Attributes & SDGs Common for all branches/Disciplines

Course Code	CourseTitle	Attributes							SDGs No.
ES115	Fundamentals of Environmental Science	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
						√			SDGs 6,13,14 ,& 15

Effective from Session:							
Course Code	ES115	**Title of the Course**	Fundamentals of Environmental Science	**L**	**T**	**P**	**C**
Year	I	**Semester**	I	**3**	**1**	**0**	**4**
Pre-Requisite	10+2	**Co-requisite**					
Course Objectives	The objectives of environmental studies are: (a) Creating awareness about environmental problems among people. (b) Imparting basic knowledge about the environment and its allied problems. The importance of environmental science and environmental studies cannot be disputed. The need for sustainable development is a key to the future of mankind. Continuing problems of pollution, loss of forget, solid waste disposal, degradation of the environment, issues like economic productivity and national security, Global warming, the depletion of the ozone layer and loss of biodiversity have made everyone aware of environmental issues						

Course Outcomes

CO1	Gain in-depth knowledge on natural processes and resources that sustain life and govern the economy
CO2	Understand the consequences of human actions on the web of life, global economy, and quality of human life.
CO3	Acquire values and attitudes towards understanding complex environmental- economic-social challenges, and active participation in solving current environmental problems and preventing the future ones.
CO4	Aware students about problems of environmental pollution, its impact on humans and ecosystems, and control measures.
CO5	Adopt sustainability as a practice in life, society, and industry

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Unit I. Humans and the Environment**	The man-environment interaction: Humans as hunter-gatherers; Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment; Middle Ages and Renaissance; Industrial revolution and its impact on the environment; Population growth and natural resource exploitation; Global environmental change. The emergence of environmentalism: Anthropocentric and eco-centric perspectives (Major thinkers)	05	CO1
2	**Unit II. Natural Resources and Sustainable Development**	Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, renewable and non-renewable. Microbes as a resource; Status and challenges. Water resources: Types of water resources- fresh water and marine resources; Availability and use of water resources; Environmental impact of over-exploitation, issues and challenges; Water scarcity and stress; Conflicts over water. Soil and mineral resources: Important minerals; Mineral exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation. Energy resources: Sources of energy and their classification, Implications of energy use on the environment. Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs.	08	CO2
3	**Unit III. Conservation of Biodiversity and Ecosystems**	Biodiversity as a natural resource; Levels and types of biodiversity; Biodiversity in India and the world; Biodiversity hotspots. Major ecosystem types in India and their basic characteristics; Ecosystem services- classification and their significance. Threats to biodiversity and ecosystems, Major conservation policies: in-situ and ex-situ conservation approaches; National and International Instruments for biodiversity conservation; the role of traditional knowledge, community-based conservation; Gender and conservation.	6	CO3
4	**Unit IV. Environmental Pollution and Health**	Definition of pollution; Point sources and non-point sources of pollution. Air pollution: Sources of air pollution; Primary and secondary pollutants; Indoor air pollution; Adverse health impacts of air pollutants; National Ambient Air Quality Standards. Water pollution: Sources of water pollution; River, lake, and marine pollution, groundwater pollution; Water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life. Soil pollution and solid waste; Solid and hazardous waste; Impact on human health. Noise pollution: Definition; Unit of measurement of noise pollution; Sources of noise pollution; Noise standards; adverse impacts of noise on human health. Thermal and Radioactive pollution: Sources and impact on human health and ecosystems. Definition of pollution; Point sources and non-point sources of pollution.	10	CO3 & 4
5	**Unit V. Climate Change: Impacts, Adaptation and Mitigation**	Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Impacts on animal species, agriculture, health, and urban infrastructure. Mitigation of climate change: Synergies between adaptation and mitigation measures; Green House Gas (GHG) reduction vs. sink enhancement; Concept of carbon intensity, energy intensity, and carbon neutrality; National and international policy instruments for mitigation, decarbonizing pathways, and net zero targets for the future; Energy efficiency measures.	8	CO4
6	**Unit VI Environmental Legislation**	Major Indian Environmental Legislations: The Wild Life (Protection) Act, 1972; The Water (Prevention and Control of Pollution) Act, 1974; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Environment (Protection) Act, 1986; The Biological Diversity Act, 2002; Noise Pollution (Regulation and Control) Rules, 2000; Waste management rules; Ecologically Sensitive Areas; Coastal Regulation Zone; India; National Green Tribunal; Some landmark Supreme Court judgments.	08	CO3
7	**Unit VII. Environmental Treaties and Organizations**	Major International Environmental Agreements: CBD; Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-sharing; CITES; Ramsar Convention; UNCCD; Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol and the Kigali Amendment; Basel Convention; Stockholm Convention; Minamata Convention; UNFCCC; Kyoto Protocol; Paris Agreement; India's status as a party to major conventions. Major International organizations and initiatives: UNEP, IUCN, WCED, UNESCO, IPCC, and MAB) program.	08	CO4
8	**Unit VIII. Case Studies and Field Work**	• Discussion on one national and one international case study related to the environment and sustainable development. • Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report.	8	CO5

		• Documentation of campus biodiversity. • Campus environmental management activities such as solid waste disposal, water management, and sewage treatment.		

Reference Books:

1) Agarwal, K.C. 2001 Environmental; Biology, Nidi Pub. Ltd. Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Pub. Pvt. Ltd., Ahemdabad-380, India.
3) Brunner R.C. 1989. Hazardous waste incineration, Mc Graw Hill
4) Clark R.S. Marine Pollution, Clanderon Press Oxford (TB)
5) Cunningham W.P.2001.Cooper, T.H. Gorhani, E & Hepworth, Environmental encyclopedia, Jacob Publication House, Mumbai.
6) De. A.K. Environmental chemistry Willey Eastern Limited.
7) Glick, H.P.1993 water in crisis, Pacific Institute for studies in dev, Environment & security, Stockholm Env, Institute, Oxford Univ, Press 473 p.
8) Hawkins R .E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay.
9) Heywood, V.H. & Watson, R. T.1995.Global biodiversity Assessment.Cambridge Univ. Press 1140 p.
10) Jadhave, H. and Bhosale, V. M. 1995 Environmental protection and laws, Himalaya pub, house, Delhi.284 p.
11) Mckinnery, M.L. and School, R. M.1996 Environmental science systems and solutions, web enhanced edition 639 p.
12) Mhaskar A.K. Matter Hazardous, Techno Science Pub (TM)
13) Miller T.G. Jr, Environmental Ecology, W. B. Saunders Co.USA,574 p. 16
14) Odum, E.P.1997.Fundamental chemistry, Goel Pub House Meerut.
15) Survey of the Environment, The Hindu (M).
16) Sharma B.K.2001.Environmental Chemistry, Goel Pub House Meerut

e-Learning Source:

https://byjus.com/biology/difference-between-environment-and-eCOsystem.
https://www.youtube.com/watch?v=dRPl4TB8w7k
https://www.youtube.com/watch?v=3fbEVytyJCk
https://www.vedantu.com/biology/conservation-of-biodiversity
https://youmatter.world/en/definition/soil-erosion-degradation-definition/
https://byjus.com/biology/difference-between-environment-and-eCOsystem.

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	1	3	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	3	1	-	1	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	1	3	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	1	3	-	1	2	-	-	-	-	-	-	-	-	2	-	-	-
CO5	1	2	3	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HOD