Environmental Science

Category: Mandatory Course (MC) **3L 0T 0P 3C**

***Pre-requisite*: 10+2**

Course Description:

The course is designed for first year students of Bachelors' Programs in Arts, Commerce and Science, providing essential and applied knowledge of Environmental Science. It explains how the protection of our environment and ecological balance are linked with the development process. It makes them understand that key to development of the future of mankind is the sustenance of "Nature". Furthermore, the course emphasizes the duty and responsibility of each one to protect nature. This course enables the study of environment as an integral part of the education process.

Course Aims and Objectives:

1. Impart knowledge about various environmental systems, including ecosystems, biodiversity, atmosphere, hydrosphere, and lithosphere and their interaction.
2. Develop analytical and problem-solving skills required to address environmental challenges such as pollution, climate change, resource management and their conservation.
3. Adopt an interdisciplinary approach by integrating concepts from biology, chemistry, physics, geology, geography, and social sciences to understand the complex environmental problems.
4. Promote awareness of sustainable development principles and practices, including sustainable agriculture, renewable energy, waste management, and environmental policy.
5. Foster an understanding of ethical considerations and social responsibilities related to environmental decision-making and management.

Course Outcomes:

At the end of the course, the student will be able to...

CO 1: Identify various factors causing degradation of natural resources **[K3].**

CO 2: Identify various ecosystems and need for biodiversity **[K3].**

CO 3: Realize and explore problems related to environmental pollution and management **[K4].**

CO 4: Explore the importance of ethics and acts associated with environment **[K4].**

CO 5: Apply information and technology to solve social issues and human rights. **[K3].**

Course Structure:

Unit 1: Introduction and Natural Resources

Contents

- Definition, scope, importance, multidisciplinary nature, and need for public awareness about environment.
- Forest resources
- Water resources
- Mineral resources
- Food resources
- Land resources
- Energy resources

Description:

This unit covers the fundamentals of environment and natural resources and focusing on their right utilization and conservation. It also includes renewable energy resources and conservation of non-renewable energy resources with sustainable development.

Examples/Applications/Case Studies:

- Importance of recycling of natural resources.
- Utilisation of solar, wind, tidal and geothermal energies.

Exercises/Projects:

- Imovative technologies in water conservation.
- Sustainable Development methods and practices.

Learning Outcomes:

- Understand the importance of environment, natural resources and their conservation.
- Explore the utilisation of renewable energy resources in place of non- renewable energy resources.

Specific Resources:

- https://www.researchgate.net/Publication/365842349
- https://www.ugc.gov.in/oldpdf/modelcurriculum/chapter2

Unit 2: Ecosystems and Biodiversity

Contents

- Structure and function of ecosystem
- Energy flow on the ecosystem
- Ecological succession
- Food chain food web ecological pyramids
- Characteristic features of ecosystems
- Biodiversity types, value, threats, and conservation
- Biodiversity at local, national, and global levels
- Hot-spots of biodiversity, endangered and endemic species of India.
- Bio-geographical Classification of India

Description:

This unit introduces the fundamentals of ecology, ecosystems and biodiversity and importance of species and their protection. It includes functions and structures of different ecosystems. It also includes biodiversity and its conservation and biodiversity at global national and local levels.

Examples/Applications/Case Studies:

- Man - animal conflicts.
- Poaching
- Hotspots of biodiversity

Exercises/Projects:

- Visit local ecosystem and observe different species.

- Importance of national parks and biosphere reserves.

Learning Outcomes:

- Explore the importance of species and their conservation.
- Predict endangered, endemic and edge species.
- Describe various conservation methods of biodiversity.

Specific Resources:

- https://www.researchgate.net/Publication/32578066
- https://www.ugc.gov.in/oldpdf/modelcurriculum/chapter4.pdf

Unit 3: Environmental Pollution and Disaster management

Contents

- Air Pollution
- Water pollution
- Noise pollution
- Soil pollution
- Marine pollution
- Thermal pollution
- Nuclear pollution
- Solid waste management: municipal solid waste, biomedical waste, and E-waste.
- Disaster management: floods, cyclones, Earthquakes, and landslides.

Description:

This unit exposes how the human activity causes environmental degradation, focusing on the interrelation between the impacts and effects of various pollutions on environment and human health and management principles of pollution in different domains. It also includes Natural Disasters Management

Examples/Applications/Case Studies:

- Case studies: London smog; Bhopal Gas tragedy; Fluorosis and Pesticide pollution in India.
- Examples : Exxon Valdez; Arsenic poisoning; Minamata Disease; Chernobyl disaster

Exercises/Projects:

- Student can visit nearby small scale industrial unit to investigate the environmental impact

Learning Outcomes:

- Identify various sources of environmental pollution, including industrial, agricultural, and urban sources. Familiarity with different types of pollutants (e.g., greenhouse gases, heavy metals, particulate matter).
- Understanding how pollution affects different ecosystems and biodiversity.
- Emphasize a holistic approach that combines knowledge, skills, attitudes, and ethical considerations to mitigate the impact of natural disasters and enhance resilience in vulnerable populations.

Specific Resources:

- https://www.britannica.com/science/pollution-environment
- https://www.goodreads.com/book/show/764165.The_Snow_Leopard

Unit 4: Social Issues and the Environment

Contents

- From unsustainable to sustainable development
- Urban problems related to energy
- Water conservation, rainwater harvesting, and watershed management
- Environmental ethics
- Climate change
- Environmental protection acts
- Environment Impact Assessment: E. I. A.

Description:

This unit focuses on the social issues and the environment which is intertwined topics that focus on the impact of human activities on society and the natural world. Addressing these issues requires collective action through policies, technological innovations, behavioural changes, and international cooperation. It involves balancing economic development with environmental sustainability and social equity to ensure a habitable planet for current and future generations

Examples/Applications/Case Studies:

- Example: Embodied energy ; Indigenous tribes; Butterfly populations in the United Kingdom
- Case studies: Energy efficiency; Pani Panchayat, Pune District, Maharashtra; Mewar, Rajasthan; Tehri Project; Chipko movement

Exercises/Projects:

- The student can visit the nearby raitu bazaar to understand what happens to the waste generated; visit to the composting plant.

Learning Outcomes:

- Focus on understanding, analyzing, and potentially addressing various challenges and impacts within these domains.
- Understand the complexities of social issues and environmental concerns, equipping them with the knowledge, skills, and attitudes necessary to contribute effectively towards positive change and sustainable development.

Specific Resources:

- https://www.gov.nl.ca/ecc/waterres/waste/water-conservation/
- https://theberkey.com/pages/a-guide-to-water-conservation
- https://www.mppcb.mp.gov.in/RWH.aspx
- https://www.cseindia.org/understanding-eia-383
- https://www.drishtiias.com/to-the-points/paper3/environmental-impact-assessment-1

Unit 5: Human Population and the Environment

Contents

- Population growth variation among nations
- Population explosion family welfare program
- Environment and human health
- Human rights
- Value education
- HIV/AIDS
- Women and child welfare
- Role of I. T. in Environment and human health

Description:

The relationship between the environment and human health is intricate and multifaceted, encompassing various aspects from air and water quality to the availability of natural resources and the impact of climate change. Key points to consider when discussing how the environment affects human health. IT plays a pivotal role in understanding, managing, and mitigating environmental impacts through technological innovation, data-driven insights, and collaborative efforts on a global scale, achieving sustainable development goals and ensuring a healthy planet for future generations. IT continues to transform the healthcare industry, making significant contributions to improving human health outcomes, enhancing patient care experiences, and advancing medical research and innovation.

Examples/Applications/Case Studies:

- Case studies: Silent Valley; Urban Environments; Chula issue
- Examples of loss of patents – Turmeric (1993); Tamarind; Neem; Arhar

Exercises/Projects:

- The students can explore the site https://bhuvan.nrsc.gov.in/home/index.php

Learning Outcomes:

- Understand how environmental factors contribute to health issues such as respiratory diseases (e.g., asthma due to air pollution), waterborne diseases, food contamination, and vector-borne diseases influenced by climate change.
- Contribute positively to their own lives and society at large developing a sense of duty towards community and environment.
- Equips individuals and organizations to harness the potential of IT in promoting sustainable environmental practices and improving public health outcomes while navigating associated challenges responsibly.
- Apply modern technological tools for both environmental sustainability and human health.

Specific Resources:

- https://health.gov/healthypeople/objectives-and-data/browse-objectives/environmental-health
- https://www.who.int/health-topics/environmental-health#tab=tab_1

Textbook(s) / Reference(s):

Textbooks:

1. Benny Joseph, (2005). *Environmental Studies*. Tata McGraw- Hill publishing company limited, New Delhi.
2. Erach Bharucha, (2005). *Environmental Studies for undergraduate courses* (2nd ed.). University Grants Commission, New Delhi, Bharati Vidyapeeth Institute of Environment Education and Research.
3. Venu Gopala Rao,P. (2006). *Principles of Environmental Science &Engineering*. Prentice-Hall of India Pvt. Ltd., New Delhi.

References:

1. De, A.K. (2018) *Environmental Chemistry* (9th ed.). New Age India.
2. Bharucha Erach, (2002) *Biodiversity of India*. Mapin Publishing.
3. Anjaneyulu,Y.(2004) *Introduction to Environmental sciences*. B S Publications, Hyderabad.
4. Anjireddy,M.(2005) *Environmental science & Technology*. B S Publications, Hyderabad.
5. Cunningham Willam, P. & Cunningham Mary Ann (2017) *Environmental Science: A Global Concern* (14th ed.). McGraw Hill.
6. Kurian Joseph & Nagendran,R. (2005) *Essentials of Environmental Studies*. Pearson Education.

Mapping of Course Outcomes to Program Outcomes:

(**H**=high; **M**=medium; **L**=low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	H						L					
CO2		H	M				L					
CO3		H	M			H	M					
CO4							M	H	H			
CO5							M	H	H			