GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering
Level: PG
Branch: Biomedical Engineering
Subject Code : ME02031101
Subject Name: Healthcare Waste Management

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Hospital Management and Clinical Technology, Human Anatomy & Physiology
Rationale:	Healthcare facilities generate a significant amount of hazardous and non-hazardous waste, which poses risks to human health and the environment if not managed properly. This course aims to prepare students with the knowledge and skills to identify, segregate, handle, treat, and dispose of healthcare waste in a safe and sustainable manner. By understanding these, students will learn about health risks, regulatory compliance, and contribute to maintaining a clean and safe environment in healthcare settings.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT
01	Understand sources of generation of health-care waste & it's importance, and to Analyze the hazards associated with healthcare waste and its impact on public health considering global and Indian scenarios.	U
02	Demonstrate the principles and techniques for segregation, collection, interim storage, and transportation of biomedical waste in compliance with regulatory guidelines.	A
03	Evaluate treatment and disposal methods for healthcare waste as per the BMWM Rules, 2016, and propose sustainable solutions for effective waste management.	E
04	Develop management strategies for healthcare facilities, including roles and responsibilities, compliance with reporting requirements, occupational safety, and resource allocation.	C
05	Understand waste management practices for outreach activities, learn about occasional waste generators, and specialized waste categories like batteries, radioactive materials, and e-waste.	U

**Revised Bloom's Taxonomy (RBT)*

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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction & Importance of Healthcare Waste Management: Definition and Types of Healthcare Waste, Sources and Generation of health-care waste, Importance of Proper Healthcare Waste Management Categories and Characteristics of Healthcare Waste: Overview of hazards, types of hazards, Global and Indian Scenario: public health impact	9	20
2.	**Biomedical waste storage and transport of health-care :**Steps involved in Bio-medical Waste Management,: Guiding principles, Segregation systems, Collection, Interim storage, On-Site and Off-Site Transportation Techniques, Central storage	10	25
3.	**Biomedical waste Treatment and disposal methods as per BMWM Rules, 2016:** Waste Segregation, storage and Transportation, Treatment and disposal methods.	10	25
4.	**Management requirement :** Roles & Responsibility of Healthcare Facility, Reporting to State Pollution Control Board or Pollution Control Committee, Occupational Safety ,Employee Health Check Up, Immunization, Training of Healthcare Workers, Budget Allocation for Bio Medical Waste Management.	9	20
5.	**Out Reach Activities and responsibility**: Steps for Bio Medical Waste Management for Out Reach Activities, Bio-Medical Waste Management by Occasional Waste Generators **Management of other BM wastes:** Management of general waste, management of other wastes like batteries, Radioactive Wastes, E-Wastes.	7	10
	Total	45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**25**	**25**	**10**	**20**	**10**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Safe Management of Wastes from Health-Care Activities (2nd Edition, WHO) Edited by Yves Chartier, Jorge Emmanuel, Ute Pieper, Annette Prüss, Philip Rushbrook, Ruth,William, Susan and Raki Zghondi.
2. Guidelines for Management of Healthcare Waste as per Biomedical Waste Management Rules, 2016 (CPCB)
3. Medical Waste Management by International Committee of the Red Cross© ICRC, November 2011
4. Healthcare Hazard Control and Safety Management Third Edition by James T. Tweedy,CRC Press.

(b) Open source software and website:

1. Biomedical Waste Management Rules, 2016 & Amendments (2018, 2019) (Ministry of Environment, Forest and Climate Change): moef.gov.in
2. Central Pollution Control Board (CPCB) Guidelines: http://cpcb.nic.in
3. WHO Online Courses and Publications: https://openwho.org

Suggested Course Practical List:

1. Identification/segregation of healthcare waste types.
2. Analyse or do research survey of waste generation in a healthcare facility.
3. Understand the characteristics and hazards of different waste categories.
4. Analyse real-world implications of healthcare waste mismanagement.
5. Hands-on practice in waste segregation using color-coded bins.
6. Understand safe and compliant waste transportation techniques.
7. Demonstration of autoclaving or other treatment methods (via available online videos).
8. Evaluate the effectiveness of treatment techniques as per BMWM Rules, 2016.
9. Understand Outreach Waste Management.

Suggested Activities for Students:

1. Waste Segregation Demonstration - Students practice segregating healthcare waste into appropriate color-coded bins based on BMWM Rules, 2016, using real or mock waste items.
2. Case Study Analysis Analyze a real-world case of biomedical waste mismanagement (e.g., an outbreak or pollution event) and discuss its causes, consequences, and preventive measures.

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