SEMESTER: III & IV PART: IV	23UEVSG48: ENVIRONMENTAL STUDIES (Common to all UG)	CREDIT: 2 HOURS: 1

Unit 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.

(2 Lectures)

Unit 2: Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems:
  a) Forest ecosystem
  b) Grassland ecosystem
  c) Desert ecosystem
  d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 Lectures)

Unit 3: Natural Resources: Renewable and Non-renewable Resources

- Land Resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Heating of earth and circulation of air; air mass formation and precipitation.
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

(8 Lectures)

Unit 4: Biodiversity and Conservation

- Levels of biological diversity :genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

(8 Lectures)

Unit 5: Environmental Pollution

- Environmental pollution : types, causes, effects and controls; Air, water, soil, chemical and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste..
- Pollution case studies.

(8 Lectures)

Unit 6: Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.
- Environment Laws : Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC).
- Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context

(7 Lectures)

Unit 7: Human Communities and the Environment

- Human population and growth: Impacts on environment, human health and welfares.
- Carbon foot-print.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquakes, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnios of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

(6 Lectures)

Unit 8: Field work

- Visit to an area to document environmental assets; river/forest/flora/fauna, etc.
- Visit to a local polluted site – Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi Ridge, etc.

(Equal to 5 Lectures)

Suggested Readings:

1. Carson, R. *2002. Silent Spring.* Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. This *Fissured Land:* An Ecological History of India. Univ. of California Press.
3. Gleeson,B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P.H. 1993. Water in *Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. *Principles of Conservation Biology.* Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P.1996. *Rivers no more: the environmental effects of dams*(pp. 29-64). Zed Books.
8. McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, h.T. & Andrews, J.1971. *Fundamentals of Ecology.* Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatement.* Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment.* 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M.L. 2001. *Environmental law and policy in India.* Tripathi 1992.
14. Sengupta, R. 2003.*Ecology and economics:* An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation.* S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics.* John Wiley & Sons.
17. Thapar, V. 1998. *Land of the Tiger: A Natural History of the Indian Subcontinent.*
18. Warren, C.E. 1971. *Biology and Water Pollution Control.* WB Saunders.
19. Wilson, E.O. 2006. *The Creation: An appeal to save life on earth.* New York: Norton.
20. World Commission on environment and Development. 1987. *Our Common Future*. Oxford University Press.
21. www.nacwc.nic.in
22. www.opcw.org