ARSD College, University of Delhi

Course Handout/Lesson Plan

Theory

Course Name : AEC 1: Environmental Science: Theory into Practice – I						
Semester	**Course Code**	**Course Title**	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Credit (C)**
I	2181001001	B.Sc. Mathematics (H) Section A	**01**	**-**	**01**	**02**
Teacher/Instructor(s)		Dr. Kanchan Srivastava				
Session		2022-23				

Learning Objectives

The Ability Enhancement Course on Environmental Science: Theory into Practice (I & II) at Undergraduate level (AEC- I) aims to train students to cater to the need for ecological citizenship through development of a strong foundation on the critical linkages between ecology-society-economy.

The Learning Objectives of this course are as follows:

• **Disciplinary knowledge**

Enable students to develop a comprehensive understanding of various facets of life forms,ecological processes, and the impacts on them by humans during the Anthropocene era.

• **Critical thinking**

Build capabilities to identify relevant environmental issues, analyse the various underlying causes, evaluate the practices and policies, and develop framework to make informed decisions.

• **Moral and ethical awareness/reasoning**

Develop empathy for all life forms, appreciation for the various ecological linkages within the web of life, awareness and responsibility towards environmental protection and nature preservation.

Learning outcomes

After the course the students will be empowered and able to:

• Analyse natural processes and resources that sustain life and govern economy.

• Predict the consequences of human actions on the web of life, global economy, and quality of human life.

• Think critically and develop appropriate strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.

• Demonstrate values and show compassionate attitudes towards complex environmentaleconomic-social challenges, and participate at national and international levels in solving current environmental problems and preventing the future ones.

• Adopt sustainability as a practice in life, society, and industry.

Lesson Plan:

Unit No.	Learning Objective	LectureNo.	Topics to be covered
1.	Introduction to Environmental Studies	1	Multidisciplinary nature of environmental studies, components of environment: atmosphere, hydrosphere, lithosphere, and biosphere
			Scope and importance; Concept of sustainability and sustainable development; Brief history of environmentalism
2.	Ecosystems	5 lectures	Definition and concept of Ecosystem
			Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession) Biogeochemical (nutrient cycling) processes. Concepts of productivity, ecological pyramids and homeostasis.
			Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries)
			importance and threats with relevant examples from India
			Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies, Basics of Ecosystem restoration
3.	Natural Resources	5 lectures	Land resources: Minerals, soil, agricultural crops, natural forest products, medicinal plants, and forest-based industries and livelihoods; Land cover, land use change, land degradation, soil erosion, and desertification,Causes of deforestation; Impacts of mining and dam building on environment, forests, biodiversity, and tribal communities.
			Water resources: Natural and man-made sources; Uses of water,Over exploitation of surface and ground water resources; Floods, droughts, and international &interstate conflicts over water
			Energy resources: Renewable and non-renewable energy sources, Use of alternate energy sources
			Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source Case studies: Contemporary Indian issues related to mining, dams, forests, energy, etc.
			National Solar Mission, Cauvery river water

			conflict, Sardar Sarovar dam, Chipko movement, Appiko movement, Tarun Bharat Sangh, etc.)
4.	Environmental Pollution And control	4 lectures	Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls. Primary and secondary air pollutants, Air and water quality standards.
			Nuclear hazards and human health risks Solid waste management: Control measures for various types of urban, industrial waste, Hazardous waste, E-waste, etc, Waste segregation and disposal
			Pollution control measures: Introduction to legal, biological, and physico-chemical methods; Role in sustainability
			Pollution case studies: Ganga Action plan (GAP), Delhi air pollution and public health issues Plastic waste management rules, Bhopal gas tragedy

Evaluation Scheme:

No.	Component	Duration	Marks
1.	Internal Assessment Assignment		10
2.	End Semester Examination	1.45 hr	50

Details of the Course		
Unit	**Contents**	**Contact Hours**
1.	**Introduction to Environmental Studies** • Multidisciplinary nature of environmental studies; components of environment: atmosphere, hydrosphere, lithosphere, and biosphere • Scope and importance; Concept of sustainability and sustainable development; Brief history of environmentalism.	1
2.	**Ecosystems** • Definition and concept of Ecosystem • Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession),and Biogeochemical (nutrient cycling) processes. Concepts of productivity,ecological pyramids and homeostasis • Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams,lakes, rivers, oceans, estuaries); importance and threats with relevant examples from India • Ecosystem services (Provisioning, Regulating, Cultural, and Supporting);	5

	Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration	
3.	**Natural Resources:** Land resources: Minerals, soil, agricultural crops, natural forest products, medicinal plants, and forest-based industries and livelihoods; Land cover, land use change, land degradation, soil erosion, and desertification; Causes of deforestation; Impacts of mining and dam building on environment, forests, biodiversity, and tribal communities • Water resources: Natural and man-made sources; Uses of water; Over exploitation of surface and ground water resources; Floods, droughts, and international &interstate conflicts over water • Energy resources: Renewable and non-renewable energy sources; Use of alternate energy sources; Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source • Case studies: Contemporary Indian issues related to mining, dams, forests, energy,etc (e.g., National Solar Mission, Cauvery river water conflict, Sardar Sarovar dam,Chipko movement, Appiko movement, Tarun Bharat Sangh, etc)	5
4.	**Environmental Pollution**: Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards • Nuclear hazards and human health risks • Solid waste management: Control measures for various types of urban, industrial waste, Hazardous waste, E-waste, etc; Waste segregation and disposal • Pollution case studies: Ganga Action plan (GAP), Delhi air pollution and public health issues, Plastic waste management rules, Bhopal gas tragedy, etc	4

Suggested Books:

Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
1.	Divan, S. and Rosencranz, A. (2002). Environmental Law and Policy in India: Cases, Material & Statutes, 2nd Edition. Oxford University Press, India.	2002
2.	Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). Environment, 9th Edition. Wiley Publishing, USA.	2015
3.	Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.	2017

4.	Gadgil, M. and Guha, R. (1993). *This Fissured Land: An Ecological History of India*. University of California Press, Berkeley, USA.	1993
5.	McCully, P. (1996). *Rivers no more: the environmental effects of dams*, In: *Silenced Rivers: TheEcology and Politics of Large Dams*, Zed Books, New York, USA.	1996
Mode of Evaluation:	Internal Assessment / End Semester Exam (60=10+50)	

Progress Report:

Unit No.	Learning Objective	Date	Topics to be covered
1.	Introduction to Environmental Studies		
			Multidisciplinary nature of environmental studies, components of environment: atmosphere, hydrosphere, lithosphere, and biosphere
			Scope and importance, Concept of sustainability and sustainable development, Brief history of environmentalism
2.	Ecosystems		Definition and concept of Ecosystem Structure of ecosystem (biotic and abiotic components); Functions of Ecosystem: Physical (energy flow), Biological (food chains, food web, ecological succession)
			Biogeochemical (nutrient cycling) processes. Concepts of productivity, ecological pyramids and homeostasis
			Types of Ecosystems: Tundra, Forest, Grassland, Desert, Aquatic (ponds, streams, lakes, rivers, oceans, estuaries) importance and threats with relevant examples from India
			Ecosystem services (Provisioning, Regulating, Cultural, and Supporting); Ecosystem preservation and conservation strategies, Basics of Ecosystem restoration
3.	Natural Resources		Land resources: Minerals, soil, agricultural crops, natural forest products, medicinal plants, and forest-based industries and livelihoods; Land cover, land use change, land degradation, soil erosion, and desertification
			Causes of deforestation; Impacts of mining and dam building on environment, forests, biodiversity, and tribal communities
			Water resources: Natural and man-made sources; Uses of water Over exploitation of surface and ground water resources; Floods, droughts, and

			international &interstate conflicts over water
			Energy resources: Renewable and non-renewable energy sources, Use of alternate energy sources Growing energy needs; Energy contents of coal, petroleum, natural gas and bio gas; Agro-residues as a biomass energy source
			Case studies: Contemporary Indian issues related to mining, dams, forests, energy, etc.National Solar Mission, Cauvery river water conflict, Sardar Sarovar dam, Chipko movement, Appiko movement, Tarun Bharat Sangh, etc.)
4.	Environmental Pollution		Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls Its causes, effects, and controls Primary and secondary air pollutants, Air and water quality standards
			Nuclear hazards and human health risks Solid waste management: Control measures for various types of urban, industrial waste, Hazardous waste, E-waste, etc.
			Waste segregation and disposal Pollution case studies: Ganga Action plan (GAP), Delhi air pollution and public health issues
			Plastic waste management rules, Bhopal gas tragedy
			Forest (Conservation) Act 1980, Air (Prevention & Control of Pollution) Act, 1981, Environment Protection Act, 1986, Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006