

## D. Syllabus Detailing and Learning objectives

Module	Chapter	Detailed Content	Syllabus Detailing	Learning Objectives
<b>Module 1</b>	<b>OVERVIEW OF ENVIRONMENTAL ASPECTS</b>	<ul style="list-style-type: none"> <li>Definition, Scope and Importance of Environmental Study</li> <li>Need for Public awareness of environmental education</li> <li>Introduction to depletion of natural resources: Soil, Water, Minerals and Forests.</li> <li>Global crisis related to – Population, water, sanitation &amp; Land.</li> <li>Ecosystem:</li> <li>Study of ecosystems : Forest, desert and aquatic (in brief).</li> <li>Energy flow in Ecosystem, overview of Food Chain, Food Web and Ecological Pyramid.</li> <li>Concept of ecological succession and its impact on human beings (in brief).</li> </ul> <p>Case Study on Chipko Movement (Uttarakhand, India), (began in 1973).</p>	<p><b>Purpose:</b> To make students understand the importance of environmental studies</p> <p><b>Scope –</b></p> <p><b>1. Academic Aspects-</b> awareness about environmental issues, natural resources and ecosystem</p> <p><b>2. Technology Aspect-</b> different methods to control on depletion of natural resources</p> <p><b>3. Application Aspect-</b> acts against global environmental crisis</p> <p><b>Students Evaluation –</b></p> <p><b>Know:</b> Learner should be able to</p> <ol style="list-style-type: none"> <li>1) Define environment, ecosystem, pollution, etc.</li> <li>2) List the environmental problems and crises.</li> <li>3) State meaning, importance and need of the environmental studies.</li> </ol> <p><b>Comprehend:</b> Learner should be able to</p> <ol style="list-style-type: none"> <li>4) Describe and draw the ecosystem with its food chain, food web and ecological pyramid.</li> <li>5) Explain the depleting nature of environmental resources and eco balance.</li> <li>6) Compare the availability of resources in the past and present.</li> <li>7) Understand the nuances of environmental problems.</li> </ol>	<ol style="list-style-type: none"> <li>1. Define environment, ecosystem, pollution, etc.</li> <li>2. List the environmental problems and crises.</li> <li>3. State meaning, importance and need of the environmental studies.</li> <li>4. Describe and draw the ecosystem with its food chain, food web and ecological pyramid.</li> <li>5. Explain the depleting nature of environmental resources and eco balance.</li> <li>6. Compare the availability of resources in the past and present.</li> </ol>

			<b>Apply, Analyze and synthesize:</b> Learner should be able to 8) Avoid the unnecessary use of natural resources. 9) Analyze depleting nature of natural resources. 10) Develop eco-friendly way of living.	
<b>Module 2</b>	<b>ASPECTS OF SUSTAINABLE DEVELOPMENT</b>	<ul style="list-style-type: none"> <li>• Concept and Definition of Sustainable Development.</li> <li>• Social, Economical and Environmental aspects of sustainable development.</li> <li>• Control measures: 3R (Reuse, Recovery, Recycle),</li> <li>• Resource utilization as per the carrying capacity (in brief).</li> </ul> <p>Case Study on Narmada Bachao Andolan (Gujarat, India, in the mid and late 1980s).</p>	<b>Purpose-</b> To make students understand Sustainable Development and their different aspects	Student shall be able to: 1. Define sustainable development and its aspects, control measures and resource utilization 2. Explain the difference between sustainable and unsustainable development 3. Describe social, economical and environmental aspects of sustainable development 4. Apply 3R control measures in day to day life 5. Explain and educate environmental issues and appropriate use of technology 6. Utilize resources as per the carrying capacity
			<b>Scope –</b> <b>1. Academic Aspects</b> – concept of Sustainable Development <b>2. Technology Aspect</b> - Social, Economical and Environmental aspects of sustainable development <b>3. Application Aspect</b> – application of 3R	
			<b>Students Evaluation –</b> <b>Know:</b> Student should be able to Define sustainable development and its social, economical and environmental aspects, control measures like reuse, recovery, recycle and resource utilization. <b>Comprehend:</b> Student should be able to Explain the difference between sustainable and unsustainable development, Describe social, economical and environmental aspects of sustainable development. <b>Apply, analyze and synthesize :</b> Student should be able to apply 3 R control measures	

			i.e. reduce, reuse and recycle in day to day life.	
<b>Module 3</b>	<b>TYPES OF POLLUTION</b>	<ul style="list-style-type: none"> <li>Water pollution: Sources of water pollution and Treatment of Domestic and industrial waste water (with flow-diagram of the treatment),</li> <li>Land Pollution: Solid waste, Solid waste management by land filling, composting and incineration</li> <li>Air pollution: Sources of air pollution,</li> </ul> <p>Consequences of air pollution :- Greenhouse effect (Explanation with schematic diagram), Photochemical Smog (Explanation with chemical reaction). Cleaning of gaseous effluents to reduce air contaminants namely dust particle or particulate matters by using:- (i) Electrostatic precipitators (ii) Venturi scrubber (Schematic diagram and working).</p> <ul style="list-style-type: none"> <li>Noise pollution: Sources, effects, threshold limit for different areas and control methods.</li> <li>E-Pollution: Definition, Sources and effects.</li> <li>Nuclear pollution: Sources and effects.</li> </ul> <p><b>Case study on Water Pollution of</b></p>	<p><b>Purpose –</b> Introduce Learner to thinking about environmental issues from an interdisciplinary perspective</p> <p><b>Scope –</b>  <b>1. Academic Aspects-</b> different types of pollutions and their effects  <b>2. Technology Aspect-</b> Bag house Filter, Electrostatic precipitators (ii) Venturi scrubber  <b>3. Application Aspect-</b> different solution to control environmental pollution</p> <p><b>Student Evaluation -</b>  <b>Know:</b>  a) Define different types of pollution such as air, water, sound, e-pollution  b) List causes and solutions of pollution</p> <p><b>Comprehend:</b>  a) Describe photochemical smog, acid rain, land pollution, waste management, E-pollution etc  b) Explain and draw the importance of bag house filter, venturi scrubber as a control measure for air pollution</p> <p><b>Apply, analyze and synthesize:</b>  a) Avoid unnecessary use of electronic gadgets and natural resources.  b) Use various treatments for purification of water, land, air, etc. such as RO, UV, carbon</p>	<ol style="list-style-type: none"> <li>1. Define the various sources of Air Pollution with its Effect on human being.</li> <li>2. Explain the concept of acid rain and its adverse effect on human nature.</li> <li>3. Describe the concept of Photochemical smog and Bag house Filter</li> <li>4. Explain the sources of water Pollution with its effect and treatment.</li> <li>5. Analyze the sources of noise pollution and its impact on human being.</li> <li>6. Evaluate the causes of various disasters and its impact on human being.</li> </ol>

		<b>Ganga River.</b> <b>Case study on London smog (U. K.)(December, 1952).</b> <b>Case Study of Fukushima Disaster (March, 2011).</b>	treatment, etc.	
<b>Module 4</b>	<b>POLLUTION CONTROL LEGISLATION</b>	<ul style="list-style-type: none"> <li>• Functions and powers of Central and State Pollution Control Board.</li> <li>• Environmental Clearance, Consent and Authorization Mechanism.</li> </ul> <b>Case Study of Dombivali MIDC- Boiler Blast Tragedy (Thane, Maharashtra, India), (May, 2016).</b>	<b>Purpose –</b> Students should know environmental Law as it plays crucial role in providing a framework for regulating the use of environment and its management.	1. Define environmental legislation, clearance and authorization mechanism. 2. List the functions and powers of central and state pollution boards 3. Describe case studies pertaining to environmental legislation 4. Explain the powers and functions of Central and State pollution control boards. 5. Differentiate between powers and functions of Central and State pollution control boards. 6. Analyze the environmental impact assessment of industries
			<b>Scope –</b> <b>1. Academic Aspects-</b> environmental legislation <b>2. Technology Aspect-</b> functions and powers of central and state pollution boards <b>3. Application Aspect-</b> Analyze the environmental impact assessment of industries	
			<b>Student Evaluation -</b> <b>Know:</b> Define environmental legislation, clearance and authorization mechanism. List the functions and powers of central and state pollution boards. <b>Comprehend</b> Describe case studies pertaining to	

			<p>environmental legislation</p> <p>Explain the powers and functions of Central and State pollution control boards.</p> <p><b>Apply, analyze and synthesize:</b></p> <p>Differentiate between powers and functions of Central and State pollution control boards.</p> <p>Analyze the environmental impact assessment industries like chemical fertilizers, asbestos mining, petrochemical complexes, pesticides, etc.</p> <p>Assess the impact of environmental damage at Narmada valley, Silent valley, etc.</p>	
<b>Module 5</b>	<b>RENEWABLE SOURCES OF ENERGY</b>	<ul style="list-style-type: none"> <li>Importance of renewable sources of energy.</li> <li>Principle and working with schematic diagram of :-</li> </ul> <p>(i) Solar Energy: (a) Flat plate collector and (b) Photovoltaic cell.</p> <p>(ii) Wind Energy: Wind Turbines.</p> <p>(iii) Hydropower: Hydropower generation from water reservoir of the dam.</p> <p>(iv) Geothermal Energy: Utilisation of underground sources of steam for power generation.</p>	<p><b>Purpose</b> – students should know different forms of renewable energy and how to use them.</p> <p><b>Scope</b> –</p> <p><b>1. Academic Aspects-</b> solar, wind, hydro and geothermal energy</p> <p><b>2. Technology Aspect-</b> principles and working of solar cells, wind turbines</p> <p><b>3. Application Aspect-</b> flat plate solar collector, photovoltaic cell, wind turbine</p>	<p>1. Explain various forms of renewable energy, and the advantages, disadvantages of Renewable Energy sources as well as limitations of conventional sources of energy.</p> <p>2. Explain solar energy as renewable energy and its Principle, Working of Flat plate collector &amp; Photovoltaic cell.</p> <p>3. Understand Wind Energy its Principle and Wind Turbines.</p>

			<p><b>Student Evaluation –</b></p> <p><b>Know:</b> Student should be able to State various renewable sources of energy sources.</p> <p><b>Comprehend:</b> Student should be able to Explain Limitations of conventional sources of Energy. Various renewable energy sources Describe Solar Energy: Principle, Working of Flat plate collector &amp; Photovoltaic cell.</p> <p><b>Apply, analyse and synthesize:</b> Student should be able to Apply Hydel Energy: Principle, Hydropower generation in day to day life.</p>	<p>4. Explain generation of Hydropower Energy and to know its Principle, advantages and disadvantages of Hydropower energy,</p> <p>5. Understand Geothermal energy its advantages and disadvantages, to know the working of Steam Power Plant.</p> <p>6. Study use and applications of energy alternatives viz. solar energy, wind energy, Hydel energy and geothermal energy</p>
Module 6	TECHNOLOGICAL ADVANCES TO OVERCOME ENVIRONMENTAL PROBLEMS	<ul style="list-style-type: none"> <li>• Concept of Green Buildings,</li> <li>• Various indoor air pollutants and their effects on health.</li> <li>• Carbon Credit: Introduction and general concept.</li> <li>• Disaster Management: Techniques of Disaster Management to cope up with (i) Earthquake and (ii) Flood.</li> </ul> <p><b>Case Study on Earthquake in Latur (Maharashtra, India),</b></p>	<p><b>Purpose –</b> Students should know how technology has played a key role in the development of human society.</p>	<p>1. Define law of thermodynamics, ENVIS, water purification, e-Gain forecasting, energy conservation, etc</p> <p>2. List features of green buildings, major contaminants, etc.</p> <p>3. Explain methods of improving internal environment of a building</p>
			<p><b>Scope –</b></p> <ol style="list-style-type: none"> <li><b>1. Academic Aspects-</b> green buildings, carbon-credits</li> <li><b>2. Technical -</b> ENVIS, water purification, e-Gain forecasting, energy conservation</li> <li><b>3. Application -</b> Disaster Management</li> </ol>	

		<p><b>(September,1993).</b>  <b>Case Study on Cloudburst and Landslides at Kedarnath (Uttarakhand, India), (June, 2013).</b></p>	<p><b>Student Evaluation –</b>  <b>Know:</b>  Define law of thermodynamics, ENVIS, water purification, eGain forecasting, energy conservation, etc.  List features of green buildings, major contaminants, etc  <b>Comprehend:</b>  Describe the elements of disaster management  Explain methods of improving internal environment of a building  Develop technology to bring about sophistication in environment (instruments like computers, satellites, telecommunication instruments, etc.)  <b>Apply, analyze and synthesize:</b>  Earn and claim for carbon credits  Take precautionary measures before, during disasters and mitigating it after</p>	<p>4. Describe the elements of disaster management.  5. Develop technology to bring about sophistication in environment.  Understand the ways to handle and manage disasters</p>
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