Ref No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY

COURSE PLAN

Academic Year 2019-2020

Program:	B E – Civil Engineering
Semester :	6
Course Code:	17CV651
Course Title:	Solid Waste Management
Credit / L-T-P:	3 / 3-0-0
Total Contact Hours:	40
Course Plan Author:	RENUKA H R

Academic Evaluation and Monitoring Cell

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Note : Remove “Table of Content” before including in CP Book
Each Course Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	CV
Semester:	6th	Academic Year:	2019-20
Course Title:	Solid Waste Management	Course Code:	17CV651
Credit / L-T-P:	3/3-0-0	SEE Duration:	180 Minutes
Total Contact Hours:	40 Hours	SEE Marks:	60 Marks
CIA Marks:	40 Marks	Assignment	1 / Module
Course Plan Author:	RENUKA H R	Sign ..	Dt:
Checked By:		Sign ..	Dt:
CO Targets	CIA Target : 78%	SEE Target:	75%

Note: Define CIA and SEE % targets based on previous performance.

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute. Identify 2 concepts per module as in G.

Module	Module Content	Teaching Hours	Module Concepts	Blooms Level
1	**Sources**: Sources of Solid waste, Types of solid waste, Physical and Chemical composition of municipal solid waste. Generation rate, Numerical Problems. **Collection**: Collection of solid waste- services and systems, equipments **Transportation**: Need of transfer operation, transfer station, transport means and methods, route optimization. Solid waste management 2000 rules with, 2016 amendments.	08	Solid waste systems Onsite Processing	L1, L2,L3
2	**Processing techniques**: Purpose of processing, Chemical volume reduction (incineration) – Process description, 3T's, principal components in the design of municipal incinerators, Air pollution control ,Mechanical volume reduction (compaction), Mechanical size reduction (shredding), component separation (manual and mechanical methods).	08	Processing of solid wastes Compaction	L1, L2,L3
3	**Composting Aerobic and anaerobic method**-process description, process microbiology, design consideration, Mechanical composting, Vermicomposting, Numerical Problems. **Sanitary landfilling**: Definition, advantages and disadvantages, site selection, methods, reaction occurring in landfill- Gas and Leachate movement, Control of gas and leachate movement, Design of sanitary landfill. Numerical Problems	08	Composting Design of sanitary landfill	L1, L2,L3
4	**Sources, collection, treatment and disposal of :-** Biomedical waste ,E-waste ,Hazardous waste and construction waste	08	Solidwaste Management Disposal of bio medical wastes	L1, L2,L3
5	**Incineration** -3Ts factor affecting incineration,types of incinerations , Pyrolsis ,design criteria for incineration, Energy recovery technique from solid waste management	08	Chemical Volume Reduction Design criteria for incineration	L1, L2,L3

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).

1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Modules	Details	Chapters in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1, 2, 3, 4, 5	George Tchobanoglous, Hilary Theisen , Samuel A Vigil, "Integrated Solid Waste Management : Engineering principles and management issues", M/c Graw hill Education . Indian edition	1, 2	In Lib / In Dept
1	Howard S Peavy, Donald R Rowe and George Tchobanoglous, "Environmental Engineering", Tata Mcgraw Hill Publishing Co ltd.	3, 4.5	In Lib/ In dept
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1, 2	Handbook of Solidwaste management, second edition, George Tchobanoglous, Frank Kreith, published by M/c Graw hill Education, 2002, ISBN-13 978-0071356237 ISBN -10 0071356231	?	In Lib
C	**Concept Videos or Simulation for Understanding**	**-**	**-**
C1	http://youtu.be/DpDzGPTkRlc (solid waste systems)		
C2	http://youtu.be/ZYTAs10Dn5I (onsite processing of solid wastes)		
C3	http://youtu.be/ldqQAzzY2uw (processing of solid waste)		
C4	http://youtu.be/EHb3XR_EGh4 (compaction)		
C5	http://youtu.be/URj3kl0TDNs (composting of solid waste)		
C6	http://youtu.be/s-ps_0UFmfI (design of sanitary landfills)		
C7	http://youtu.be/nL354fxAfBk (solid waste management)		
C8	http://youtu.be/MEslczJKxro (disposal of solid waste)		
C9	http://youtu.be/FFBbJJf_iK0 (chemical volume reduction)		
C10	http://youtu.be/xxDz5WCxz6A (design criteria of incineration)		
D	**Software Tools for Design**	**-**	**-**
E	**Recent Developments for Research**	**-**	**-**
	http://youtu.be/9csuvyBbJJU		
	http://youtu.be/3RDGV5i82_Q		
F	**Others (Web, Video, Simulation, Notes etc.)**	**-**	**-**

4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

Modules	Course Code	Course Name	Topic / Description	Sem	Remarks	Blooms Level
1	17CV651	Solid waste management	Knowledge on solid waste management and different process of solid waste management.	6th		L3

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.
Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Mod	Topic / Description	Area	Remarks	Blooms

ules				Level
1	Solid Waste management/Knowledge of different solid waste systems	Higher study	Seminar on solid waste management	Understanding L2
2	Different process of solid waste and compaction	Higher study	Seminar on compaction and different process of solid waste	Understanding L2
3	Different methods of composting and landfilling	Higher study	Seminar on composting of solid waste	Understanding L2
4	Disposal of solid waste and different process	Higher study	Seminar on disposal of solid waste	Understanding L2
5	Design of incenaration	Higher study	Seminar on design of incenaration	Understanding L2

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

Modules	Course Code.#	Course Outcome **At the end of the course, student should be able to . . .**	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
1	17CV651.1	Students are able to understand the solid waste systems	04	Solid waste systems	Lecture	C.I.A	Understand L2
1	17CV651.2	Students are able to estimate solid waste generation rate	04	Onsite Processing	Lecture	C.I.A	L3 Apply
2	17CV651.3	Students are able to apply the processing techniques in solid waste management	04	Processing of solid wastes	Lecture	C.I.A	L3 Apply
2	17CV651.4	Students are able to apply the compaction techniques in solid waste management	04	Compaction	Lecture	C.I.A	Understand L2
3	17CV651.5	Students are able to understand the composting process and applly in SWM	04	Composting	Lecture	C.I.A	Apply L3
3	17CV651.6	Students are able to design sanitary landfill.	04	Design of sanitary landfill	Lecture	C.I.A	Apply L3
4	17CV651.7	Students are able to design suitable solid waste processing system and disposal methods	04	Solidwaste Management	Lecture	C.I.A	Apply L3
4	17CV651.8	Students are able to design suitable Hazardous waste Management systems	04	Disposal of bio medical wastes	Lecture	C.I.A	Apply L3
5	17CV651.9	Students are to estimate the technique for energy recovery from solid waste	04	Chemical Volume Reduction	Lecture	C.I.A	Apply L3
5	17CV651.10	Students are able to design suitable incineration technique	04	Design criteria for incineration	Lecture	C.I.A	Apply L3
-	**-**	**Total**	**40**	**-**	**-**	**-**	**L2-L3**

2. Course Applications

Write 1 or 2 applications per CO.
Students should be able to employ / apply the course learnings to . . .

Modules	Application Area Compiled from Module Applications.	CO	Level
1	understand solid waste systems	CO1	L2
1	Used to estimate solid waste generation rate	CO2	L2
2	Adopt processing techniques in solid waste management	CO3	L2
2	Used in compaction process	CO4	L2
3	Used in composting process	CO5	L2
3	Used to design sanitary landfill.	CO6	L2
4	Used to design suitable solid waste processing system.	CO7	L2
4	Used to design disposal methods	CO8	L2
5	Used to estimate the technique for energy recovery from solid waste	CO9	L2
5	Used to estimate the technique for energy chemical volume reduction	CO10	L2

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.
To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Modules	Mapping		Mapping Level	Justification for each CO-PO pair	Level
-	**CO**	**PO**	-	**'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment'**	-
1	CO1	PO1	3	Apply the knowledge of science, Engineering fundamentals, to understand solidwaste systems.	L3
1	CO1	PO2	2	Identify the sources of solid waste generation using natural sciences, and Engineering sciences	L2
1	CO2	PO1	1	Apply the knowledge of science, Engineering fundamentals, to understand solidwaste generation rate..	L3
1	CO2	PO2	2	Identify the point of solid waste generation using natural sciences, and Engineering sciences	L2
1	CO2	PO3	2	Design solutions for waste generation problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and environmental considerations.	L1
1	CO2	PO4	1	Analysis and interpretation of data, and synthesis of the information to provide valid conclusions for solid waste generation rate.	L1
1	CO2	PO6	3	Apply reasoning informed by the knowledge waste generation to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Engineering practice	L3
1	CO2	PO7	1	Understand the impact of the solidwaste generation in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.	L1
1	CO2	PO10	1	Communicate effectively on complex waste management activities with the Engineering Community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	L1
2	CO3	PO1	2	Apply the knowledge of science, Engineering fundamentals, a to understand processing techniques involved in solid waste management.	L3
2	CO3	PO2	2	Identify, formulate and analyze volume and size reduction problems of solid waste reaching substantiated conclusions using Engineering sciences	L2
2	CO3	PO3	1	Design solutions for complex processing techniques problems in solid waste and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,	L1
2	CO3	PO6	2	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal issues and the consequent responsibilities relevant to the solidwaste processing practice	L2
2	CO3	PO7	2	Understand the impact of the processing techniques in solid waste management in societal and environmental contexts, and the need for	L1

				sustainable developments.	
2	CO3	PO10	2	Communicate effectively on complex processing activities of solid waste with the Engineering Community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	L1
2	CO4	PO1	3	Apply the knowledge of science, Engineering fundamentals, for composting of solid waste.	L3
2	CO4	PO2	2	Identify, formulate and analyze methods of composting using Engineering sciences	L2
2	CO4	PO3	2	Design solutions for aerobic and anaerobic composting and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	L2
2	CO4	PO6	3	Apply reasoning informed by the knowledge of composting techniques to assess societal, health, safety, and the consequent responsibilities relevant to the Solidwaste management practices	L2
2	CO4	PO7	2	Understand the impact of the composting in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.	L1
2	CO4	PO10	2	Composting techniques communicate effectively on solid waste management activities with the Engineering Community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	L1
3	CO5	PO1	3	Apply the knowledge of mathematics, science, Engineering fundamentals to the solution of disposal of solid waste.	L3
3	CO5	PO2	2	Identify the site for the sanitary land filling for the solid waste disposal.	L2
3	CO5	PO3	2	Design solutions for complex solid waste disposal problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	L2
3	CO5	PO6	2	Apply reasoning informed by the sanitary landfilling knowledge to assess societal, health, safety, legal issues and the consequent responsibilities relevant to the professional Engineering practice	L2
3	CO5	PO7	2	Understand the impact of the sanitary landfilling in ground water, societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.	L1
3	CO6	PO1	3	Apply the knowledge of science, Engineering fundamentals, for hazardous waste management.	L3
3	CO6	PO2	2	Identify point, sources and collection of hazardous waste using natural sciences, and Engineering sciences	L2
3	CO6	PO3	2	Design solutions for complex biomedical, e-waste and construction waste and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, societal, and environmental considerations.	L2
3	CO6	PO4	2	Analysis and interpretation of data, and synthesis of the information to provide valid conclusions for hazardous waste management.	L2
3	CO6	PO6	2	Apply reasoning informed by the knowledge of e-waste and biomedical waste management to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Hazardous waste management practices.	L2
3	CO6	PO7	3	Understand the impact of the sanitary landfilling in ground water, societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.	L2
3	CO6	PO10	2	Identify point, sources and collection of hazardous waste using natural sciences, and Engineering sciences	L2
3	CO6	PO11	2	Design solutions for complex biomedical, e-waste and construction waste and design system components or processes that meet the	L1

				specified needs with appropriate consideration for the public health and safety, societal, and environmental considerations.	
4	CO7	PO1	3	Apply the knowledge of mathematics, science, Engineering fundamentals to the solution of disposal of solid waste.	L3
4	CO7	PO2	2	analysis and interpretation of data, and synthesis of the information to provide valid conclusions for hazardous waste management.	L2
4	CO8	PO1	3	Understand the impact of the hazardous waste in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.	
4	CO8	PO2	2	Hazardous waste management communicate effectively on solid waste management activities with the Engineering Community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	
4	CO8	PO3	1	Demonstrate knowledge of and understanding of the hazardous waste management principles and apply these to one"s own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.	
5	CO9	PO1	3	Apply the knowledge of science, Engineering fundamentals to understand Incineration and pyrolysis	
5	CO9	PO2	2	Identify, formulate, review research literature, and analyze Incineration and pyrolysis reaching substantiated conclusions using natural sciences and Engineering sciences	
5	CO9	PO3	1	Design of municipal incinerator for solid waste management and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	
5	CO10	PO1	3	Apply reasoning informed by the knowledge of incineration and energy recovery from the solid waste to assess societal, health, safety, legal issues and the consequent responsibilities relevant to the professional Engineering practice	
5	CO10	PO2	2	Understand the impact of the incineration and pyrolysis in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.	
5	CO10	PO3	1	Incinerators communicate effectively on solid waste management activities with the Engineering Community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	

4. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Course Outcomes	Program Outcomes														-
Modules	CO.#	**At the end of the course student should be able to . . .**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Level
1	17CV651.1	Students are able to understand the solid waste systems	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	L2
1	17CV651.2	Students are able to estimate solid waste generation rate	3	2	1	1	-	3	1	-	-	1	-	-	-	-	-	L2
2	17CV651.3	Students are able to apply the processing techniques in solid waste management	3	2	1	-	-	2	1	-	-	1	-	-	-	-	-	L2
2	17CV651.4	Students are able to apply the compaction techniques in solid waste management	3	2	2	-	-	2	1	-	-	1	-	-	-	-	-	L3
3	17CV651.5	Students are able to understand the composting process and applly in SWM	3	2	2	-	-	2	1	-	-	-	-	-	-	-	-	L3
3	17CV651.6	Students are able to design	3	2	2	2	-	1	2	-	-	2	1	-	-	-	-	L3

		sanitary landfill.																	
4	17CV651.7	Students are able to design suitable solid waste processing system and disposal methods	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L3
4	17CV651.8	Students are able to design suitable Hazardous waste Management systems	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	L3
5	17CV651.9	Students are to estimate the technique for energy recovery from solid waste	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	L3
5	17CV651.10	Students are able to design suitable incineration technique	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	L3
-	**17CV651**	**Average attainment (1, 2, or 3)**																	
-	*PO, PSO*	*1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design*																	

5. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Modules	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					

6. Content Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Modules	Gap Topic	Area	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1						
1						
2						
2						
3						
3						
4						
4						
5						
5						

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Module #	Title	Teaching Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Sources Collection	08	2	-	-	1	1	2	CO1, CO2	L2, L3

	Transportation									
2	Processing techniques	08	2	-	-	1	1	2	CO3	L2, L2
3	Composting Aerobic and anaerobic method Sanitary landfilling	08	-	2	-	1	1	2	CO4, CO5	L2, L3
4	Sources, collection, treatment and disposal	08	-	2	-	1	1	2	CO6	L3
5	Incineration	08	-	-	4	1	1	2	CO7	L3
-	**Total**	**40**	**4**	**4**	**4**	**5**	**5**	**10**	**-**	**-**

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Modules	Evaluation	Weightage in Marks	CO	Levels
1, 2	CIA Exam – 1	15	CO1, CO2, CO3,Co4	L2,L4,L3,L2
3, 4	CIA Exam – 2	15	CO5, CO6, CO7, Co8	L2,L3,L3,L4
5	CIA Exam – 3	15	CO9, CO10	L2,L2
1, 2	Assignment - 1	05	CO1, CO2, CO3,Co4	L2,L4,L3,L2
3, 4	Assignment - 2	05	CO5, CO6, CO7, Co8	L2,L3,L3,L4
5	Assignment - 3	05	CO9, CO10	L2,L2
1, 2	Seminar - 1		-	-
3, 4	Seminar - 2		-	-
5	Seminar - 3		-	-
1, 2	Quiz - 1		-	-
3, 4	Quiz - 2		-	-
5	Quiz - 3		-	-
1 - 5	Other Activities – Mini Project	-	CO9, CO10	L2,L2
	Final CIA Marks	**40**	**-**	**L3**

D1. TEACHING PLAN - 1

Module - 1

Title:	Solid Waste Management	Appr Time:	08 Hrs
a	***Course Outcomes***	-	**Blooms**
-		-	**Level**
1	Students are able to understand the solid waste systems	CO1	L2
2	Students are able to estimate solid waste generation rate	CO2	L3
b	***Course Schedule***	-	-
Class No	**Module Content Covered**	**CO**	**Level**
1	Sources of Solid waste, Types of solid waste	CO1	L2
2	Physical and Chemical composition of municipal solid waste	CO1	L2
3	Generation rate, Numerical Problems	CO2	L3
4	Collection of solid waste- services and systems, equipments	CO1	L2
5	Transportation: Need of transfer operation, transfer station	CO1	L2
6	transport means and methods	CO1	L2
7	route optimization	CO1	L2
8	Solid waste management 2000 rules with, 2016 amendments.	CO1	L2
c	**Application Areas**	**CO**	**Level**
1	understand solid waste systems	CO1	L2
2	Used to estimate solid waste generation rate	CO2	L3

d	**Review Questions**	-	-
1	List out different sources of Municipal Solid Waste. Explain briefly.	CO1	L2
2	Explain with the aid of neat sketches, Hauled container system and stationary container system of collection of Municipal wastes.	CO1	L2
3	Describe Route Optimization process.	CO1	L2
4	With the aid of schematic of HCS and SCS, explain the terms : pick up hond, at site and off route	CO1	L2
5	What is a transfer station'? Explain factors to be considered in the design of transfer station.	CO1	L2
6	Explain the factors to be considered in container on site process technique.	CO1	L2
7	Briefly explain physical and chemical characteristics of solid waste.	CO1	L2
8	With a neat sketch, explain hauled container system.	CO1	L2
9	Discuss the factors influencing the solid waste generation rates.	CO1	L2
10	Briefly discuss on the various methods used to estimate waste quantities.	CO1	L2
11	Explain the classification of functional elements of a solid waste management system with the help of flow diagram	CO1	L2
e	**Experiences**	-	-
1			
2			
3			
4			
5			

Module – 2

Title:	Solid Waste Management	Appr Time:	08 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Students are able to apply the processing techniques in solid waste management	CO3	L3
b	***Course Schedule***	-	-
Class No	**Module Content Covered**	**CO**	**Level**
1	Processing techniques: Purpose of processing	CO3	L2
2	Chemical volume reduction (incineration) – Process description	CO3	L2
3	3T's	CO3	L2
4	principal components in the design of municipal incinerators	CO3	L2
5	Air pollution control	CO3	L3
6	Mechanical volume reduction (compaction)	CO3	L3
7	Mechanical size reduction (shredding)	CO3	L3
8	component separation (manual and mechanical methods)	CO3	L3
c	**Application Areas**	**CO**	**Level**
1	adopt processing techniques in solid waste management	CO3	L3
d	**Review Questions**		
1	Brief out what do you mean by Mechanical volume reduction and Chemical volume reduction.	CO3	L3
2	Give list of component separation techniques. Explain them	CO3	L3
3	Define Incineration. Sketch and explain a typical Municipal Incinerator.	CO3	L2
4	What are 3T's of Incineration process? Explain.	CO3	L2
5	Explain briefly the following component separation techniques : i) Magnetic separation ii) Air separation.	CO3	L3
6	Write a short note on following; i) Garbage chutes ii)Bailing and Campaction.	CO3	L2

7	What is meant by 'size reduction'? Enumerate the various equipments used and with a neat sketch, explain any one.	CO3	L3
8	Discuss on the factors that must be considered in the design of transfer station.	CO3	L3
e	**Experiences**	-	-
1			
2			
3			
4			
5			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	17CV651	Sem:	6	Marks:	30	Time:	75 minutes
Course:	Solid Waste Management						

-	-	**Note: Answer any 3 questions, each carry equal marks.**	**Marks**	**CO**	**Level**
1	a	List out different sources of Municipal Solid Waste. Explain briefly.	08	CO1	L2
	b	Estimate the moisture content, bulk density and energy content of 1000kg sample Of solid waste with the following composition. Also estimate energy content on dry weight basis and on ash free dry basis. Take ash content as 7 percent	07	CO2	L3
2	a	Define the terms : i) solid waste ii) solid waste management	05	CO1	L2
	b	Explain the classification of functional elements of a solid waste management system with the help of flow diagram	05	CO1	L2
	c	Estimate unit solid waste generation rate for a residential area having 1500 dwellinges with 6 persons per hours. The observation taken for a week at a disposal facility is as follows	05	CO2	L3
3	a	Explain briefly the following processing techniques i) Mechanical volume reduction ii) Mechanical size reduction.	09	CO3	L3
	b	Explain briefly the following component separation techniques : i) Magnetic separation ii) Air separation.	06	CO3	L3
4	a	Write a short note on following; i) Garbage chutes ii)Bailing and Campaction.	08	CO3	L2
	b	With a neat sketch, explain municipal incinerators.	07	CO3	L2

Component	Food waste	Paper	Cardboard	Plastic	Wood
% by mass	45	5	15	15	20
Moisture %	70	06	05	02	20
Bulk density kg/m3	290	85	50	65	240
Energy content kJ/kg	4650	16750	16300	32600	18600

Vehicle	Number of loads	Average volume	density, kg/m3
Truck	10	10	350
Tractor	08	1.5	150
Private vehicle	22	0.3	100

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions

Crs Code:	17CV651	Sem:	6	Marks:	5	Time:	75 minutes
Course:	Solid Waste Management						

Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.

SNo		Assignment Description	Marks	CO	Level
1		List out different sources of Municipal Solid Waste. Explain briefly.	05	CO1	L2
2		Explain with the aid of neat sketches, Hauled container system and stationary container system of collection of Municipal wastes.	05	CO1	L2
3		Describe Route Optimization process.	05	CO1	L2
4		Brief out what do you mean by Mechanical volume reduction and Chemical volume reduction.	05	CO3	L2
5		Give list of component separation techniques. Explain them	05	CO3	L2
6		Define Incineration. Sketch and explain a typical Municipal Incinerator.	05	CO3	L2
7		What are 3T's of Incineration process? Explain.	05	CO3	L2
8		Briefly explain physical and chemical characteristics of solid waste.	05	CO1	L2
9		From the following data estimate the waste generation rate per day for a residential area consisting of 1200 houses. The observation location is a local transfer station that receives all the waste collected for disposal. The observation period is for one week. Assume 5 persons in each house Vehicle type / No. of loads / Vol. of vehicle (m3) / Sp. Wt. of solid waste (kg/m3) Compactor truck / 10 / 15.30 / 296.50 Flat bed load / 08 / 1.53 / 133.40 Private cars/trucks / 25 / 0.23 / 88.90	05	CO2	L3
10		With a neat sketch, explain the operational sequence of Hauled Container System.	05	CO1	L2
11		Estimate the moisture content, bulk density and energy content of 1000kg sample Of solid waste with the following composition. Also estimate energy content on dry weight basis and on ash free dry basis. Take ash content as 7 percent. Component / Food waste / Paper / Cardboard / Plastic / Wood % by mass / 45 / 5 / 15 / 15 / 20 Moisture % / 70 / 06 / 05 / 02 / 20 Bulk density kg/m3 / 290 / 85 / 50 / 65 / 240 Energy content kJ/kg / 4650 / 16750 / 16300 / 32600 / 18600	05	CO2	L3
12		Explain with a neat sketch, working of a municipal incinerator.	05	CO3	L2
13		Explain briefly the following processing techniques i) Mechanical volume reduction ii) Mechanical size reduction.	05	CO3	L3
14		Explain briefly the following component separation	05	CO3	L3

		techniques : i) Magnetic separation ii) Air separation.			
15		Write a short note on following; i) Garbage chutes ii)Bailing and Campaction.	05	CO3	L2
16		With a neat sketch, explain municipal incinerators.	05	CO3	L2
18		Explain the effect of 3T's in incineration process of solid waste.	05	CO3	L2
19		Discuss on the factors that must be considered in the design of transfer station. .	05	CO2	L2
20		List the principal components in the design of large municipal incinerators.	05	CO3	L2

D2. TEACHING PLAN - 2

Module – 3

Title:	Solid Waste Management	Appr Time:	08 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Students are able to understand the composting process and apply in SWM	CO4	L3
2	Students are able to design sanitary landfill.	CO5	L3
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Composting Aerobic and anaerobic method - process description	CO4	L2
2	Process microbiology, design consideration	CO4	L2
3	Mechanical composting, Vermicomposting	CO4	L2
4	Numericals	CO4	L3
5	Sanitary landfilling: Definition, advantages and disadvantages, site selection, methods	CO5	L2
6	Reaction occurring in landfill- Gas and Leachate movement	CO5	L2
7	Control of gas and leachate movement	CO5	L2
8	Design of sanitary landfill	CO5	L3
c	**Application Areas**	**CO**	**Level**
1	Used in composting process	CO4	L3
2	Used to design sanitary landfill.	CO5	L3
d	**Review Questions**	-	-
1	Describe different design components which are to be considered for Aerobic composting process	CO4	L2
2	With the aid of neat sketch, explain the bangalore Process of composting	CO4	L2
3	Explain the various ways of control of gas movement in landfills.	CO4	L2
4	Define leachate and list out the factors that affect the composition of leachate.	CO4	L2
5	Briefly discuss on the difference between Indore and Bangalore process of compositing of municipal solid waste.	CO4	L2
6	Explain the factors that govern the selection of site for Sanitary Land filling	CO5	L2
7	What are the sanitary land filling methods? Explain briefly.	CO5	L2
8	Explain the various ways of control of gas movement in landfills.	CO5	L2
9	With neat sketches, briefly explain the various vent systems used to control the lateral movement of gases in landfill.	CO5	L2
10	With neat sketches, briefly explain the various vent systems used to control the lateral movement of gases in landfill.	CO5	L2
e	**Experiences**	-	-
1		CO1	L2
2			
3			
4		CO3	L3
5			

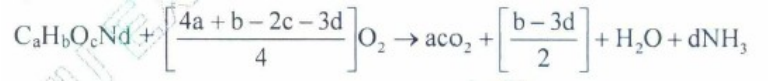
Module – 4

Title:	Solid Waste Management	Appr Time:	08 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Students are able to design suitable solid waste processing system and disposal methods	CO6	L3
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Sources, collection of Biomedical waste	CO6	L2
2	Treatment and disposal of Biomedical waste	CO6	L3
3	Sources, collection of E-waste	CO6	L2
4	Treatment and disposal of E-waste	CO6	L3
5	Sources, collection of Hazardous waste	CO6	L2
6	Treatment and disposal of Hazardous waste	CO6	L3
7	Sources, collection of construction waste	CO6	L2
8	Treatment and disposal of construction waste	CO6	L3
c	**Application Areas**	**CO**	**Level**
1	Used to design suitable solid waste processing system and disposal methods	CO6	L3
d	**Review Questions**	-	-
1	Explain briefly the Biomedical waste classification and disposal.	CO6	L2
2	Write a short note on Plastic waste, its environmental significance and reuse.	CO6	L2
3	Highlight the Open dumping method of disposing Municipal Solid waste with its advantages and disadvantages.	CO6	L2
4	Explain environmental significance of plastic waste.	CO6	L2
5	Define Hazardous waste. Explain briefly about collection and disposal of hazardous waste	CO6	L2
6	Explain the characteristics of Bio - medical waste and its disposal method.	CO6	L2
7	Briefly explain about E - Waste and its environmental significance.	CO6	L2
8	Briefly explain about reuse of construction and demolition waste in Construction Industry.	CO6	L2
9	Outline the importance of recycle and reuse of plastic materials with examples.	CO6	L2
10	List the advantages and disadvantages of open dumping and ocean disposal of solid waste.	CO6	L2
11	Briefly discuss the salient features of "The bio-medical waste (management and handling)Rules, 2000.	CO6	L2
e	**Experiences**	-	-
1			
2			
3			
4			
5			

E2. CIA EXAM – 2

a. Model Question Paper - 2

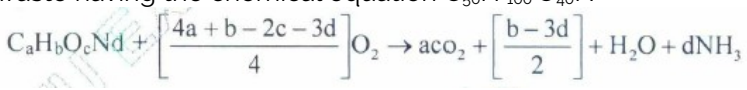
Crs Code:	17CV651	Sem:	6	Marks:	30	Time:	75 minutes
Course:	Solid Waste Management						

-	-	**Note: Answer any 2 questions, each carry equal marks.**	**Marks**	**CO**	**Level**
1	a	Describe different design components which are to be considered for Aerobic composting process	08	CO4	L2
	b	Determine the amount of air required to oxidize one tone of waste having the chemical equation $C_{50}H_{100}O_{40}N$ 	07	CO4	L3
2	a	Explain the factors that govern the selection of site for Sanitary Land filling	08	CO5	L2
	b	What are the sanitary land filling methods? Explain briefly.	07	CO5	L2
3	a	Define Hazardous waste. Explain briefly about collection and disposal of hazardous waste	07	CO6	L2
	b	Explain the characteristics of Bio - medical waste and its disposal method.	08	CO6	L2
4	a	Briefly explain about E - Waste and its environmental significance.	07	CO6	L2
	b	Briefly explain about reuse of construction and demolition waste in Construction Industry.	08	CO6	L2

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	17CV651	Sem:	6	Marks:	5 / 10	Time:	75 minutes
Course:	Solid Waste Management						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo		**Assignment Description**	**Marks**	**CO**	**Level**
1		Describe different design components which are to be considered for Aerobic composting process	05	CO4	L2
2		With the aid of neat sketch, explain the bangalore Process of composting	05	CO4	L2
3		Explain the factors that govern the selection of site for Sanitary Land filling	05	CO5	L2
4		What are the sanitary land filling methods? Explain briefly.	05	CO5	L2
5		Determine the land fill area required for a municipal solid waste management system with a population 50000, given that : i) Solid waste generation = 350gm/person/day. ii)Compacted density of landfill = 504 kg/m3 iii)Average depth of compacted solid wastes = 3m	05	CO5	L3
6		Explain the factors that governs the selection of site for sanitary land filling.	05	CO5	L2
7		Determine the amount of air required to oxidize one tone of waste having the chemical equation $C_{50}H_{100}O_{40}N$ 	05	CO4	L3
8		Explain with neat sketch, Indore process and Bangalore process of composting of municipal solid waste.	05	CO4	L2
9		Determine the landfill area required for municipality with population 50,000. given that. i) Solid waste generation rate = 450 gm/person/day. ii) Compacted density of landfill = 504 kg/m3. iii) Avg. depth of compacted solid work=5mt.	05	CO5	L3

10		Explain the various ways of control of gas movement in landfills.	05	CO5	L2
11		Define leachate and list out the factors that affect the composition of leachate.	05	CO5	L2
12		Explain the area method and trench method of landfilling techniques stating merits and demerits	05	CO5	L2
13		Determine the landfill area required for municipality with a population of 50,000 given that : Solid waste generation = 360 gm/person/day Compacted density of land fill = 504 kg/m3 Average depth of compacted solid waste = 3m,	05	CO5	L3
14		What are the important factors for the design considerations in anaerobic compositing?	05	CO4	L2
15		Briefly discuss on the difference between Indore and Bangalore process of compositing of municipal solid waste.	05	CO4	L2
16		Determine the amounts of oxygen required to oxidize 1 tonne of waste and also to stabilize Ammonia in having the chemical equation : $C_{50}H_{100}O_{40}N$, use equation $C_aH_bO_cN_d + \frac{4a+b-2c+3d}{4}H_2O \rightarrow \frac{4a+b-2c-3d}{8}CH_4 + \frac{4a-b+2c+3d}{8}CO_2 + dNH_3$	05	CO4	L3
17		Enumerate and briefly discuss the factors governing aerobic composting.	05	CO4	L2
18		What is a sanitary landfill? List and explain principal methods used for land-filling and explain in brief	05	CO5	L2
19		With neat sketches, briefly explain the various vent systems used to control the lateral movement of gases in landfill.	05	CO5	L2
20		Explain briefly the Biomedical waste classification and disposal.	05	CO6	L2

D3. TEACHING PLAN - 3

Module – 5

Title:	Solid Waste Management	Appr Time:	08 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Students are to estimate the technique for energy recovery from solid waste	CO7	L3
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Incineration -3Ts	CO7	L2
2	Factor affecting incineration	CO7	L2
3	Types of incinerations	CO7	L2
4	Types of incinerations	CO7	L2
5	Pyrolsis	CO7	L2
6	Design criteria for incineration	CO7	L3
7	Design criteria for incineration	CO7	L3
8	Energy recovery technique from solid waste management	CO7	L3
c	**Application Areas**	**CO**	**Level**
1	Used to estimate the technique for energy recovery from solid waste	CO7	L3
d	**Review Questions**	-	-
1	What is incineration? With help of sketch, incneration processes.	CO7	L2

2	Write note on energy recovery operations of solid wastes	CO7	L2
3	What are 3Ts of incineration process? Explain briefly.	CO7	L2
4	Define Incineration. Explain briefly about air pollution control methods adopted in an incineration process.	CO7	L3
5	What is pyrolysis? With a flow diagram, explain the process of pyrolysis.	CO7	L2
6	Briefly discuss the various factors to be considered is design of an incinerating system.	CO7	L2
e	**Experiences**	-	-
1			
2			
3			
4			
5			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:	17CV651	Sem:	6	Marks:	30	Time:	75 minutes
Course:	Solid Waste Management						

-	-	**Note: Answer any 2 questions, each carry equal marks.**	**Marks**	**CO**	**Level**
1	a	List the principal components in the design of large municipal incinerators.	05	CO7	L2
	b	Differentiate between combustion, pyrolysis and solification. Explain pyrolysis.	10	CO7	L2
2	a	What is incineration? With help of sketch, explain incneration processes.	09	CO7	L2
	b	What are 3Ts of incineration process? Explain briefly.	06	CO7	L2
3	a	Explain briefly about air pollution control methods adopted in an incineration process.	08	CO7	L2
	b	List out different types of incinearators. Explain any one in detail	07	CO7	L2
4	a	Briefly discuss the various factors to be considered is design of an incinerating system.	10	CO7	L2
	b	Write note on energy recovery operations of solid wastes	05	CO7	L2

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	17CV651	Sem:	6	Marks:	5 / 10	Time:	90 – 120 minutes
Course:	Solid Waste Management						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo		**Assignment Description**	**Marks**	**CO**	**Level**
1		Explain Pyrolysis process with applicable to incineration process for Municipal solid waste.	05	CO7	L2
2		Differentiate between combustion, pyrolysis and solification. Explain pyrolysis.	05	CO7	L2
3		What is incineration? With help of sketch, incneration processes.	05	CO7	L2
4		Write note on energy recovery operations of solid wastes	05	CO7	L2
5		What are 3Ts of incineration process? Explain briefly.	05	CO7	L2
6		Define Incineration. Explain briefly about air pollution control	05	CO7	L2

		methods adopted in an incineration process.			
7		What is pyrolysis? With a flow diagram, explain the process of pyrolysis.	05	CO7	L2
8		Briefly discuss the various factors to be considered is design of an incinerating system.	05	CO7	L2
9		List out different types of incinearators. Explain any one in detail	05	CO7	L2
10		List the principal components in the design of large municipal incinerators.	05	CO7	L2
11		With a neat sketch, explain municipal incinerators.	05	CO7	L2
12		Explain Pyrolysis process with applicable to incineration process for Municipal solid waste.	05	CO7	L2
13		Differentiate between combustion, pyrolysis and solification. Explain pyrolysis.	05	CO7	L2
14		What is incineration? With help of sketch, incneration processes.	05	CO7	L2
15		Write note on energy recovery operations of solid wastes	05	CO7	L2
16		What are 3Ts of incineration process? Explain briefly.	05	CO7	L2
17		Define Incineration. Explain briefly about air pollution control methods adopted in an incineration process.	05	CO7	L2
18		What is pyrolysis? With a flow diagram, explain the process of pyrolysis.	05	CO7	L2
19		Briefly discuss the various factors to be considered is design of an incinerating system.	05	CO7	L2
20		List out different types of incinearators. Explain any one in detail	05	CO7	L2

F. EXAM PREPARATION

1. University Model Question Paper

<table>
<tr><td colspan="2">Course:</td><td colspan="4">SOLID WASTE MANAGEMENT</td><td colspan="2">Month / Year</td><td colspan="2">May /2018</td></tr>
<tr><td colspan="2">Crs Code:</td><td>17CV651</td><td>Sem:</td><td>VI</td><td>Marks:</td><td>80</td><td colspan="2">Time:</td><td colspan="2">180 minutes</td></tr>
<tr><td>Module</td><td>Note</td><td colspan="6">Answer all FIVE full questions. All questions carry equal marks.</td><td>Marks</td><td>CO</td><td>Level</td></tr>
<tr><td>1</td><td>a</td><td colspan="6">List out different sources of Municipal Solid Waste. Explain briefly.</td><td>08</td><td>CO1</td><td>L2</td></tr>
<tr><td></td><td>b</td><td colspan="6">Estimate the moisture content, bulk density and energy content of 1000kg sample Of solid waste with the following composition. Also estimate energy content on dry weight basis and on ash free dry basis. Take ash content as 7 percent

<table><tr><td>Component</td><td>Food waste</td><td>Paper</td><td>Cardboard</td><td>Plastic</td><td>Wood</td></tr><tr><td>% by mass</td><td>45</td><td>5</td><td>15</td><td>15</td><td>20</td></tr><tr><td>Moisture %</td><td>70</td><td>06</td><td>05</td><td>02</td><td>20</td></tr><tr><td>Bulk density kg/m3</td><td>290</td><td>85</td><td>50</td><td>65</td><td>240</td></tr><tr><td>Energy content kJ/kg</td><td>4650</td><td>16750</td><td>16300</td><td>32600</td><td>18600</td></tr></table></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="6">OR</td><td></td><td></td><td></td></tr>
<tr><td>-</td><td>a</td><td colspan="6">Define the terms : i) solid waste ii) solid waste management</td><td>05</td><td>CO1</td><td>L2</td></tr>
<tr><td></td><td>b</td><td colspan="6">Explain the classification of functional elements of a solid waste management system with the help of flow diagram</td><td>05</td><td>CO1</td><td>L2</td></tr>
</table>

	c	Estimate unit solid waste generation rate for a residential area having 1500 dwellinges with 6 persons per hours. The observation taken for a week at a disposal facility is as follows	05	CO2	L3

Vehicle	Number of loads	Average volume	density, kg/m3
Truck	10	10	350
Tractor	08	1.5	150
Private vehicle	22	0.3	100

2	a	Explain briefly the following processing techniques i) Mechanical volume reduction ii) Mechanical size reduction.	09	CO3	L3
	b	Explain briefly the following component separation techniques : i) Magnetic separation ii) Air separation.	06	CO3	L3
		OR			
-	a	Write a short note on following; i) Garbage chutes ii)Bailing and Campaction.	08	CO3	L2
	b	Explain the effect of 3T's in incineration process of solid waste.	07	CO3	L2
3	a	Describe different design components which are to be considered for Aerobic composting process	08	CO4	L2
	b	Determine the amount of air required to oxidize one tone of waste having the chemical equation $C_{50}H_{100}O_{40}N$ $C_aH_bO_cNd + \left[\frac{4a+b-2c-3d}{4}\right]O_2 \rightarrow aco_2 + \left[\frac{b-3d}{2}\right] + H_2O + dNH_3$	07	CO4	L3
4	a	Briefly explain about E - Waste and its environmental significance.	07	CO6	L2
	b	Briefly explain about reuse of construction and demolition waste in Construction Industry.	08	CO6	L2
		OR			
-	a	Define Hazardous waste. Explain briefly about collection and disposal of hazardous waste	07	CO6	L2
	b	Explain the characteristics of Bio - medical waste and its disposal method.	08	CO6	L2
5	a	Explain briefly about air pollution control methods adopted in an incineration process.	08	CO7	L2
	b	List out different types of incinearators. Explain any one in detail	07	CO7	L2
		OR			
	a	Briefly discuss the various factors to be considered is design of an incinerating system.	10	CO7	L2
	b	Write note on energy recovery operations of solid wastes	05	CO7	L2

2. SEE Important Questions

Course:	SOLID WASTE MANAGEMENT					Month / Year	May /2018
Crs Code:	17CV651	Sem:	6	Marks:	80	Time:	180 minutes

	Note	Answer all FIVE full questions. All questions carry equal marks.	-	-	
Module	Qno.	Important Question	**Marks**	**CO**	**Year**
1	1	List out different sources of Municipal Solid Waste. Explain briefly.	08	CO1	2015
	2	Estimate the moisture content, bulk density and energy content of 1000kg sample Of solid waste with the following composition. Also estimate energy content on dry weight basis and on ash free dry basis. Take ash content as 7 percent	07	CO2	2016

Component	Food waste	Paper	Cardboard	Plastic	Wood

		% by mass	45	5	15	15	20			
		Moisture %	70	06	05	02	20			
		Bulk density kg/m3	290	85	50	65	240			
		Energy content kJ/kg	4650	16750	16300	32600	18600			
2	1	Explain briefly the following processing techniques i) Mechanical volume reduction ii) Mechanical size reduction.						09	CO3	2017
	2	Explain briefly the following component separation techniques : i) Magnetic separation ii) Air separation.						06	CO3	2015
3	1	Determine the amount of air required to oxidize one tone of waste having the chemical equation $C_{50}H_{100}O_{40}N$ $C_aH_bO_cNd + \left[\frac{4a+b-2c-3d}{4}\right]O_2 \rightarrow aco_2 + \left[\frac{b-3d}{2}\right] + H_2O + dNH_3$						07	CO4	2012
	2	Explain the factors that govern the selection of site for Sanitary Land filling						08	CO5	2010
4	1	Briefly explain about E - Waste and its environmental significance.						07	CO6	2011
	2	Briefly explain about reuse of construction and demolition waste in Construction Industry.						08	CO6	2014
5	1	Briefly discuss the various factors to be considered is design of an incinerating system.						10	CO7	2008
	2	Write note on energy recovery operations of solid wastes						05	CO7	2005

Course Outcome Computation

Academic Year:

Odd / Even semester

INTERNAL TEST	**T1**						**T2**						**T3**			
Course Outcome	**CO1**		**CO 2**		**CO3**		**CO4**		**CO5**		**CO6**		**CO7**		**CO8**	
QUESTION NO	**Q1**	**LV**	**Q2**	**LV**	**Q3**	**LV**	**Q1**	**LV**	**Q2**	**LV**	**Q3**	**LV**	**Q1**	**LV**	**Q2**	**LV**
MAX MARKS																
USN-1																
USN-2																
USN-3																
USN-4																
USN-5																
USN-6																
Average CO Attainment																

LV Threshold : 3:>60%, 2:>=50% and <=60%, 1: <=49%

CO1 Computation :(2+2+2+3)/4 = 10/4=2.5

PO Computation

Program Outcome Weight of CO - PO	PO1		PO3		PO3		PO1		PO12		PO12		PO6		PO1	
Course Outcome	CO1		CO2		CO3		CO4		CO5		CO6		CO7		CO8	
Test/Quiz/Lab	T1						T2						T3			
QUESTION NO	Q1	LV	Q2	LV	Q3	LV	Q1	LV	Q2	LV	Q3	LV	Q1	LV	Q2	LV
MAX MARKS																
USN-1																
USN-2																
USN-3																
USN-4																
USN-5																
USN-6																
Average CO Attainment																