

ENVIRONMENTAL SCIENCE

Subject code: MC109ES

Regulations: R18-JNTUH

Class: I Year B. Tech CE & ME I Sem



Department of Science and Humanities

BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY

Ibrahimpattam - 501 510, Hyderabad

ENVIRONMENTAL SCIENCE (MC109ES)

I. COURSEOVERVIEW:

This course is recommended for undergraduate students of engineering program who are interested in gaining the awareness in various aspects of the Environment.

II. PREREQUISITE:

1. Basic fundamental knowledge at undergraduate level on following subjects is necessary:
2. About Natural recourses and their conservation.
3. Various chemical and physical reactions in the environment.
4. Knowledge of various extinct species.
5. Waste management strategies.

III. COURSEOBJECTIVE:

1	Understanding the importance of ecological balance for sustainable development.
2	Understanding the impacts of developmental activities and mitigation measures
3	Understanding the environmental policies and regulations

IV. COURSE LEARNING OUTCOME:

S.No	Description	Bloom's Taxonomy Level
1	Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development	Knowledge, Understand(Level1, Level2)
2	Design of pollution control structures.	Apply, Create(Level 3, Level 6)
3	Various schemes for the protection of species	Evaluate
4	Implement various Environmental policies, regulations and schemes	Analyze (Level 4)
5	Students can apply the knowledge, techniques, skills and modern tools to become successful professionals in communication and media industries	Apply (Level 3)

IV. HOW PROGRAM OUTCOMES AREASSESSED:

Program Outcomes (PO)		Level	Proficiency assessed by
PO1	Engineering knowledge: Apply the knowledge of basics science, engineering fundamentalsto the solution of complex engineering problems related to environment concern.	3	Assignments
PO2	Problem analysis: Identify, formulate, review research literature, and analyze environmental problems and reaching substantiated conclusions using first principles of natural sciences	3	Assignments
PO3	Design/development of solutions: Design solutions for environmental related and design the processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Assignments
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Assignments
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering tools for the prediction and modeling of complex environmental issues with an understanding of the limitations.	--	--
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the environment with an engineering practice.	1	Assignments
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	-	--
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	-	--
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	-	--
PO10	Communication: Communicate effectively on complex engineering 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.	-	--
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	-	--
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of environmental changes.	2	Research

V. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED

Program Specific Outcomes (PSO)		Level	Proficiency assessed by
PSO1	Foundation of environmental concepts: To use the knowledge of surrounding environment and with suitable techniques to crack the environmental protection issues	3	Lectures, Assignments
PSO2	Foundation of environmental pollution: The ability to interpret the various kinds of pollutions and pollutants. Students can understand the different techniques used for environmental problems	2	Lectures, Assignments
PSO3	Foundations of methods development: Possess competent skills and knowledge on environmental issues and provide new ideas and innovations towards research for environmental protection	--	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) - : None

VI. SYLLABUS:

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT-III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil

Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS).Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-Gol Initiatives...

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. **EIA:** EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects.Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

- 1 Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin& Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by AnubhaKaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS.Publications.

VII. COURSE PLAN:

Session	Week	Unit	Topics	Course Learning Outcomes	Reference
1		1	Introduction to ecosystem	Discuss the overview on the surrounding environment	T1, R1

2	1		Ecosystem-Definition, scope, importance	Describe the scope, importance of the ecosystem	T1, R1
3			Classification, Structural components, Functions of an ecosystem	Describe the Structural components, Functions of an ecosystem	T1, R1
4			Food chain, Food web, flow of energy	Describe about various existed chain systems in the nature	T1, R1
5			Ecological pyramids	Demonstration about flow of energy in the ecosystem	T1, R1
6	2		Biogeochemical cycles	Discuss various important cycles in nature	T1, R1
7			Bioaccumulation	Discribe about the awareness of bioaccumulation and its effects	T1, R1
8			Biomagnification, Ecosystem values	Demonstration on various values of surrounding environment	T1, R1
9	3		Ecosystem services and carrying capacity	Analyze the relation between ecosystem with carrying capacity	T1, R1
10			Field Visit	Demonstration on various aspects by field visits	T1, R1
11			Revision	Analyze the students awareness about nature by asking questions	T1, R1
12			MOCK TEST-1	Examine the performance	T1, R1
13			Classification of Resources- Living Non-living resources	Discus the difference between various natural resources	T1, R1

14	4	2	Water resources: Use and over utilization of surface and ground water, floods, drought	Express the concepts of various water sources and importance	T1, R1
15			Dams: benefits and problems	Express the benefits and problems associated with dams construction	T1, R1
16			Mineral resources: use and exploitation	Illustrate the kinds of Mineral resources: use and exploitation	T1, R1
17	5		Environmental effects of extracting and using mineral resources case - studies	Illustrate the methods of extractions and problems	T1, R1
18			Land resources: Forest Resources	Discuss the land and forest sources and importance	T1, R1
19			Energy resources: Growing energy needs	Illustrate Energy resources and their value in the modern society	T1, R1
20		Renewable and non-renewable energy sources	Describe the difference between natural sources	T1, R1	
21	6	Use of alternate energy sources - case studies	Discuss the use and importance of alternate energy sources	T1, R1	
22		3	Introduction	Demonstration on bio diversity	T1, R1
23	Genetic, species and ecosystem diversity		Discuss the concepts in various types of bio diversity	T1, R1	
24	Value of biodiversity		Illustrate different values of bio diversity	T1, R1	
25	7	Consumptive use, productive use	Analyze the uses of consume goods and various industrial products.	T1, R1	
26		Social, ethical, aesthetic and option values	Describe various values	T1, R1	
27		India a mega diversity nation, Hotspots of biodiversity	Analyze the various available biodiversity in india and world	T1, R1	
28		Field Visit	Demonstration on the various diversities by visiting	T1, R1	

29	8		Threats to biodiversity	Examine the problems for biodiversity.	T1, R1
30			Habitat loss	Describe the loosing of diversity	T1, R1
31			Poaching of wild life	Examine wild life degradation	T1, R1
32			Man-wildlife conflicts	Analyze Man-wildlife conflicts and relations	T1, R1
I Mid Examinations (Week 9)					
33	9	4	Man-wildlife conflicts	Analyze Man-wildlife conflicts and relations	T1, R1
34			Conservation of biodiversity: in-situ and ex-situ	Describe the various types of conservation processes	T1, R1
35			National Biodiversity act	Describe the various acts for protection of biodiversity	T1, R1
36	9	4	Environmental Pollution: Classification of Pollution	Understand the various types of environment pollutions	T1, R1
37	10		Air pollution: primary and secondary pollutions,	Demonstration the concept of pollutants	T1, R1
38			Automobile and industrial pollution, Ambient air quality standards.	Understand the various sources of pollutants	R5
39			Water Pollution: Sources and type of pollution, drinking water quality Standards.	Understand the water pollution and its properties	R5
40			Soil Pollution: Sources and type, Impacts of modern agriculture degradation of soil	Understand the soil degradation and impacts	R5
41			Noise Pollution: Sources and Health hazards, standards	Understand the concept of Noise pollution and effects	R5
42			Solid Waste: Municipal solid waste management, composition	Understand the concept of waste management	R5
43			Characteristics of e-waste and its management.	Understand the concept of	R5

				e-waste	
44	11				R5
			Pollution Control technologies: Wastewater treatment methods-Primary, secondary and tertiary	Understand and Analyze the methods of techniques to pollution control	
45	12		Overview of air control technologies: Primary, secondary of bioremediation.	Understand the bioremediation	R5
46			Global Environmental problems and global efforts: Climate change and impacts on human environment	Understand the concept of global challenges	R5
47			Ozone depletion and Ozone depleting substances(ODS).	Understand the ozone depletion problems from different pollutants,	R5
48			Deforestation and desertification.	Analyze the concept of Deforestation and desertification and its conservation	R5
49	13		International conventions/protocols: Earth summit	Understand the concept of various protocols for environment conservation	R5
50			Kyoto protocol and Montreal protocol.	Understand the importance of specific protocols	R5
51			MOCK TEST – II	Examine the performance	R5
52	13	5	Environmental protection act. legal aspects Air Act-1981, Water Act, forest Act, wild life Act,	Understand the concept of, Environmental protection act	R5
53	14		Municipal solid waste management, composition, and handling rules, biomedical waste management	Understand the concept of various methods used for	R5

			3							0	1		1		3
CO1	-	-	2	-	1	-	-	-	-	-	-	-	1	-	-
CO2	2		-	-	-	-	-	-	-	-	-	-		2	-
CO3	2	-	1	-		-	-	-	-	-	-	-	2	-	-
CO4	2		-	1	3	1	-	-	-	-	-	-	-	-	-
CO5	2		-	2	-	-	-	-	-	-	-	-	1	-	-
AVG	1.6	-	0.6	0.6	0.8	0.2	-	-	-	-	-	-	0.8	0.4	-

IX. QUESTION BANK(JNTUH)

UNIT I

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Explain any three types of ecosystem with suitable example.	Understand	2
2	What do you understand by the term biogeochemical cycles? Explain with example	Knowledge	2
3	at are the factors that determine the homeostasis of a system?	Understand	1
4	Food chain	Understand	1
5	Food web	Understand	2
6	Flow of energy	Understand	2
7	Cybernetics	Analyze	2
8	Biogeochemical cycles	Apply	5
9	Make a note on food chain concentration	Understand	5
10	Explain the structure of ecosystem with suitable example.	Apply	3
11	What do you understand by the term biogeochemical cycles? Explain with examples	Apply	3
12	Write a note on carbon cycle and water cycle with a neat labeled diagram	Apply	3
13	Make a note on Bio-magnification and Bio-accumulation	Understand	3
14	Define ecological pyramid. Explain all the three types with examples	Understand	3

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Food chain	Knowledge	1
2	Food web	Understand	2
3	Flow of energy	Knowledge	1
4	Pyramid of number	Knowledge	1
5	Pyramid of energy	Knowledge	1

UNIT II

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Describe some of the case studies which explain the effect of over exploitation of natural resources	Understand	4
2	Make a note on benefits and problems associated with dams	Apply	4
3	What is surface water? Give some example of over utilization of surface and ground water.	Analyze	4
4	Explain any three methods of using land as a resource	Knowledge	5
5	Describe the role of individual in conservation of natural resources.	Knowledge	5
6	Explain how agricultural practices implemented to increase the field from the land lead to formation of unproductive land.	Analyze	4
7	Explain the difference in consumption of resources by the countries of the developing and developed world.	Knowledge	4
8	Write a brief note on: a) Non-renewable resources b) Renewable resources c) Floods as a series environmental hazard.	Apply	4
9	What is the necessity for a rational land use policy as part of the environmental policy?	Analyze	4
10	Give an account of non-renewable energy resources.	Knowledge	5

11	Write a brief note on: a) Non-renewable resources b) Renewable resources c) Floods as a series environmental hazard.	Knowledge	5
12	What is the necessity for a rational land use policy as part of the environmental policy?	Apply	4

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Floods	Understanding	4
2	drought	Understanding	4
3	Soil erosion	Understanding	4
4	Renewable & non renewable natural resources	Understanding	4
5	Renewable Energy resources	Understanding	4

UNIT III

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Explain biodiversity and its types.	Apply	5
2	Make a note on hot spots of biodiversity	Apply	5
3	Explain In-situ and Ex-situ conservation	Knowledge	5
4	Write a note on biogeographical classification of India.	Knowledge	5
5	Discuss in detail about value of biodiversity.	Understand	5
6	Justify India as a mega diversity nation.	Understand	5
7	Explain the various threats to and measures recommended for conservation of biodiversity.	Understand	5
9	What is mean by endangered species? Give types of endangered species with example.	Knowledge	4
10	Explain factors affecting endangered species.	Understand	4

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Species bio-diversity	Understand	5
2	genetic bio-diversity	Understand	5
3	ecosystem bio-diversity	Analysis	5
4	poaching	Analysis	5
5	list of examples for in-situ & ex-situ conservation of bio-diversity	Analysis	5

UNIT IV**Long Answer Questions-**

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	List the major gaseous air pollutants of anthropogenic origin and explain their characteristics	Apply	5
2	Make a note on the following: ETP; STP; ODS; and e-WASTE	Knowledge	5
3	What are Ozone depleting substances? How they are involved in depletion of Ozone layer?	Knowledge	5
4	Make a note on green house effect	Knowledge	5
5	Discuss earth summit in detail	Knowledge	5
6	Make a note on the legal acts taken to protect water resources	Knowledge	5
7	Make a note on forest conservation act	Knowledge	5
8	What are the biomedical waste management and handling rules?	Apply	5
9	What are the hazardous waste management rules?	Apply	5
10	Make a note on municipal solid waste management and handling rules	Apply	5

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	automobile air pollution	Understand	5
2	industrial air pollution	Understand	5
3	e-WASTE	Understand	5

4	Green house effect.	Knowledge	5
5	Ozone depleting substances	Knowledge	5

UNIT V

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	What is environmental impact assessment?	Understand	5
2	Explain EIS	Knowledge	5
3	Make a note on EMP	Understand	5
4	Discuss the strategies for achieving sustainable development	Understand	5
5	Make a note on the legal acts taken to protect water resources	Knowledge	5
6	Make a note on forest conservation act	Understand	5
7	What are the biomedical waste management and handling rules?	Knowledge	5
8	What are the hazardous waste management rules?	Understand	5
9	Make a note on municipal solid waste management and handling rules	Understand	5
10	What is environmental ethics?	Knowledge	5

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	environmental impact assessment	Understand	2
2	population growth	Understand	3
3	population growth rate	Understand	4
4	population explosion	Understand	2
5	green buildings	Analysis	5

Unit wise Objective-Type Questions

Unit-1

Multiple choice questions:

1. The term "detritivore" includes
 - a)Decomposers b)Primary consumers c)Secondary consumers d)autotrophs
2. The accumulation of herbivore biomass in an ecosystem is an example of
 - a)Biogeochemical cycles b)Transpiration c) secondary productivity d) Gross primary productivity
3. Pre requisite of human life.
 - a) water b)wood c)minerals d) forest
4. The type of ecosystem with the highest mean plant productivity is
 - a) Tropical rain forest b) Temperate grassland c)Desert d)Tundra
5. Identify the possible link "A" in the following food chain: Plant → insect → frog → "A" → Eagle
 - a) Cobra b) Parrot c) Rabbit d)Wolf

Fill in the blanks:

1. The living community of plants and animals in any area together with the non living components of the environment constitute the ecosystem.
2. Pyramid of energy is always upright.
3. No. of individuals that a system can sustain is known as its carrying capacity.
4. The sequence of eating and being eaten in an ecosystem is called a Food Chain
5. Organisms who feed directly on producers are called herbivores
6. Movement of nutrients in ecosystem is cyclic while flow of energy is unidirectional

Unit 2

Multiple choice questions:

- 1.Which one of the following is an example non renewable resources?
 - a)wind b)water c)vegetation d) coal and mineral
2. The concentration of which gas in highest in our environment
 - a)oxygen b)Hydrogen c)Nitrogen d)Carbondioxide
3. Biomass generation is mainly based on the principle of
 - a)Fermentation b)Degradation c)Purification d)both a and b
- 4.The major reservoir for phosphorous is
 - a) aquifers b)soil and rocks c) The atmosphere d) The sun
5. A renewable inexhaustible natural resource is
 - a)Forest b)Coal c)Petroleum d)Minerals
6. minimum disturbance is caused to soil during
 - a) contour farming b) no-till farming c) terrace farming d) alley cropping

Fill in the blanks:

1. A layer of sediment or rock that is highly permeable and contains water is called an aquifer.
2. Renewable resources are inexhaustible resources which can be generated within a given span of time.
3. Nuclear power is the power released by atom splitting is fission.
4. 95% of natural gas is methane
5. Inadequate drainage and poor quality irrigation of water often leads to salinity and water logging of soils

Unit 3**Multiple choice questions:**

1. A biosphere reserve conserves and preserves
a) wild animals b) wild land c) Natural vegetation d) all of the above
2. ____ Values related to biodiversity conservation are based on the importance of protecting all forms of life.
a) Ethical b) Consumptive c) Productive d) none of the above.
3. The biodiversity contained in the ecosystem provides forest dwellers with
a) Food b) Building material c) medicines d) all of the above.
4. The conservation of species is best done by protecting its habitat along with all the other species that live in it in nature. This is known as ____
a) Ex-situ conservation b) In-situ conservation c) both a and b d) none of the above
5. Which one of the following is not used for ex situ plant conservation?
a) Field gene banks b) Seed banks c) Shifting cultivation d) Botanical Gardens

Fill in the blanks:

1. Biodiversity deals with the degree of nature's variety in the biosphere.
2. Nandha Devi, Manon and Sunder bans are examples of biosphere reserves.
3. 1.8 million species have been identified and named till now.
4. Quinine is obtained from the bark of cinchona tree

Unit 4**Multiple choice questions:**

1. Ozone layer is depleted by using
a) CO₂ b) CFC's c) NO₂ d) SO₂
2. Examples of non-degradable pollutants are
a) Toxic elements b) lead c) nuclear wastes d) all of the above
3. Erosion is a natural process often caused by
a) wind b) flowing water c) both a and b d) none of the above

Fill in the blanks:

1. Biomagnification of the pesticides DDT in the food chain resulted in the thinning of shells in birds eggs.

2. Pollutants that are emitted directly from identifiable sources are produced both by natural events and human activities are called as primary pollutants

3. Montreal protocol called for a freeze in the use of CFC's

Unit 5

Multiple choice questions:

1. Which of the year has been declared as the international year of biodiversity

- a) 2009 b) 2008 c) 2010 d) 2011

2. Environmental protection act was passed in the year

- a)1976 b)1986 c) 1996 d) 2006

Fill in the blanks:

1. EIA stands for Environmental Impact Assessment.

2. EMP stands for Environmental Management Plan

WEBSITES' ADDRESSES

a. www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf

b. www.springer.com

EXPERT DETAILS

Mr. AnjiReddy, Professor of environmental studies, JNTU

Dr. ShashiChawla, Professor Dept. of Applied Science, AMITY School of Engineering New Delhi

JOURNALS (NATIONAL & INTERNATIONAL)

a) Journal of Environmental Engineering—published by the American Society of Civil Engineers

b) Journal of Renewable and Sustainable Energy—published by the American Institute of Physics

c) Renewable and Sustainable Energy Reviews—published by Elsevier

d) International Journal of Environmental Research and Public Health—published by MDPI in Switzerland

e) Journal of Toxicology and Environmental Health, Part B: Critical Reviews – published by Taylor & Francis

4. LIST OF TOPICS FOR STUDENTS' SEMINARS

a) Sustainable development

b) Effect of anthropogenic activities on marine ecosystem

5. CASE STUDIES / SMALL PROJECTS

a) Explain EIA-with reference to Pharmaceutical company

b) Biodiversity-Importance and preservation