

Name of Faculty	:	Faculty of Engineering & Technology
Name of Program	:	Master of Technology (M. Tech)
Course Code	:	2MEE02
Course Title	:	Sewage Treatment & Disposal
Type of Course	:	Programme Core (PC)
Year of Introduction	:	2023-24

Prerequisite	:	Basic knowledge of environmental science, Environmental engineering, Chemistry and biology
Course Objective	:	To impart knowledge on the disposal of sewage and sludge.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	The students would estimate sewage generation, understand the characteristics and composition of sewage.
	CO2	Acquire knowledge of various sewage treatment processes and technologies, including primary, secondary, and tertiary treatment methods, as well as advanced treatment techniques.
	CO3	Develop skills in designing and implementing effective sewage treatment systems, considering factors such as site suitability, treatment capacity, and regulatory requirements.
	CO4	Demonstrate an understanding of the legal and regulatory frameworks governing sewage treatment and disposal, including local, national, and international guidelines and standards.

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	SEE	CIA	SEE	CIA	
3	2	0	4	70	30	30	20	150

Legends: L-Lecture; T-Tutorial/Teacher Guided Theory Practice; P - Practical, C - Credit, SEE - Semester End Examination, CIA - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content

Unit No.	Topics	Teaching Hours	Weightage	Mapping with CO
1	Introduction Disaster: Introduction to wastewater characteristics, Reactors and reactor analysis: Types of reactors and their Analysis; Preliminary Treatment: Screening, Grit removal; Primary Treatment: Primary sedimentation. Physical Unit operations, High rate clarification, Oxygen transfer, flotation, Aeration systems.	10	24%	CO1
2	Secondary Treatment: Fundamentals of Biological Treatment, Suspended growth biological treatment processes (ASP), Attached growth and combined biological treatment processes: Trickling filters, Rotating Biological Contractors, Fluidized-Bed Bioreactors, Anaerobic Suspended and attached growth biological treatment processes: Up flow Anaerobic Sludge Blanket (UASB)	14	33%	CO2
3	Tertiary Treatment: purpose of tertiary treatment, Disinfection: chlorine, Chlorine Dioxide, Ozone, Ultraviolet Radiation, Treatment, Reuse and Disposal of solids and bio solids, Biological Nutrients Removal Processes: Nutrients in domestic wastewater, Objectives of Nutrients removal, Biological Nitrogen Removal processes (BNR), Biological Phosphorus Removal (BPR)	10	24%	CO3
4	Advanced Treatment Process: Electro-oxidation, Fenton, Electro Fenton, Electro-coagulation, wetland treatment, approach to combined physic-chemical and biological, approach to Decentralized wastewater systems, waste disposal systems	08	19%	CO2 CO4

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	20	30	25	15	5	5

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

Suggested List of Experiments/Tutorials

Sr. No.	Name of Tutorial	Teaching Hours
1	Types of reactors and their analysis	1
2	Primary Treatment in Screening, Grit removal	3
3	Secondary Treatment in Fundamentals of Biological Treatment	2
4	Secondary Treatment in Trickling filters	3
5	Tertiary Treatment in Disinfection, , Treatment, Reuse	2
6	Tertiary Treatment in Disposal of solids and bio solids	3
7	Removal Processes in Nutrients in domestic wastewater	3
8	Advanced Treatment Process in Electro-oxidation, Electro Fenton, Electro-coagulation	4
9	Decentralized wastewater systems	3
10	waste disposal systems	3

Suggested Learning Websites

Sr. No.	Name of Website
1	https://www.wef.org/
2	https://www.who.int/water_sanitation_health/wastewater/management/en/
3	https://www.epa.gov/water-research/wastewater-treatment
4	https://www.iwapublishing.com/
5	https://www.ewa-online.eu/

Reference Books

Sr. No.	Name of Reference Books
1	Metcalf and Eddy Inc., "Wastewater Engineering: Treatment, and Reuse", 4th edition, Tata McGraw Hill, 2007.
2	Benfield L D, and Randall, C W. "Biological Process Design for Wastewater Treatment" Prentice Hall, 1980.
3	Schroeder E D., "Water and Wastewater Treatment", McGraw-Hill, 1997
4	Arceivala S J, "Wastewater Treatment for pollution control and Reuse", 3rd edition Tata McGraw Hill, 2007