)
6. Jar Test Apparatus
7. pH, Turbidity, TDS and Conductivity meter
8. Sound level meter
9. High volume sampler
10. Gas Analyzer
11. Microbial Incubator

List of Open Source/learning website:

- https://nptel.ac.in/courses/103/106/103106162/
  - Water Quality Monitoring
- https://nptel.ac.in/courses/105/102/105102089/
  - Air Quality Monitoring
- https://nptel.ac.in/content/storage2/courses/103107084/module1/lecture5/lecture5.pdf
  - Water Quality Monitoring: Estimation of Chemical Parameter
- https://nptel.ac.in/courses/105/108/105108077/
  - Application of Remote Sensing in Environmental Monitoring

List of Open Source Software:

- Q-GIS
- OpenForis