

M.TECH (ENVIRONMENTAL ENGG.)

SEMESTER I

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
01MEE 101	Advanced Mathematics	4	1	0	5
01MEE 102	Unit Processes	4	1	0	5
01MEE 103	Major Elective-I Air and Noise Pollution	4	1	0	5
01MEE 104	Major Elective-II Industrial Waste Treatment	4	1	0	5
01MEE 201	Minor Elective-I Env. Lab. -1	<u>0</u>	<u>0</u>	3	2
01MEE 301	DISCIPLINE & EXTRA CURRICULAR ACTIVITIES	<u>0</u>	<u>0</u>	4	1
	Total	16	4	7	23

SEMESTER II

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
02MEE 101	Simulation & Modelling	4	1	0	5
02MEIE 102	Major Elective-IV Solid and Hazardous Waste Mgt.	4	1	0	5
02MEE 103	Major Elective-V Air and Water Quality Modeling	4	1	0	5
02MEE 104	Major Elective-VI Environment and Health	4	1	0	5
02MEE 201	Minor Elective-II Env. Lab.-2	0	0	3	2
02MEE 301	DISCIPLINE & EXTRA CURRICULAR ACTIVITIES	0	0	4	1
	Total	16	4	7	23

SEMESTER III

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
03MEE 101	EIA	4	1	0	5
03MEE 102	Design of Env. Structures	4	1	0	5
03MEE 201	PROJECT	5	0	0	5
03MEE 202	SEMINAR	3	0	0	3
03MEE 301	DISCIPLINE & EXTRA CURRICULAR ACTIVITIES	0	0	4	1
	Total	16	2	4	19

SEMESTER IV

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
04ME 201	DISSERTATION				
	a) Continuous Evaluation	5			5
	b) Project Report	6	0	0	6
	c) Viva Voice	6			6
04MEE 301	DISCIPLINE & EXTRA CURRICULAR ACTIVITIES	0	0	4	1
	Total	17	0	4	18

SEMESTER I

Advanced Course in Mathematics

COURSE/PAPER 01 MEE 101

MEE I SEMESTER

Statistics and Probability: Probability theory, Baye's theorem, Binomial, Poisson and normal distributions, testing of hypothesis, Chi square test- goodness of fit, independence of two variables, student's t-test, analysis of variance: F-test, correlation and regression, coefficient of correlation, rank correlation, lines of regression.

Stochastic Process: Poisson process for discrete parameters, Markov chains, queing theory.

Numerical Analysis: Interpolation, finite differences-forward, backward and central differences, Newton's formulae for forward differences and backward differences; Stirling's formula for central differences, Numerical differentiation and integration- Simpsons one-third, Simpsons three- eighth rules and trapezoidal rule, Numerical solution of ODE of I order: Euler's method, modified Euler's method and Runga Kutta 4th order method, Milne's method.

Complex Variables: Analytic functions, conformal mapping, Schwarz- Christoffel transformation.

Unit Processes

COURSE/PAPER 01 MEE 102

MEE I SEMESTER

General Chemistry- Henry's law, activity & activity coefficient, Solubility product, common ion effect, Diverse ion effect, Coagulation; Flocculation; Settling; Filtration; Disinfection; Aeration and gas transfer process; Adsorption

Basics of biochemistry- EMP & TCA cycles, Electron transport mechanism; Enzyme-substrate reactions, Continuous flow stirred tank reactor, Plug flow reactor; Fundamental of Microbiology, Nutritional requirements, Environmental effects on microbial growth, Wastewater characteristics, Physical, chemical and biological characteristics of sewage; Kinetic relationships from microbiology applied for process design; Activated sludge Process and its modifications; Aeration and aeration systems; Treatment ponds and aerated lagoons; Trickling filters; Rotating biological contactors; Anaerobic digestion; Nitrification & Denitrification.

Air and Noise Pollution

COURSE/PAPER 01 MEE 103

MEE I SEMESTER

Sources of air pollution; Classification of aerosols, Gases vapors, natural pollutants; Properties of air pollutants; Meteorological

factors influencing dispersion of air pollutants; Gaussian plume model for dispersion of air pollutants and its applications; Effects on man, material, vegetation, art treasure; Air pollution disasters; Economic Effects of air pollution; Global Effects of Air pollution; Air pollution Due to Automobiles and emission control; General concept of transport planning for prevention of air pollution; Control technology for particulate and gaseous pollutants.

Basics of noise Pollution; Measurement of noise; permissible noise levels in different zones; Effects of noise.

Industrial Waste Treatment

COURSE/PAPER 01 MEE 104

MEE I SEMESTER

Problems of industrial wastewater in India; Effects of Discharges of Industrial Waste on Receiving Bodies of water, land and Sewer; Effluent and stream standards; Environmental legislation and standards related to industrial waste; Industrial treatment Processes; Inventorization and treatment of Industrial Wastewater generated from Textile (cotton and Synthetic) Tannery, Pulp and Paper, Dairy, metal Plating (Chromium and Cyanide problem), Slaughter House, Distillery, dying and Printing, fertilizer, Copper & cement Industry; Potentials for Wastewater Recycle and Reuse in industries; Concept of Common effluent treatment plants.

Environmental Lab - 1

COURSE/PAPER 01 MEE 201

MEE I SEMESTER

Water quality: principles of measurement and testing of water for parameters like pH, TDS, NO_3 , $\text{PO}_4\text{-P}$, Hardness, Turbidity, residual chlorine, breakpoint chlorination, DO, Chlorides, Jar test for coagulant dosing.

Waste water quality: COD,BOD,TOC,SS,VSS, heavy metals using AAS, Color Measurement and its removal using O_3 , Microscopy.

Water quality: principles of measurement and testing of water for parameters like pH, TDS, NO_3 , $\text{PO}_4\text{-P}$, Hardness, Turbidity, residual chlorine, breakpoint chlorination, DO, Chlorides, Jar test for coagulant dosing.

Waste water quality: COD,BOD,TOC,SS,VSS, heavy metals using AAS, Color Measurement and its removal using O_3 , Microscopy.

Water quality: principles of measurement and testing of water for parameters like pH, TDS, NO_3 , $\text{PO}_4\text{-P}$, Hardness, Turbidity, residual chlorine, breakpoint chlorination, DO, Chlorides, Jar test for coagulant dosing.

Waste water quality: COD,BOD,TOC,SS,VSS, heavy metals using AAS, Color Measurement and its removal using O_3 , Microscopy.

SEMESTER II

Simulation And Modeling

COURSE/PAPER 02 MEE 101

MEE II SEMESTER

Definition of a system, System concepts, type of system, continuous & discrete systems, modeling process verification & validation.

Introduction of Probability Distributions and random processes, Central limit theorem.

Estimation of mean and variance, Confidence interval, Hypothesis testing, Normal distribution, t-test, ANOVA- an Introduction

Markov chains: CTMC and DTMC

Queuing models: Basic queuing models. Little's Theorem and network of queues.

Introduction, classification of simulation models, advantages and disadvantages of simulation. Concept of simulation time and real time. Discrete system simulation. Monte Carlo method, Random number generators.

Simulation of inventory systems

Introduction to simulation environment and software tools.

Text/References:

1. Principles of Operations Research, Wagner, PhI.
1. Simulation modeling and analysis, Law and Kelton, McGraw Hill.
2. Probability and Statistics with Reliability, Queuing and Computer Science Application, Kishore S Trivedi, Wiley.
3. System simulation, Gorden G., Prentice Hall of India.

Solid and Hazardous Waste Management

COURSE/PAPER 02 MEE 102

MEE II SEMESTER

Problems Associated with Solid Waste Disposal; Generation of Solid Wastes; Classification of Solid; Characteristics of Solid Waste; Analysis of Solid Waste; Onsite Handling, Storage and Processing of solid waste; Solid Waste collection Systems; Options for Transfer and Transport Systems; Processing and Disposal Methods; Recovery of Resources, Conversion Products and Energy generation from solid waste.

Hazardous waste definition; Environmental Legislation; Risk associated with hazardous waste & its Assessment; Waste Minimization; Priorities in hazardous waste management; hazardous waste treatment.

Air and Water Quality Management

COURSE/PAPER 03 MEE 103

MEE II SEMESTER

Water quality criteria; objectives and steps in water quality management; analysis of water quality system; Modeling approaches to water quality system; Planning sampling networks and schedules for monitoring of water quality; Sample collection and analysis.

Air Quality Models: Diffusion model, Gaussian dispersion model, evaluation of stability parameters, model for line sources, area sources, plum rise equations, dry deposition models, evaluation and experimental verification of plume models.

Air monitoring survey networks, siting criteria; Principles and techniques for ambient and stack sampling; Principles & Methods of monitoring particulate and gaseous air pollutants; Chemical and size analysis of particulates, Guidelines for setting of industries, Stack emission standards, ambient air quality standards.

Environment & Health

COURSE/PAPER 02 MEE 104

MEE II SEMESTER

Contamination of drinking water and its effect on human health; Concept of indicator organism; Problems of water quality in Rajasthan; Water quality standards; Water quality indices; Ambient air quality and its effect on human health; Sources of air pollution; different air pollutants and their impact on respiratory system; Air quality standards; Air quality indices; Indoor air quality and its effect on human health; Sources of indoor air

pollution; WHO guideline values for indoor air quality; Noise pollution and its impact on human health; Standards for ambient and occupational noise; Noise pollution indices; Solid waste disposal and its effects on human health; Solid waste and rodent control; arthropod-borne diseases;

Design of studies to establish cause-effect relationship between environmental quality and health; Management of environmental quality to reduce impact on health

Environmental Lab – 2

COURSE/PAPER 02 MEE 201

MEE II SEMESTER

Air quality: Air for SPM,RSPM, NO₂ & SO₂ using High volume sampler, CO, NO_x , SO₂ using continuous analysers.Noise measurement using SLM

Use of softwares like LOOP,SEWER,CALINE etc.

SEMESTER III

Environmental Impact Assessment

COURSE/PAPER 03 MEE 101

MEE III SEMESTER

Basic Concept of EIA, EIS and EMP; Prediction and assessment of impacts on air, water, biota, noise, cultural and socioeconomic environment; Rapid and comprehensive EIAs. Case studies.

Design of Environmental Structures

COURSE/PAPER 03 MEE 102

MEE III SEMESTER

Conduit: Stresses in pipes, strength of conduits, design of concrete and steel pipe for internal and external loads, anchor blocks.

Tanks : Underground tanks, retaining wall and floor junction
Rectangular and circular tanks in R.C.C and steel intz tanks.
Steel and concrete staging.

Treatment Units ; Clarifiers, flocculator, Filter house, Hopper bottom tanks, Digesters.