

Academic Course Description

BHARATH UNIVERSITY
 Faculty of Engineering and Technology
 Department of Civil Engineering
BCE056 SOLID AND HAZARDOUS WASTE MANAGEMENT
Fifth Semester, 2017-18 (Odd Semester)

Course (catalog) description

The purpose of this course is to educate the students on the principles involved in the management of municipal solid waste and hazardous wastes- from source identification up to disposal.

Compulsory/Elective course : Compulsory for Civil students

Credit / Contact hours : 3 credits / 45 hours

Course Coordinator : Ms.M.Asathy, Assistant Professor

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@bharathuniv.ac.in)	Consultation
Ms.M.Asathy	Final year Civil	Civil Block		aswathym026@gmail.com	9.00 - 9.50 AM
Ms.L.MariaSubashini	Final year Civil	Civil Block			12.45 - 1.15 PM
Mr. S.Rajesh	Final year Civil	Civil Block			1.45-3.45pm

Relationship to other courses:

Pre –requisites : BCE505 Environmental Engineering

Assumed knowledge : Basic knowledge in Waste handling and disposal

Following courses : Environmental health Engineering

Syllabus Contents

UNIT I INTRODUCTION

9

Types and Sources of solid and hazardous wastes-Need for solid and hazardous waste management- Elements of integrated waste management and roles of stakeholders- Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, lead acid batteries, plastics and fly ash, financing waste management.

UNIT II WASTE CHARACTERIZATION AND SOURCE REDUCTION

9

Waste generation rates and variation-Composition, physical, chemical and biological properties of solid wastes- Hazardous Characteristics- TCLP tests- waste sampling and characterization plan- source reduction of wastes- Recycling and reuse- waste exchange.

UNIT III STORAGE, COLLECTION AND TRANSPORT OF WASTES

9

Handling and segregation of wastes at source- storage and collection of municipal solid wastes- Analysis of collection systems- Need for transfer and transport- Transfer stations Optimizing Waste allocation- compatibility, storage, labeling and handling of hazardous wastes- hazardous waste manifests and transport.

UNIT IV WASTE PROCESSING TECHNIQUES

9

Objectives of waste processing- material separation and processing technologies- biological and chemical conversion technologies-method and controls of composting- thermal conversion technologies and energy recovery- incineration- solidification and stabilization of hazardous wastes- treatment of biomedical wastes.

UNIT V WASTE DISPOSAL

9

Waste disposal options- Disposal in landfills- Landfill Classification, types and methods- site selection- design and operation of sanitary landfills, secure landfills and landfill bioreactors- leachate and landfill gas management- landfill closure and environmental monitoring- closure of landfills- landfill remediation.

REFERENCES:

- 1.George Tchobanoglous, Hilary Theisen and Samuel A, Vigil “Integrated Solid Waste Management, McGraw- Hill International edition, New York, 1993.
- 2.CPHEEO “Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation, Government of India, New Delhi, 2000.
- 3.Micheael D. Lagrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, McGraw- Hill International edition, New york, 2001.
- 4.Vesilind P.A., Worrell W and Reinhart, Solid Waste Engineering, Thomson Learning Inc., Singapore, 2002.

Computer usage: Nil

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area: Pollution control,waste management

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1 st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2 nd week	Session 15 to 28	2 Periods
3	Model Test	October 2 nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

This Course is to introduce the principles of various waste management methods and applications to Civil Engineering projects.	Correlates to program outcome		
	H	M	L
1. To make them understand the fundamentals of solid and hazardous wastes and also the types, need and sources of solid and hazardous wastes	b	d	A
2. To understand about the methods of waste characterization and source reduction and to study the various methods of generation of wastes.	e	b	a
3. To understand in detail about the storage, collection and transport of wastes. and also to study about the methods used for handling and segregation of wastes.	e	b	a
4. . To improve the knowledge on the waste processing techniques which includes incineration, solidification and stabilization of hazardous wastes	a	c	b
5. To know about the basics of the waste disposal options and also a detailed study on the disposal in landfills and also to learn about landfill remediation		d	a

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

Session	Topics	Problem Solving Yes/No	Text /Chapter
UNIT 1 INTRODUCTION			
1.	Types and Sources of solid and hazardous wastes	No	
2.	Need for solid and hazardous waste management	No	
3.	Elements of integrated waste management and roles of stakeholders	No	
4.	Salient features of Indian legislations on management and handling of municipal solid	No	T1/Chapter 1
5.	wastes, hazardous wastes,	No	R1/Chapter 1
6.	biomedical wastes	No	R4/Chapter 1
7.	lead acid batteries	No	
8.	plastics and fly ash	No	
9.	financing waste management.	No	
UNIT II WASTE CHARACTERIZATION AND SOURCE REDUCTION			
10.	Waste generation rates and variation	No	
11.	waste exchange	No	
12.	Composition, physical, chemical	No	
13.	biological properties of solid wastes	No	T2/chapter 1
14.	Hazardous Characteristics	No	R1/Chapter 2
15.	TCLP tests-	No	R4/Chapter 2
16.	waste sampling and characterization plan	No	
17.	source reduction of wastes-	No	
18.	Recycling and reuse	No	
UNIT III STORAGE, COLLECTION AND TRANSPORT OF WASTES			

19.	Handling and segregation of wastes at source -.	No	
20.	storage and collection of municipal solid wastes-	No	
21.	Analysis of collection systems	No	T2/chapter 2
22.	Need for transfer and transport-	No	R2/Chapter 2
23.	Optimizing Waste allocation	No	R4/Chapter 3
24.	compatibility, storage, labeling of hazardous wastes	No	
25.	handling - hazardous waste	No	
26.	manifests and transport	No	
27.	Transfer stations	No	
UNIT IV WASTE PROCESSING TECHNIQUES			
28.	Objectives of waste processing	No	T1/chapter 3 R3/Chapter 4 R4/Chapter 4
29.	material separation and processing technologies	No	
30.	biological and chemical conversion technologies	No	
31.	method and controls of composting	No	
32.	thermal conversion technologies	No	
33.	energy recovery	No	
34.	Incineration	No	
35.	solidification and stabilization of hazardous wastes	No	
36.	treatment of biomedical wastes	No	
UNIT V WASTE DISPOSAL			
37.	Waste disposal options	No	T1/chapter 5 R3/Chapter 5 R5/Chapter1
38.	Disposal in landfills	No	
39.	Landfill Classification	No	
40.	types and methods	No	
41.	site selection, design and operation of sanitary landfills	No	
42.	secure landfills and landfill bioreactors	No	
43.	leachate and landfill gas management	No	
44.	landfill closure and environmental monitoring	No	
45.	closure of landfills- landfill remediation.	No	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.

- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	5%
Assignment	-	5%
Attendance	-	10%
Final exam	-	70%

Prepared by: Ms.M.Asathy Assistant Professor , Department of Civil

Dated :

Addendum

ABET Outcomes expected of graduates of B.Tech / Civil / program by the time that they graduate:

- a. An ability to apply knowledge of mathematics, science, and engineering
- b. An ability to design and conduct experiments, as well as to analyze and interpret data
- c. An ability to design a hardware and software system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d. An ability to function on multidisciplinary teams
- e. An ability to identify, formulate, and solve engineering problems
- f. An understanding of professional and ethical responsibility
- g. An ability to communicate effectively
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i. A recognition of the need for, and an ability to engage in life-long learning
- j. A knowledge of contemporary issues
- k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives

PEO1: PREPARATION

Civil Engineering graduates will have knowledge to apply the fundamental principles for a successful profession and/or for higher education in Civil Engineering based on mathematical, scientific and engineering principles, to solve realistic and field problems that arise in engineering and non engineering sectors

PEO2: CORE COMPETENCE

Civil Engineering graduates will adapt to the modern engineering tools and construction methods for planning, design, execution and maintenance of works with sustainable development in their profession.

PEO3: PROFESSIONALISM

Civil Engineering Graduates will exhibit professionalism, ethical attitude, communication and managerial skills, successful team work in various private and government organizations both at the national and international level in their profession and adapt to current trends with lifelong learning.

PEO4: SKILL

Civil Engineering graduates will be trained for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS

Civil Engineering graduates will be installed with ethical feeling, encouraged to make decisions that are safe and environmentally-responsible and also innovative for societal improvement.

BCE056- SOLID AND HAZARDOUS WASTE

MANAGEMENT

Course Teacher	Signature
Ms.M,Aswathy	
Ms.L.MariaSubashini	
Mr. S.Rajesh	

Course Coordinator

HOD/CIVIL