Ref No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY, BANGALORE

COURSE PLAN
Academic Year 2019-20

Program:	B E – Mechanical Engineering
Semester :	4
Course Code:	18ME44
Course Title:	Kinematics of Machines
Credit / L-T-P:	3 / 3-0-0
Total Contact Hours:	44
Course Plan Author:	Dr.K.M.KENCHI REDDY

Academic Evaluation and Monitoring Cell

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Table of Contents

A. COURSE INFORMATION 3
1. Course Overview 3
2. Course Content 3
3. Course Material 4
4. Course Prerequisites 4
5. Content for Placement, Profession, HE and GATE 5
B. OBE PARAMETERS 5
1. Course Outcomes 5
2. Course Applications 6
3. Mapping And Justification 6
4. Articulation Matrix 7
5. Curricular Gap and Content 8
6. Content Beyond Syllabus 8
C. COURSE ASSESSMENT 9
1. Course Coverage 9
2. Continuous Internal Assessment (CIA) 9
D1. TEACHING PLAN - 1 9
Module - 1 9
Module – 2 10
E1. CIA EXAM – 1 11
a. Model Question Paper - 1 11
b. Assignment -1 12
D2. TEACHING PLAN - 2 13
Module – 3 13
Module – 4 14
E2. CIA EXAM – 2 15
a. Model Question Paper - 2 15
b. Assignment – 2 15
D3. TEACHING PLAN – 3 16
Module – 5 16
E3. CIA EXAM – 3 17
a. Model Question Paper - 3 17
b. Assignment – 3 18
F. EXAM PREPARATION 18
1. University Model Question Paper 18
2. SEE Important Questions 19
G. Content to Course Outcomes 20
1. TLPA Parameters 20
2. Concepts and Outcomes: 21

A. COURSE INFORMATION

1. Course Overview

Degree:	ME	Program:	ME

Semester:	II/4 SEM	Academic Year:	2019-2020
Course Title:	KINEMATICS OF MACHINES	Course Code:	18ME44
Credit / L-T-P:	3/3-0-0	SEE Duration:	180 min
Total Contact Hours:	50 Hrs	SEE Marks:	60 Marks
CIA Marks:	40	Assignment	2 / Module
Course Plan Author:	Dr.K.M.KENCHI REDDY	Sign	Dt:
Checked By:	HARENDRA KUMAR .H.V	Sign	Dt:
CO Targets	85%	Program:	ME

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	Content	Teaching Hours	Identified Module Concepts	Blooms Learning Levels
1	Energy and power, forms of energy, primary energy sources, energy flows, world energy production and consumption, Key energy trends in India: Demand, Electricity, Access to modern energy, Energy production and trade, Factors affecting India's energy development, Economy and demographics Policy and institutional framework, Energy prices and afford ability, Social and environmental aspects, Investment	8	Energy resources and scenario	L2
2	Thermal energy storage methods, Energy saving, Thermal energy storage systems, Energy Management: Principles of Energy Management, Energy demand estimation, Energy pricing, Energy Audit: Purpose, Methodology with respect to process Industries, Characteristic method employed in Certain Energy Intensive Industries, Economic Analysis: Scope, Characterization of an Investment Project	10	Energy Management and Analysis	L3
3	Environment: Introduction, Multidisciplinary nature of environmental studies-Definition, scope and importance, Need for public awareness. Ecosystem: Concept, Energy flow, Structure and function of an ecosystem. Food chains, food webs and ecological pyramids, Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems, Ecological succession	8	Environmental and biological structure	L2
4	Environmental Pollution: Definition, Cause, effects, control measures of - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards , Solid waste Management, Disaster management Role of an individual in prevention of pollution, Pollution case studies	8	Environmental pollution and hazards	L2
5	Social Issues and the Environment: Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case Studies. Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act,Forest Conservation Act,.Issues involved in enforcement of environmental legislation	8	Environmental issues and acts	L2
-	**Total**	**42**	-	-

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.)**	-	-
1-5	Textbook for Environmental Studies For Undergraduate Courses of	-	-

	all Branches of Higher Education by University grant commission and Bharathi Vidyapeeth Institute of environment education and Research ,Pune		
2	De, B. K., Energy Management audit & Conservation, 2nd Edition, Vrinda Publication, 2010.		In Lib
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	-	-
3	Murphy, W. R., Energy Management, Elsevier, 2007.Environment pollution control Engineering by C S rao, New Age Internationalism, 2006, reprint 2015, 2nd edition	-	In dept
1-5	Environmental Studies by Dr. Suresh K Dhameja,3rd Edition,S.K.Katariya and sons publications.		
C	**Concept Videos or Simulation for Understanding**		
1	https://www.khanacademy.org › ... › Energy and enzymes		
2	https://www.powermag.com › the-latest-in-thermal-energy-storage		
3	https://www.toppr.com › guides › biology › our-environment › ecosystem		
4	https://www.eartheclipse.co pollution various-types-of-environmental-pollution		
5	https://schooledbyscience.com › environmental-issues		

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	17ME15	Elements of Mechanical Engineering	Knowledge on Non-conventional energy resources	1	-	L2

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.

Modules	Topic / Description	Area	Remarks	Blooms Level
4	Environmental Pollution	Industry and GATE	Seminar on renewable source of energy	L2
5	Social issues in and an environment	Industry and Higher Education	Seminar on controlling pollution and getting awerance in society	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**	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level

		should be able to . . .					
1	17ME562.1	Students should be able to Summarize the basic concept of energy	4	Energy Resources	Lecture	Chalk and board	L2 Understand
1	17ME562.2	Students should be able to understand the energy distribution and Scenario	4	Energy Scenario	Lecture/ Tutorial	Chalk and board	L2 Understand
2	17ME562.3	Students should be able to explain different energy storage system	5	Environmental analysis of energy	Lecture	Chalk and board	L2 Understand
2	17ME562.4	Students should be able to understand the economical analysis of energy	5	Economical analysis of energy	Lecture	Chalk and board	L3 Apply
3	17ME562.5	Students should be able to summarize the basic concept of Environmental studies	4	Environmental studies	Lecture	Chalk and board	L2 Understand
3	17ME562.6	Students should be able to understand the biological system of Environmental	4	Biological systems of environmental system	Lecture/Tutorial	Chalk and board	L2 Understand
4	17ME562.7	Students should be able to identify the various types of environmental pollution	4	Environmental pollution	Lecture/Tutorial	Chalk and board	L2 Understand
4	17ME562.8	Students should be able to understand the effects of environment pollution	4	Pollution hazards	Lecture/Tutorial	Chalk and board	L2 Understand
5	17ME562.9	Students should be able to understand social issues of environment	4	Environmental issues	Lecture	Chalk and board	L2 Understand
5	17ME562.10	Students should be able to discuss environmental acts	4	Environmental acts	Lecture	Chalk and board	L2 Understand
-	-	**Total**	**42**	-	-	-	**L2-L3**

2. Course Applications

Modules	Application Area Compiled from Module Applications.	CO	Level
1	Evaluate the performance of solar energy, wind energy and other renewable energies	CO1	L2
2	Understanding the cumulative achievement in renewable energy sector	CO2	L2
3	Understanding essential technique for thermal applications ranging from heating to cooling, particularly in buildings.	CO3	L3
4	Use energy economic analysis begins with determining the actual variations in technology, climate, maintenance, and end-use applications.	CO4	L3
5	Apply the knowledge of environmental awareness.	CO5	L2
6	Apply the ecosystem approach to an environment assessment .	CO6	L2
7	Apple the environmental pollution control awareness .	CO7	L2
8	Understand the pollution control acts to save the environment pollution.	CO8	L2
9	Understand the awareness of social environmental issues like global worming ozone layer depletion etc.	CO9	L2
10	Understand environmental pollution control acts to spread the awareness.	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	L2	'Engineering Knowledge:'Acquisition of Engineering_Knowledge is required to understand the different performance of basic energy conversion systems_to accomplish solutions to complex engineering_problems in Mechanical Engineering.	L2

1	CO2	PO2	L2	'Problem Analysis': Analyzing problems require knowledge / understanding energy scenario to accomplish solutions to complex engineering problems in Mechanical engineering.	L2
1	CO2	PO7	L2	"Environment and Sustainability:" Understand the impact of professional engineering solutions in social and environmental contexts and demonstrate the knowledge of needs for sustainable needs.	L2
2	CO3	PO1	L3	'Engineering Knowledge:'Acquisition of Engineering_Knowledge is required to understand the energy storage systems in Mechanical Engineering.	L3
2	CO4	PO1	L3	'Engineering Knowledge:'Acquisition environmental studies is required to understand environmental system in Mechanical Engineering.	L3
2	CO4	PO2	L3	'Problem Analysis': Analyzing problems require knowledge / understanding problems in the environmental systems to complex engineering problems in Mechanical engineering.	L3
2	CO4	PO7	L3	"Environment and Sustainability:" Understand the impact of professional engineering solutions in social and environmental contexts and demonstrate the knowledge of needs for sustainable needs	L3
3	CO5	PO1	L2	'Engineering Knowledge:'Acquisition of Engineering_Knowledge is required to understand the basic concept of environmental studies to accomplish solutions to complex engineering problems in Mechanical Engineering.	L3
3	CO5	PO2	L2	'Problem Analysis': Analyzing problems in an environmental studies require knowledge / understanding problems in the eco system in Mechanical engineering.	L2
3	CO6	PO1	L2	'Engineering Knowledge:'Acquisition of Engineering_Knowledge is required to understand the biological systems in an environment to complex engineering problems in Mechanical Engineering.	L2
3	CO6	PO2	L2	'Problem Analysis': Analyzing problems require knowledge / understanding problems in the biological process in an environment.	L2
3	CO6	PO7	L2	"Environment and Sustainability:" Understand the impact of professional engineering solutions in social and environmental contexts and demonstrate the knowledge of needs for sustainable needs	L2
4	CO7	PO1	L2	'Engineering Knowledge:'Acquisition of Engineering_Knowledge is required to understand the various pollution in an environment studies to accomplish solutions to complex engineering problems in Mechanical Engineering.	L2
4	CO7	PO6	L2	"The engineering and Society" understanding the knowledge to assess societal, health, safety in a society and responsibilities relevant to the professional engineering practice.	L2
4	CO7	PO7	L2	"Environment and Sustainability:" Understand the impact of professional engineering solutions in social and environmental contexts and demonstrate the knowledge of needs for sustainable needs	
4	CO8	PO1	L2	'Engineering Knowledge:'Acquisition of Engineering_Knowledge is required to understand the different pollution control acts,to complex engineering_problems in Mechanical Engineering.	L2
4	CO8	PO7	L2	"Environment and Sustainability:" Understand the impact of professional engineering solutions in social and environmental contexts and demonstrate the knowledge of needs for sustainable needs.	L2
4	CO9	PO6	L2	"The engineering and Society" understanding the knowledge to assess social issues in a society and responsibilities relevant to the professional engineering practice.	L2
4	CO9	PO7	L2	"Environment and Sustainability:" Understand the impact of professional engineering solutions in social and environmental contexts and demonstrate the knowledge of needs for social issues.	L2
5	CO10	PO7	L2	"Environment and Sustainability:" Understand the impact of professional engineering solutions in social and environmental contexts and demonstrate the knowledge of environmental acts.	L2
5	CO10	PO8	L2	Ethics: Applying the ethical principals and responsibilities and norms of engineering practice to know the social issues in the environment acts.	L2

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	17ME562.1	Students should be able to	2															L2

		Summarize the basic concept of energy																	Understand
1	17ME562.2	Students should be able to understand the energy distribution and Scenario		3					2										L2 Understand
2	17ME562.3	Students should be able to explain different energy storage system	2																L2 Understand
2	17ME562.4	Students should be able to understand the economical analysis of energy	3	2					1										L3 Apply
3	17ME562.5	Students should be able to summarize the basic concept of Environmental studies	3	2															L2 Understand
3	17ME562.6	Students should be able to understand the biological system of Environmental	3	2					1										L2 Understand
4	17ME562.7	Students should be able to identify the various types of environmental pollution	2					3	1										L2 Understand
4	17ME562.8	Students should be able to understand the effects of environment pollution	3						2										L2 Understand
5	17ME562.9	Students should be able to understand social issues of environment						3	2										L2 Understand
5	17ME562.10	Students should be able to discuss environmental acts							3	2									L2 Understand
-	**17ME562**	**Average attainment (1, 2, or 3)**																	-

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
2	Energy management and Audit	NPTEL Videos	-	-	PO3
4	Public awerance in an environment	NPTEL Videos	-	-	PO5

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	Different forms of energy and there functions	Placement, GATE, Higher Study, .	Presentation	30/08/2019	Self	PO1

3	Food chain and Food web	Placement, Higher Study	Presentation	9/9/2019	Self	PO6

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.

Modules	Title	Teach. Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Basic Introduction to Energy	8	2	-	-	1	1	2	CO1, CO2	L2, L2
2	Energy storage and management system	10	-	-	4	1	1	2	CO3, CO4	L2, L3
3	Environmental and Ecosystem	8	2	-	-	1	1	2	CO5, CO6	L2, L2
4	Environmental pollution	8	-	2	-	1	1	2	CO7, C08	L2, L2
5	Social issues and environment	8	-	2		1	1	2	CO9, CO10	L2, L2
-	**Total**	42	**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	30	CO1, CO2, CO3, CO4	L2, l2, l2, l2
3, 4	CIA Exam – 2	30	CO5, CO6, CO7, C08	L1, L3, L2, L2
5	CIA Exam – 3	30	CO9, CO10	L2, L2
1, 2	Assignment - 1	10	CO1, CO2, CO3, CO4	L2, L2, L2, L2
3, 4	Assignment - 2	10	CO5, CO6, CO7, CO8	L1, L2, L2, L1
5	Assignment - 3	10	CO9, CO10	L2, L2
1, 2	Seminar - 1	-		
3, 4	Seminar - 2	-		L2, L2, L2 . ..
5	Seminar - 3	-	-	-
	-	-	-	-
	Final CIA Marks	**40**	**CO1 to CO10**	**L2,L3**

D1. TEACHING PLAN - 1

Module - 1

Title:	**Basic Introduction to Energy:**	Appr Time:	8 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Students should be able to Summarize the basic concept of energy	CO1	L2
2	Students should be able to understand the energy distribution and Scenario	CO2	L2
b	***Course Schedule***	-	-
Class No	**Module Content Covered**	**CO**	**Level**
1	Energy and power,	C01	L2
2	forms of energy, primary energy sources, energy flows	C01	L2
3	world energy production and consumption,	C01	L2
4	Key energy trends in India	C01	L2
5	Demand, Electricity, Access to modern energy	CO2	L2
6	Energy production and trade	CO2	L2

7	Factors affecting India's energy development	CO2	L2
8	Economy and demographics Policy and institutional framework	CO2	L2
9	Energy prices and afford ability	CO2	L2
10	Social and environmental aspects, Investment	CO2	L2
c	**Application Areas**	**CO**	**Level**
1	Evaluate the performance of solar energy, wind energy	CO1	L2
2	Understanding the cumulative achievement in renewable energy sector	CO2	L2
d	**Review Questions**	-	-
-		-	-
1	Interpret World Energy Scenario with respect to production and consumption using relevant statistics.	CO2	L2
2	Explain Energy and Power.	CO1	L2
3	Explain the various key energy trends in India.	CO2	L2
4	Outline the factors that affect India's energy development.	CO2	L2
5	With relevant statistics, enumerate the primary energy production trend for India.	CO2	L2
6	Outline the factors that affect India's energy development.	CO2	L2
7	Define Energy and Power. Differentiate the same.	CO1	L2
8	Differentiate the energy and power	CO1	L2
9	Write a short note on forms of energy	CO1	L2
10	Write a short note on primary energy sources	CO1	L2
11	Explain word energy production and consumption	CO1	L2
12	Write a short notes on demand of electricity .	CO1	L2
13	Write a short notes on modern energy system.	CO1	L2
14	Di scribe the factors effecting Indians energy development	CO2	L2
15	Explain economy and demographics policy of energy system	CO2	L2
16	Write a short notes on energy prices and affordability.	CO2	L2
17	Di scribe social and environmental aspects	CO2	L2
18	Write a short note on investment projects of energy system	CO2	L2
e	**Experiences**		
1			
2			
3			
4			
5			

Module – 2

Title:	**Energy storage systems**	Appr Time:	8Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-		-	**Level**
1	Students should be able to explain different energy storage system	CO3	L2
2	Students should be able to understand the economical analysis of energy	CO4	L3
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
11	Thermal energy storage methods	CO3	L2
12	Energy saving, Thermal energy storage systems	CO3	L2
13	Energy Management, Principles of Energy Management	CO3	L2
14	Energy demand estimation, Energy pricing	CO4	L3
15	Energy Audit: Purpose,	CO4	L3
16	Methodology with respect to process Industries,	CO4	L3
17	Characteristic method employed in Certain Energy Intensive Industries,	CO4	L3
18	Economic Analysis: Scope,	CO4	L3
19	Characterization of an Investment Project	CO4	L3
c	**Application Areas**	**CO**	**Level**
1	Understanding essential technique for thermal applications ranging from heating to cooling, particularly in buildings.	CO3	L3
2	Use energy economic analysis begins with determining the actual ... variations in technology, climate, maintenance, and end-use applications.	CO4	L4

d	**Review Questions**		
-	The attainment of the module learning assessed through following questions	-	-
1	Explain in the detail the various phases of energy audit methodology	CO3	L1
2	Calculate the cost of generation per kWh for a power station having the following data: Installed capacity of the plant = 200 MW Capital cost = Rs 400 crores Rate of interest and depreciation = 12% Annual cost of fuel, salaries and taxation = Rs 5 crores Load factor = 50% Also estimate the saving in cost per kWh if the annual load factor is raised to 60%	CO4	L3
3	Elaborate the benefits of thermal energy storage	CO3	L2
4	Explain in the detail the various phases of energy audit methodology.	CO4	L4
5	List the various thermal energy storage methods.	CO4	L2
6	Explain sensible heat and latent heat storage methods.	CO3	L5
7	Define Energy audit.	CO3	L2
8	Write a short note on energy demand estimation	CO3	L3
9	Explain the need for energy audit.	CO4	L2
10	Write a short note on energy storing methods.	CO4	L2
11	Explain the principles of energy management system	CO4	L2
12	Write a shot notes on energy demand estimation	CO4	L2
13	Explain short note on energy pricing.	CO4	L2
14	Elaborate purpose of energy audit method	CO4	L2
15	Explain short note on methodology of energy audit	CO4	L2
16	Explain short note on characteristic method employed in energy intensive industries.	CO4	L2
17	Write a shot notes on scope of economic analysis.	CO4	L2
18	Write a shot notes on characterization of economical analysis	CO4	L2
e	**Experiences**		
1			
2			
3			
4			
5			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	17ME562	Sem:	5	Marks:	30	Time:	75 minutes		
Course:	Energy and environment								
-	-	**Note: Answer all questions, each carry equal marks. Module : 1, 2**					**Marks**	**CO**	**Level**
1	a	Explain Energy and Power with example.					5	CO1	L1
	b	Write a short note on forms of energy					5	CO1	L2
	c	Write a short note on primary energy sources					5	CO1	L3
		or							L1
2	a	Di scribe the factors effecting Indians energy development					5	CO2	L2
	b	Explain economy and demographics policy of energy system					5	CO2	L4
	c	Write a short notes on energy prices and affordability.					5	CO2	L3
		or							
3	a	Explain sensible heat and latent heat storage methods.					5	CO3	L1
	b	Write a short note on Energy audit.					5	CO3	L2
	c	Write a short note on energy demand estimation					5	CO3	L1
		or							
4	a	Explain the need for energy audit.					5	CO4	L2
	b	Write a short note on energy storing methods.					5	CO4	L2
	c	Explain the principles of energy management system					5	CO4	L1

b. Assignment -1

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

Model Assignment Questions							
Crs Code:	17ME562	Sem:	V	Marks:	10	Time:	90 – 120 minutes
Course:	Energy and environment				Module : 1, 2		
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Interpret World Energy Scenario with respect to production and consumption using relevant statistics.	10	CO2	L2
2		Explain Energy and Power with suitable examples.	10	CO1	L2
3		Discuss the various key energy trends in India.	10	CO2	L2
4		Outline the factors that affect India's energy development.	10	CO2	L2
5		Discuss the primary energy production trend for India.	10	CO1	L2
6		Outline the factors that affect India's energy development.	10	CO2	L2
7		Collect data of the energy and power treads in India .	10	CO1	L2
8		Differentiate the energy and power	10	CO1	L2
9		Discuss the different forms of energy and which form of energy is more using in India.	10	CO1	L2
10		Collect the data of utilization of primary energy sources in world.	10	CO1	L2
11		Write a word energy production and consumption	10	CO2	L2
12		Collect the data of demand of electricity necessary for economical development .	10	CO2	L2
13		Modern energy system is satisfy the energy demand in India? Give justification.	10	CO2	L2
14		Di scribe the factors effecting Indians energy development	10	CO2	L2
15		Explain economy and demographics policy of energy system	10	CO2	L2
16		Write a short notes on energy prices and formability.	10	CO1	L2
17		Describe social and environmental aspects	10	CO1	L2
18		Write a short note on investment projects of energy system	10	CO2	L2
19		Explain in the detail the various phases of energy audit methodology	10	CO4	L2
20		Calculate the cost of generation per kWh for a power station having the following data: Installed capacity of the plant = 200 MW Capital cost = Rs 400 crores Rate of interest and depreciation = 12% Annual cost of fuel, salaries and taxation = Rs 5 crores Load factor = 50% Also estimate the saving in cost per kWh if the annual load factor is raised to 60%	10	CO4	L3
21		Collect the places where thermal energy storage system is implemented in India.	10	CO3	L2
22		Discuss the factors effecting various phases of energy audit methodology.	10	CO3	L2
23		List the various thermal energy storage methods.	10	CO3	L2
24		Explain sensible heat and latent heat storage methods.	10	CO3	L2
25		Write a short note Energy audit.	10	CO3	L2
26		Write a short note on energy demand estimation	10	CO3	L2
27		Explain the need for energy audit in present scenario.	10	CO3	L2
28		Discuss the energy storing methods.	10	CO3	L2
29		Explain the principles of energy management system	10	CO3	L2
30		Write a shot notes on energy demand estimation	10	CO4	L2
31		Explain short note on energy pricing.	10	CO4	L2
32		Elaborate purpose of energy audit method	10	CO3	L2
33		Discuss the methodology of energy audit system in industries.	10	CO3	L2
34		Explain short note on characteristic method employed in energy intensive industries.	10	CO4	L2
35		Write a scope of economic analysis of energy.	10	CO4	L2
36		Write a shot notes on characterization of economical analysis	10	CO4	L2

D2. TEACHING PLAN - 2

Module – 3

Title:	**Environment**	Appr Time:	8 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to	-	**Level**
1	Students should be able to summarize the basic concept of Environmental studies	CO5	L2
2	Students should be able to understand the biological system of Environmental	CO6	L3
b	***Course Schedule***		
Class No	**Portion covered per hour**	-	-
1	Environment: Introduction, Multidisciplinary nature of environmental studies	CO5	L2
2	Definition, scope and importance, Need for public awareness.	CO5	L2
3	Ecosystem: Concept, Energy flow	CO5	L2
4	Structure and function of an ecosystem	CO5	L2
5	Food chains, food webs Ecological pyramids	CO6	L2
6	Forest ecosystem Grassland ecosystem	CO6	L2
7	Desert ecosystem and Aquatic ecosystems	CO6	L2
8	Ecological succession	CO6	L2
c	**Application Areas**	-	-
-	Students should be able employ / apply the Module leanings to .	-	-
1	Apply the knowledge of environmental awareness.	CO5	L2
2	Apply the ecosystem approach to an environment assessment .	CO6	L2
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	What is an ecosystem?	CO6	L2
2	Discuss how oxygen cycle is utilized in the ecosystem.	CO6	L2
3	Write a short note on ecological succession .	CO6	L2
4	Elaborate how the nitrogen cycle ecosystem operates.	CO6	L2
5	Enumerate the utilization of carbon in ecosystem.	CO6	L2
6	Describe grassland ecosystem.	CO6	L2
7	Discuss how oxygen cycle is utilized in the ecosystem.	CO6	L2
8	Define Environment. Mention its scope.	CO5	L2
9	Discuss the need for public awareness.	CO5	L2
10	What are the types of grassland ecosystem ?	CO6	L2
11	How conservation of grassland can be made.	CO6	L2
12	Explain the food chain process.	CO6	L2
13	Write a short note on food web.	CO6	L2
14	Explain the ecological pyramid.	CO6	L2
15	Discuss forest ecosystem.	CO6	L2
16	Explain how conservation of forest can be done.	CO6	L2
17	Explain the desert ecosystem.	CO6	L2
18	Write a short note on aquatic ecosystem..	CO6	L2
19	Explain ecological succession.	CO6	L2
20	Write a short note on importance of environmental studies.	CO5	L2
21	Explain scope of environmental studies.	CO5	L2
e	**Experiences**		
1			
2			
3			

4			
5			

Module – 4

Title:	**Environmental Pollution:**	Appr Time:	8 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Students should be able to summarize the basic concept of Environmental studies	CO7	L2
2	Students should be able to understand the biological system of Environmental	CO8	L3
b	***Course Schedule***		
Class No	**Portion covered per hour**	-	-
1	Environmental Pollution, Cause, effects	CO7	L2
2	control measures of - Air pollution,	CO7	L2
3	Water pollution, Soil pollution	CO7	L2
4	Marine pollution, Nuclear hazards	CO7	L2
5	Noise pollution, Thermal pollution	CO7	L2
6	Solid waste Management	CO7	L2
7	Disaster management Role of an individual in prevention of pollution	CO7	L2
8	Pollution case studies.	CO8	L2
c	**Application Areas**	-	-
-	Students should be able employ / apply the Module leanings to.	-	-
1	The environmental pollution control awareness .	CO7	L2
2	Understand the pollution control acts to save the environment pollution.	CO8	L2
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Enumerate the water pollution causes and its effects.	CO7	L2
2	Discuss any two case studies related to pollution of environment in detail	CO7	L2
3	Elaborate the control measures of Soil Pollution	CO8	L2
4	Elaborate the control measures Noise Pollution	CO8	L2
5	Elaborate the control measures Thermal Pollution	CO8	L2
6	Discuss Solid Waste Management techniques	CO8	L2
8	Mention the control measures that can be initiated for environment pollution	CO8	L2
9	Elaborate the causes, effects Soil Pollution	CO7	L2
10	Elaborate the causes, effects Noise Pollution	CO7	L2
11	Elaborate the causes, effects Thermal Pollution	CO7	L2
12	Enumerate the role of an individual in prevention of pollution	CO8	L2
13	Discuss the pollution case studies	CO8	L2
e	**Experiences**		
1			
2			
3			
4			
5			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:	17ME562	Sem:	V	Marks:	30	Time:	75 minutes		
Course:	Energy Environment								
-	**-**	**Note: Answer all questions, each carry equal marks. Module : 3, 4**					**Marks**	**CO**	**Level**
1	a	Define Environment. Mention its scope.					15	CO5	L2
	b	Discuss the need for public awareness.						CO5	L2
	c	Write a short note on importance of environmental studies.						CO5	L2

		or			
2	a	Discuss how oxygen cycle is utilized in the ecosystem.	15	CO6	L2
	b	Write a short note on ecological succession .		CO6	L2
	c	Elaborate how the nitrogen cycle ecosystem operates.		CO6	L2
		or			
3	a	Elaborate the causes, effects Soil Pollution	15	CO7	L2
	b	Elaborate the causes, effects Noise Pollution		CO7	L2
	c	Elaborate the causes, effects Thermal Pollution		CO7	L2
		or			
4	a	Enumerate the role of an individual in prevention of pollution	15	CO8	L2
	b	Discuss the pollution case studies		CO8	L2
	c	Elaborate the control measures of Soil Pollution		CO8	L2

b. Assignment – 2

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

Model Assignment Questions							
Crs Code:	17ME562	Sem:	V	Marks:	10	Time:	90 – 120 minutes
Course:	Energy Environment				Module : 3, 4		
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Discuss about ecosystem?	10	CO6	L1
2		Discuss how oxygen cycle is utilized in the ecosystem.	10	CO6	L2
3		Write a short note on ecological succession .	10	CO6	L2
4		Elaborate how the nitrogen cycle ecosystem operates.	10	CO6	L2
5		Enumerate the utilization of carbon in ecosystem.	10	CO6	L2
6		Describe grassland ecosystem& write its uses.	10	CO6	L2
7		Discuss how oxygen cycle is utilized in the ecosystem.	10	CO6	L2
8		Elaborate Environment. Mention its scope.	10	CO5	L2
9		Discuss the need for public awareness for pollution control.	10	CO5	L2
10		What are the types of grassland ecosystem ?	10	CO6	L2
11		How conservation of grassland can be made.	10	CO6	L2
12		Explain the food chain process with examples.	10	CO6	L2
13		Write a short note on food web.	10	CO6	L2
14		Explain the ecological pyramid.	10	CO6	L2
15		Discuss forest ecosystem.	10	CO6	L2
16		Explain how conservation of forest can be done.	10	CO6	L2
17		Explain the desert ecosystem.	10	CO6	L2
18		Write a short note on aquatic ecosystem with examples.	10	CO6	L2
19		Explain ecological succession.	10	CO6	L2
20		Write a short note on importance of environmental studies.	10	CO5	L2
21		Explain scope of environmental studies.	10	CO5	L2
22		Enumerate the water pollution causes and its effects with controlling measure.	10	CO7	
23		Discuss any two case studies related to pollution of environment in detail	10	CO7	L2
24		Elaborate the control measures of Soil Pollution	10	CO7	L2

D3. TEACHING PLAN – 3

Module – 5

Title:	**Social Issues and the Environment:**	Appr Time:	8Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Students should be able to understand social issues of environment	CO9	L2
2	Students should be able to discuss environmental acts	CO10	L2
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
1	Social Issues and the Environment:		

2	Climate change	CO9	L2
3	Global warming	CO9	L2
4	Acid rain, ozone layer depletion	CO9	L2
5	Nuclear accidents and holocaust,	CO9	L2
6	Case Studies.	CO9	L2
7	Wasteland reclamation	CO9	L2
8	Consumerism and waste products	CO9	L2
9	Environment Protection Act,	CO10	L2
10	Air (Prevention and Control of Pollution) Act,	CO10	L2
11	Water (Prevention and control of Pollution) Act,	CO10	L2
12	Wildlife Protection Act	CO10	L2
13	Forest Conservation Act,	CO10	L2
14	Issues involved in enforcement of environmental legislation	CO10	L2
c	**Application Areas**	-	-
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Understand the awareness of social environ mental issues like global worming ozone layer depletion etc.	CO10	L2
2	Understand environmental pollution control acts to spread the awareness.	CO9	L2
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	What is acid rain? What are its effects?	CO9	L2
2	Explain the salient features of Air Pollution act.	CO10	L2
3	Explain about Environment Impact Assessment (EIA)	CO10	L2
4	Discuss (i) Wildlife Protection act (ii) Forest Conservation act	CO10	L2
5	Write a note on ozone layer depletion	CO10	L2
6	Express the need for reclaiming the wasteland and its development	CO9	L2
7	What are the regulations governing water pollution prevention act?	CO10	L2
8	Enumerate the impact of global warming on our mother nature.	CO9	L2
9	Write short note on climate change in environmental issues.	CO9	L2
10	Describe global worming effects.	CO9	L2
11	Explain the concept of acid rain.	CO9	L2
12	Write a short note on ozone layer depletion.	CO9	L2
13	Explain the nuclear accident and holocaust	CO9	L2
14	Di scribe any 3 case studies of social issues of environmental studies.	CO9	L2
15	Write a short note on waste land reclamation.	CO9	L2
16	Explain the concept of Consumerism and waste products	CO9	L2
17	Write a short note on Environment Protection Act	CO10	L2
18	Write a short note on Air (Prevention and Control of Pollution) Act,	CO10	L2
19	Write a short note on water (Prevention and Control of Pollution) Act,	CO10	L2
20	Write a short note on wildlife (Prevention and Control of Pollution) Act,	CO10	L2
21	Write a short note on forest conservation (Prevention and Control of Pollution) Act,	CO10	L2
22	Write a short note on issues involved in enforcement of environmental legislation	CO10	L2
e	**Experiences**		
1			
2			
3			
4			
5			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:	17ME562	Sem:	V	Marks:	30	Time:	75 minutes		
Course:	ENERGY ENVIRONMENT								
-	-	**Note: Answer any 2 questions, each carry equal marks.**					**Marks**	**CO**	**Level**
1	a	Write short note on climate change in environmental issues.					15	CO9	L2
	b	Describe global worming effects.						CO9	L2
	C	Explain the concept of acid rain.						CO9	L2

		or			
2	a	Write a short note on ozone layer depletion.	15	CO9	L2
	b	Explain the nuclear accident and holocaust		CO9	L2
	C	Di scribe any 3 case studies of social issues of environmental studies.		CO9	L2
		or			
3	a	Write a short note on Environment Protection Act	15	CO10	L2
	b	Write a short note on Air (Prevention and Control of Pollution) Act,		CO10	L2
	C	Write a short note on water (Prevention and Control of Pollution) Act,		CO10	L2
		or			
4	a	Write a short note on wildlife (Prevention and Control of Pollution) Act,	15	CO10	L2
	b	Write a short note on forest conservation (Prevention and Control of Pollution) Act,		CO10	L2
	C	Write a short note on issues involved in enforcement of environmental legislation		CO10	L2

b. Assignment – 3

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

Model Assignment Questions							
Crs Code:	17ME562	Sem:	V	Marks:	10	Time:	90 – 120 minutes
Course:	HEAT TRANSFER				Module : 5		
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		What is acid rain? What are its effects?	10	CO9	L2
2		Explain the salient features of Air Pollution act.	10	CO10	L2
3		Explain about Environment Impact Assessment (EIA)	10	CO10	L2
4		Discuss (i) Wildlife Protection act (ii) Forest Conservation act	10	CO10	L2
5		Write a note on ozone layer depletion	10	CO10	L2
6		Express the need for reclaiming the wasteland and its development	10	CO9	L2
7		What are the regulations governing water pollution prevention act?	10	CO10	L2
8		Enumerate the impact of global warming on our mother nature.	10	CO9	L2
9		Write short note on climate change in environmental issues.	10	CO9	L2
10		Describe global worming effects.	10	CO9	L2
11		Explain the concept of acid rain.	10	CO9	L2
12		Write a short note on ozone layer depletion.	10	CO9	L2
13		Explain the nuclear accident and holocaust	10	CO9	L2
14		Di scribe any 3 case studies of social issues of environmental studies.	10	CO9	L2
15		Write a short note on waste land reclamation.	10	CO9	L2
16		Explain the concept of Consumerism and waste products	10	CO9	L2
17		Write a short note on Environment Protection Act	10	CO10	L2
18		Write a short note on Air (Prevention and Control of Pollution) Act,	10	CO10	L2
19		Write a short note on water (Prevention and Control of Pollution) Act,	10	CO10	L2
20		Write a short note on wildlife (Prevention and Control of Pollution) Act,	10	CO10	L2
21		Write a short note on forest conservation (Prevention and Control of Pollution) Act,	10	CO10	L2
22		Write a short note on issues involved in enforcement of environmental legislation	10	CO10	L2

F. EXAM PREPARATION

1. University Model Question Paper

Course:		ENERGY AND ENVIRONMENT					Month / Year		May /2019
Crs Code:		17ME562	Sem:	V	Marks:	100	Time:		180 minutes
Module	**Note**	Answer all FIVE full questions. All questions carry equal marks.					**Marks**	**CO**	**Level**
1	a	Explain briefly on World Energy Scenario with respect to production and consumption using relevant statistics					10	CO2	L2
	b	Define Energy and Power. Differentiate the same.					10	CO1	L2
		OR							
1	a	Di scribe the various energy trends in India					10	CO2	L2
	b	Elaborate the primary energy sources and various types of energy flows.					10	CO1	L2
2	a	Elaborate in the detail the various phases of energy audit methodology.					10	CO4	L2
	b	List the various thermal energy storage methods.					10	CO3	L2
		OR							
2	a	Define Energy audit. Explain the need for energy audit.					10	CO4	L2
	b	Write a short note on economic analysis of energy storage system.					10	CO4	L2
3	a	What is an ecosystem? Discuss forest ecosystem. Explain how conservation of forest can be done					10	CO6 CO5	L2
	b	Discuss how food chin and food web utilized in the ecosystem					10	CO6	L2
		OR							
		Write a short note on (i) ecological succession (ii) desert ecosystem					10	CO6	L2
3	a	Elaborate how the aquatic ecosystem operates					10	CO6	L2
	b								
		Discuss briefly the causes, effects of air pollution					10	CO7	L2
4	a	Explain the Solid Waste Management techniques.					10	CO8	L2
	b	**OR**							
		Elaborate the causes, effects and control measures of (i) Soil Pollution (ii) Noise Pollution					10	CO7	L2
							10	CO8	L2
4	a	Enumerate the any five case studies of pollution							
	b	What is acid rain? What are its effects?					6	CO9	L2
	c	Explain the salient features of Air Pollution act					10	CO10	L2
		OR							
5	a	Explain about Environment Impact Assessment (EIA)					8	CO10	L2
	b	Discuss (i) Ozone layer depletion (ii) waste and reclamation					8	CO9	L2

2. SEE Important Questions

Course:		ENERGY AND ENVIRONMENT					Month / Year		May /2019
Crs Code:		17ME562	Sem:	V	Marks:	100	Time:		180 minutes
	Note	Answer all FIVE full questions. All questions carry equal marks.					-	-	
Module	Qno.	Important Question					**Marks**	**CO**	**Year**
1	1	Interpret World Energy Scenario with respect to production and consumption using relevant statistics.					10	CO2	2016
	2	Define Energy and Power. Differentiate the same					8	CO1	2016
	3	Explain the various key energy trends in India.					6	CO2	2016
	4	Outline the factors that affect India's energy development					8	CO2	2016
		With relevant statistics, enumerate the primary energy production trend for India.					8	CO1	2017
2	1	Explain in the detail the various phases of energy audit methodology					8	CO4	2016
	2	List the various thermal energy storage methods. Explain sensible heat and latent heat storage methods					10	CO3	2016
	3	Define Energy audit. Explain the need for energy audit.					8	CO4	2015
	4	Write a short note on energy demand estimation.					8	CO3	2015
	5	Explain in the detail the various phases of energy audit methodology					8	CO4	2016

3	1	What is an ecosystem? Discuss forest ecosystem. Explain how conservation of forest can be done.	8	CO6	2016
	2	Discuss how oxygen cycle is utilized in the ecosystem.	8	CO6	2016
	3	Write a short note on (i) ecological succession (ii) food chain, food web and ecological pyramid	8	CO6	2016
	4	Elaborate how the nitrogen cycle ecosystem operates	8	CO6	2015
		Describe grassland ecosystem. What are its types? How conservation of grassland can be made.	8	CO6	2015
4	1				
	2	Enumerate the water pollution causes and its effects. Mention the control measures that can be initiated for mitigating the same	8	CO7 CO8	2016
	3	Discuss any two case studies related to pollution of environment in detail	8	CO8	2016
5	1	Elaborate the causes, effects and control measures of (i) Soil Pollution (ii) Noise Pollution (iii) Thermal Pollution	8	CO7	2016
	2	Discuss Solid Waste Management techniques.	8	CO8	2016
	3	Enumerate the role of an individual in prevention of pollution.	8	CO7	2015
	4				
		What is acid rain? What are its effects?	6	CO9	2015
		Explain the salient features of Air Pollution act	10	CO10	2015
		Explain about Environment Impact Assessment (EIA)	8	CO9	2015
		Discuss (i) Wildlife Protection act (ii) Forest Conservation act	8	CO10	2015
		Enumerate the impact of global warming on our mother nature	8	CO9	2016

G. Content to Course Outcomes

1. TLPA Parameters

Table 1: TLPA – Example Course

Module- #	Course Content or Syllabus	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	Energy and power, forms of energy, primary energy sources, energy flows, world energy production and consumption, Key energy trends in India: Demand, Electricity, Access to modern energy,	3	L2	L2	Understand	Chalk and board	Assignment
1	Energy production and trade, Factors affecting India's energy development, Economy and demographics Policy and institutional framework, Energy prices and afford ability, Social and	5	L2	L2	Understand	Chalk and board	Assignment

	environmental aspects, Investment						
2	Thermal energy storage methods, Energy saving, Thermal energy storage systems, Energy Management: Principles of Energy Management, Energy demand estimation, Energy pricing,	5	L3	L3	Understand	Chalk and board	Assignment
2	Energy Audit: Purpose, Methodology with respect to process Industries, Characteristic method employed in Certain Energy Intensive Industries, Economic Analysis: Scope, Characterization of an Investment Project	5	L3	L3	Understand	Chalk and board	Assignment
3	Environment: Introduction, Multidisciplinary nature of environmental studies-Definition, scope and importance, Need for public awareness.	3	L2	L2	Understand	Chalk and board	Assignment
3	Ecosystem: Concept, Energy flow, Structure and function of an ecosystem. Food chains, food webs and ecological pyramids, Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems, Ecological succession	5	L2	L2	Understand	Chalk and board	Assignment
4	Environmental Pollution: Definition, Cause, effects, control measures of - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards ,	5	L2	L2	Understand	Chalk and board	Assignment
4	Solid waste Management, Disaster management Role of an individual in prevention of pollution, Pollution case studies	3	L2	L2	Understand	Chalk and board	Assignment
5	Social Issues and the Environment: Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust,	4	L2	L2	Understand	Chalk and board	Assignment
5	Case Studies. Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act,.Issues involved in enforcement of environmental legislation	4	L2	L2	Understand	Chalk and board	Assignment

2. Concepts and Outcomes:

Table 2: Concept to Outcome – Example Course

Module-#	Learning or Outcome from study of the Content or Syllabus	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content / Syllabus. A short word for learning or outcome)	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology, 4.Benchmark)	Course Outcome **Student Should be able to ...**
A	*I*	*J*	*K*	*L*	*M*	*N*
1	-Energy and power, forms of energy -world energy production and consumption, -Key energy trends in India Demand, Electricity, Access to modern energy,	-Energy resources and scenario	Energy resources and scenario	Energy trends in India	- Understand -Key energy trends in india	Understand the basic concept of energy
2	-Thermal	-Energy	Energy	Energy storage	- Understand	Understand the different

	energy storage methods, Energy Management, Audit	Management and Analysis -	Management and Analysis	methods and Management	- Energy management and auditing	energy storage systems and there management and auditing
3	-Ecosystem: Concept, Energy flow, Structure and function of an ecosystem. Food chains, food webs and ecological pyramids, Forest ecosystem,	Environmental and biological structure	Environmental and biological structure	Scenario of an environment and Biological structure	- Understand Structure of an environment and Biological structure	Understand the basic concept of Environmental studies and biological system of Environmental
4	-Environmental Pollution: Definition, Cause, effects, control measures of - Air , Water , Soil, Marine, Noise, Thermal pollution and Nuclear hazards ,	Environmental pollution and hazards	Environmental pollution and hazards	Different pollution formed in an environment	- Understand how pollution formed	Understand the various types of environmental pollution and its effects.
5	-Social Issues and the Environment: Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust,	Environmental issues and acts	Environmental issues and acts	Social issues in an environment	- Understand how different social issues formed in an environment and control measure acts	understand social issues of environment