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

M. Tech. I Semester II

Subject Name: Environmental Modelling **Subject Code:**MTEN14202

Type of course: PE-III
Prerequisite: Fundamentals of Environmental Systems and Basics of Statistics
Rationale: To understand the dynamics of environmental system and control the parameters causing deterioration of environment system

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:** Mathematical modelling and simulation, Defining systems and its components, Types of models and their applications, Evaluation of models, Graphical analysis, Quantitative analysis, Sensitivity analysis, Uncertainty analysis.	6	15%
2.	**Environmental Modelling:** Eutrophication of lakes, stoichiometry, phosphorus as a limiting nutrient, mass balance on total phosphorus in lakes, dynamic ecosystem, Models for Eutrophication Assessments.	8	15%
3.	**Models For Transport And Fate Of Contaminants:** Mass and energy balance, plugs flow systems, Streeter Phelps equation, modifications to Streeter Phelps equation, Dissolved oxygen in rivers & estuaries, Their application in modelling of rivers-lakes, sediments, wetlands, subsurface flow and transport. Models for activated sludge process, Anaerobic processes, Aquasim, Ginafit. Ground water contamination, Darcy's law, flow equations, Contaminant solute transport equation, Bio transformations.	14	35%
4.	**Air Quality Modeling:** Types of modeling techniques, Modelling of volatilization, Chemical transformations, sorption/desorption, Photochemical transformations, Modeling for nonreactive pollutants, single source, multi-source and area source models, fixed box models, diffusion models, dispersion models, receptor and source oriented models	10	25%
5.	**Applications:** Software based applications- Air quality and water quality modeling	4	10%

PE-III: Program Elective -III

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**20**	**20**	**15**	**15**	**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.	Integrated Environmental Modeling – Pollutant Transport, Fate, and Risk in the Environment	Ramaswami A., Milford J.B., Small M.J.	John Wiley & Sons	2005	1st
2.	Principles of Geographical Information Systems	Burrough P.A. and McDonnell R.A.	Oxford University Press, Ishbhn-10: 0198748612	2016	International Third Edition
3.	Dynamics of environmental bioprocesses, modelling and simulation	Snape J.B., Dunn I.J., Ingham J. and Prenosil J.	Wiley VCH, Ishbhn-10: 3527287051	1995	Har/Dskt Edition
4.	Activated sludge modelling ASM1 and ASM2		International Water Association		
5.	Surface Water Quality Modeling	Chapra S.C.	Waveland Pr Inc, Ishbhn-10: 1577666054	2008	
6.	Modelling the Eutrophication Process	M W Lorenzen			
7.	Environmental modelling: Fate & transport of pollutants in	Jerald L Schnoor	Wiley-Interscience	1996	1st

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	Water, Air and Soil				
8.	Environmental Modelling	John Wainwright & Mark Mulligan	Wiley, ISBN-13 978-0470749111	2013	2nd

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Understand the Basic Concepts of Modelling and Simulation. (*R, U - Cognitive leve*l)	10
CO-2	Identify the types of modelling, its application, evaluation and simulation of model related to Environment. (*R, U, E- Cognitive leve*l)	20
CO-3	Understand the model for transport and fate of contaminants and their application in the different era of Environment. (*U, A, E- Cognitive leve*l)	25
CO-4	Understand the different techniques of analysis like sensitivity analysis, Quantitative analysis and Uncertain analysis and its application in Environment. (*N, A, E- Cognitive leve*l)	20
CO-5	Apply the soft computing techniques for evaluate the air and water quality modelling. (A, *E, C- Cognitive leve*l)	25

LIST OF PRACTICALS:

Term work will comprise of assignment and exercises based on mass balances, Basic concepts of transport phenomena, chemical modelling, Eutrophication of lakes, Conventional pollutants in rivers, ground water contamination.