



FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Engineering

Semester I

Course Code: 102440105

Course Title: Waste Management And Energy Recovery

Type of Course: Program Elective I

Course Objectives: To impart knowledge on methods of waste management and facilitate selection of waste handling processes

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Internal		External		Total
				Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	40 /16	20 /08	60 /24	30 /12	150 /60

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	WASTE CHARACTERISTICS AND OPERATIONS FOR WASTE HANDLING Sources, types, composition, generation, estimation techniques, characterization, types of collection system, transfer stations, transfer operations. Separation and Processing: Size reduction - separation through density variation, magnetic/electric field; Densification - physical, chemical and biological properties and transformation technologies	10
2	WASTE DISPOSAL TECHNIQUES, TRANSFORMATION TECHNOLOGIES AND VALUE ADDITION OF WASTES Landfill , landfill gas - generation, extraction, gas usage techniques, leachates formation, UNFCCC model for land fill gas prognosis and reclamation; Physical Transformation: Component separation and volume reduction; Chemical Transformation: combustion, gasification, pyrolysis; Energy Recovery: biological transformation, aerobic composting, anaerobic digestion	11
3	HAZARDOUS WASTE MANAGEMENT AND WASTE RECYCLING Definition, sources and classification; incineration vs combustion technology; RDF / mass firing, material recycling, disposal of white goods and E-wastes, carbon credit calculations and economic analysis of waste disposal and transformation techniques	10
4	MANAGEMENT OF LIQUID AND GASEOUS WASTES Liquid Waste: Sewage treatment - Dilution, mechanical treatments, biological treatments and chemical treatments, removal of ammonia; Gaseous waste management and control measures	8
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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	U	A	N	E	C	
15%	30%	15%	30%	10%	0%	

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 Books:

1	Integrated Solid Waste Management, Tchobanoglous, Theisen and Vigil, McGraw Hill
2	Environmental Engineering, Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, McGraw Hill
3	Hazardous Waste Chemistry, Toxicology and Treatment, Stanley E. Manahan, Lewis Publishers
4	Energy from Waste - An Evaluation of Conversion Technologies, Parker, Colin and Roberts, Elsevier Applied Science
5	Waste Disposal in Engineered Landfills, Manoj Datta, Narosa Publishing House
6	Sustainable Solid Waste Management, Syeda Azeem Unnisa, S. Bhupatthi Rav, CRC Press
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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students able to differentiate types of waste and select suitable operations and conversion technologies	20
CO-2	Students understand and able to select appropriate methods for waste management and apply transformation techniques for densification	30
CO-3	Students must understand the concept of waste management and waste recycling	25
CO-4	Students able to economic analysis of waste disposal	25
CO-5	Click or tap here to enter text.	Click
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List of Practicals / Tutorials:

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1	Study of waste characteristics
2	Study of transfer operations, waste separation and processing
3	Study of UNFCCC model for land fill gas prognosis and reclamation
4	Study of Physical transformation and chemical transformation
5	Study of Energy Recovery
6	Study of material recycling process
7	Study of disposal of white goods and E-wastes
8	Study of economic analysis of waste disposal
9	Study of sewage treatment plant
10	Study of gaseous waste management and control measures
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Supplementary learning Material:

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Curriculum Revision:

Version:	1
Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22