

Teaching Plan

Session – April 2022-August 2022

Paper-: Environmental Studies (AECC), code - 72182801

Semester: Second

Teacher Name -: Dr. Rashmi Kumari

Unit 1

Introduction to Environmental Studies (2 lectures)

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

Unit 2

Ecosystems (6 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), 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); Ecosystem preservation and conservation strategies; Basics of Ecosystem restoration

Unit 3

Natural Resources - 8 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 & inter- state 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)

Unit 4

Biodiversity and Conservation - 8 lectures

Definition of Biodiversity; Levels of biological diversity: genetic, species and ecosystem diversity

India as a mega-biodiversity nation; Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered species of India; IUCN Red list criteria and categories

Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and informational values of biodiversity with examples; sacred groves and their importance with examples

Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis

Biodiversity conservation strategies: in-situ and ex-situ methods of conservation; National Parks, Wildlife Sanctuaries, and Biosphere reserves; Keystone, Flagship, Umbrella, and Indicator species; Species reintroduction and translocation

Case studies: Contemporary Indian wildlife and biodiversity issues, movements, and projects (e.g., Project Tiger, Project Elephant, Vulture breeding program, Project Great Indian Bustard, Crocodile conservation project, Silent Valley movement, Save Western Ghats movement, etc)

Unit 5

Environmental Pollution - 8 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 case studies: Ganga Action plan (GAP), Delhi air pollution and public health issues, Plastic waste management rules, Bhopal gas tragedy, etc

Unit 6

Global Environmental Issues and Policies - 7 lectures

Causes of Climate change, Global warming, Ozone layer depletion, and Acid rain; Impacts on human communities, biodiversity, global economy, and agriculture

International agreements and programmes: Earth Summit, UNFCCC, Montreal and Kyoto

protocols, Convention on Biological Diversity(CBD), Ramsar convention, The Chemical Weapons Convention (CWC), UNEP, CITES, etc

Sustainable Development Goals: India's National Action Plan on Climate Change and its major missions

Environment legislation in India: Wildlife Protection Act, 1972; Water (Prevention and Control of Pollution) Act, 1974; 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

Unit 7

Human Communities and the Environment -6 lectures

Human population growth: Impacts on environment, human health, and welfare; Carbon footprint

Resettlement and rehabilitation of developmental project affected persons and communities; relevant case studies

Environmental movements: Chipko movement, Appiko movement, Silent valley movement, Bishnois of Rajasthan, Narmada Bachao Andolan, etc

Environmental justice: National Green Tribunal and its importance

Environmental philosophy: Environmental ethics; Role of various religions and cultural practices in environmental conservation

Environmental communication and public awareness: case studies (e.g., CNG vehicles in Delhi, Swachh Bharat Abhiyan, National Environment Awareness Campaign (NEAC), National Green Corps (NGC) "Eco-club" programme, etc)

Field work/ Practicals

(Equal to 5 lectures, including two mandatory field visits)

Field visit to any of the ecosystems found in Delhi like Delhi Ridge/ Sanjay lake/ Yamuna river and its floodplains *etc.*, or any nearby lake or pond, explaining the theoretical aspects taught in the class room

Visit to any biodiversity park/ reserve forest/ protected area/ zoo/ nursery/ natural history museum in and around Delhi, such as Okhla bird sanctuary/ Asola Bhatti Wildlife Sanctuary/ Yamuna Biodiversity Park/ Sultanpur National Park, explaining the theoretical aspects taught in the classroom

Visit to a local polluted site (urban/rural/industrial/agricultural), wastewater treatment plants, or landfill sites, etc

Study of common plants and animals; basic principles of identification

Organize a seminar/ conference/ workshop/ panel discussion on relevant topics for enhancing awareness, capacity building, and critical reasoning among students

Assessment methods

1. Written examinations (Semester exams, Internal assessment)
2. Project work and reports related to field visits and practical learning
3. Assignment/presentations on any contemporary environmental issue

Programme Learning Outcome in course

The course will empower the undergraduate students through:

Gaining of in-depth knowledge on natural processes and resources that sustain life and govern economy.

Understanding and predicting the consequences of human actions on the web of life, global economy, and quality of human life.

Development of critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.

Acquisition of values and attitudes towards understanding complex environmental-economic-social challenges, and active participation in solving current environmental problems and preventing the future ones.

Encouraging adoption of sustainability as a practice in life, society, and industry.

Course Learning Outcomes

The course will empower the undergraduate students by helping them to:

Gain in-depth knowledge on natural processes and resources that sustain life and govern economy.

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

Develop critical thinking for shaping strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.

Acquire values and attitudes towards understanding complex environmental-economic-social challenges, and active participation in solving current environmental problems and preventing the future ones.

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

Lesson Plan – Unit wise break of syllabus

Teaching time (No. of Weeks)----16

Week 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

Week 2

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

Week 3

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

Week 4

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

Natural and man-made sources of water; Uses of water; Over exploitation of surface and ground

water resources; Floods, droughts, and international & inter-state conflicts over water

Week 5

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).

Week 6

Definition of Biodiversity; Levels of biological diversity; India as a mega-biodiversity nation; Biogeographic zones of India; Biodiversity hotspots; Endemic and endangered

species of India; IUCN Red list criteria and categories

Value of biodiversity: Ecological, economic, social, ethical, aesthetic, and informational values of biodiversity with examples; sacred groves and their importance with examples

Week 7-8

Threats to biodiversity: Habitat loss, degradation, and fragmentation; Poaching of wildlife; Man-wildlife conflicts; Biological invasion with emphasis on Indian biodiversity; Current mass extinction crisis; Biodiversity conservation strategies: in-situ and ex-situ methods of conservation; National Parks, Wildlife Sanctuaries, and Biosphere reserves; Keystone, Flagship, Umbrella, and Indicator species; Species reintroduction and translocation

Case studies: Contemporary Indian wildlife and biodiversity issues, movements, and projects (e.g., Project Tiger, Project Elephant, Vulture breeding program, Project Great Indian Bustard, Crocodile conservation project, Silent Valley movement, Save Western Ghats movement, etc)

Week 9

Environmental pollution (Air, water, soil, thermal, and noise): causes, effects, and controls; Primary and secondary air pollutants; Air and water quality standards

Related case studies

Week 10

Nuclear hazards and human health risks; Control measures for various types of urban, industrial waste, Hazardous waste, E-waste, etc; Waste segregation and disposal

Related case studies

Week 11

Causes of Climate change, Global warming, Ozone layer depletion, and Acid rain; Impacts on human communities, biodiversity, global economy, and agriculture

International agreements and programmes: Earth Summit, UNFCCC, Montreal and Kyoto protocols, Convention on Biological Diversity(CBD), Ramsar convention, The Chemical Weapons Convention (CWC), UNEP, CITES, etc

Week 12

Sustainable Development Goals: India's National Action Plan on Climate Change and its major missions

Wildlife Protection Act, 1972; Water (Prevention and Control of Pollution) Act, 1974; 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

Week 13

Human population growth: Impacts on environment, human health, and welfare; Carbon foot-print; Resettlement and rehabilitation of developmental project affected persons and communities; relevant case studies; Environmental movements: Chipko movement, Appiko

movement, Silent valley movement, Bishnois of Rajasthan, Narmada Bachao Andolan, etc;
Environmental justice: National Green Tribunal and its importance

Week 14

Environmental philosophy: Environmental ethics; Role of various religions and cultural practices in environmental conservation

Environmental communication and public awareness: case studies (e.g., CNG vehicles in Delhi, Swachh Bharat Abhiyan, National Environment Awareness Campaign (NEAC), National Green Corps (NGC) “Eco-club” programme, etc)

Week 15-16

Field visit to any of the ecosystems found in Delhi like Yamuna biodiversity park, explaining the theoretical aspects taught in the class room

Organize a seminar/ conference/ workshop/ panel discussion on relevant topics for enhancing awareness, capacity building, and critical reasoning among students

Basic exercise to Calculate and Assess carbon footprint/ Solid waste generation/ water consumption for a specific duration at individual/ family/ college/ locality level.

ASSESSMENT

Internal Assessment: 25 Marks

Written Semester Examination – 75 Marks

ESSENTIAL READINGS

1. Brusseau, M.L., Pepper, I.L., and Gerba, C.P. (2019). *Environmental and Pollution Science*, 3rd Edition. Academic Press, USA. (pp. 1-520).
2. Divan, S. and Rosencranz, A. (2002). *Environmental Law and Policy in India: Cases, Material & Statutes*, 2nd Edition. Oxford University Press, India. (pp. 1-837).
3. Gadgil, M., and Guha, R. (1993). *This Fissured Land: An Ecological History of India*. University of California Press, Berkeley, USA. (pp. 1-245).
4. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). *Environment*, 8th Edition. Wiley Publishing, USA. (pp. 1-472).
5. Singh, J.S., Singh, S.P., and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. (pp.1-842).

SUGGESTED READINGS

Suggested readings unit-wise -

Unit 1

Introduction to Environmental Studies

1. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). *Environment*, 8th Edition. Wiley Publishing, USA. **Chapter 1** (Pages: 1-17); **Chapter 2** (Pages: 22-23); **Chapter 3** (Pages: 40, 41); **Chapter 4** (Pages: 64, 66).
2. Singh, J.S., Singh, S.P., and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 1** (Page: 3-28).

Unit 2 Ecosystems

1. Odum, E.P., Odum, H.T., and Andrews, J. (1971). *Fundamentals of Ecology*. Saunders, Philadelphia, USA. **Chapter 1** (Pages: 1-16); **Chapter 2** (Pages: 18-76); **Chapter 10** (Pages: 414-458).
2. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y., and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 3** (Pages: 38-52); **Chapter 4** (Pages: 53-62); **Chapter 5** (Pages: 100-103); **Chapter 6** (Pages: 106-128).
3. Singh, J.S., Singh, S.P., and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 13** (Pages: 307-323); **Chapter 18** (Pages: 420-442); **Chapter 28** (Pages: 747-769).

Unit 3 Natural Resources

1. Gadgil, M. and Guha, R. (1993). *This Fissured Land: An Ecological History of India*. University of California Press, Berkeley, USA. (pp. 1-245).
2. McCully, P. (1996). *Rivers no more: the environmental effects of dams*, In: *Silenced Rivers: The Ecology and Politics of Large Dams*, Zed Books, New York, USA. **Page. 29-64**.
3. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapters 10, 11, 12, 13** (Pages: 180-263); **Chapter 14** (Pages: 272-275); **Chapter 15** (Pages: 286-289).
4. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 25** (Pages: 623-663).

Unit 4 Biodiversity and Conservation

1. Primack, R.B. (2014). *Essentials of Conservation Biology*, Oxford University Press, USA. Page. 1-536.
2. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 5** (Pages: 97-99); **Chapter 16** (Pages: 299-318).
3. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapters 24** (Pages: 599-690); **Chapter 26** (Pages: 664-714).

Unit 5 Environmental Pollution

1. Brusseau, M.L., Pepper, I.L. and Gerba, C.P. (2019). *Environmental and Pollution Science*, 3rd Edition.

- Academic Press, USA. **Chapter 16** (Pages: 243-255); **Chapter 18** (Pages: 280-305); **Chapter 21** (Pages: 352-358); **Chapter 22** (Pages: 365-374); **Chapter 23** (Pages: 378-388); **Chapter 25** (Pages: 416-426).
2. Carson, R. (2002). *Silent Spring*. Houghton Mifflin Harcourt, USA. Pp. 1-264.
 3. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 19** (Pages: 359-381); **Chapter 21** (Pages: 401-421); **Chapter 23** (Pages: 440-453).
 4. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapters 19, 20, 12** (Pages: 445-535).

Unit 6 Global Environmental Issues and Policies

1. Divan, S. and Rosencranz, A. (2002). *Environmental Law and Policy in India: Cases, Material & Statutes*, 2nd Edition. Oxford University Press, India. **Chapter 2** (Pages: 23-39); **Chapter 3** (Pages: 41-86).
2. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 19** (Pages: 370-376); **Chapter 20** (Pages: 385-399).
3. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 23** (Pages: 555-598); **Chapter 30** (Pages: 801-807).

Unit 5 Human Communities and the Environment

1. Divan, S. and Rosencranz, A. (2002). *Environmental Law and Policy in India: Cases, Material & Statutes*, 2nd Edition. Oxford University Press, India. **Chapter 10** (Pages: 416-473).
2. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). *Environment*, 9th Edition. Wiley Publishing, USA. **Chapter 2** (Pages: 33-36); **Chapter 8** (Pages: 148-162).
3. Singh, J.S., Singh, S.P. and Gupta, S.R. (2017). *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi. **Chapter 1** (Pages: 23-26); **Chapter 31** (Pages: 826-842).