

Savitribai Phule Pune University

(Formerly University of Pune)



Value Education Course (VEC)

Syllabus for F.Y.B.Sc. Students

(As Per National Education Policy-2020)

For Colleges Affiliated to Savitribai Phule Pune University

To be implemented from Academic Year 2024-2025

VEC-101-T: Environment Education-I

Course type: VEC (Theory)

No. of Credits: 2

Semester : I

Course Outcomes

After the completion of this course, student will be able to-

CO-1: describe how human activities impact the environment.

CO-2: explain principles of sustainable development and resource management.

CO-3: analyze local, regional, and global environmental issues and their effects.

CO-4: evaluate different strategies for conserving biodiversity and ecosystems.

CO-5: apply relevant environmental policies and ethical considerations to real-world scenarios.

CO-6: design and implement action plans for community-based environmental projects.

Course Content

Chapter 1: Humans and the Environment

[06 hours]

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); The Club of Rome- Limits to Growth; UN Conference on Human Environment 1972; World Commission on Environment and Development and the concept of sustainable development; Rio Summit and subsequent international efforts.

Suggested Readings

1. Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.
2. Headrick, Daniel R. (2020) Humans versus Nature- A Global Environmental History, Oxford University Press.
3. Hughes, J. Donald (2009) An Environmental History of the World- Humankind's Changing Role in the Community of Life, 2nd Edition. Routledge.
4. Perman, R., Ma, Y., McGilvray, J., and Common, M. (2003) Natural Resource and Environmental Economics. Pearson Education.
5. Simmons, I. G. (2008). Global Environmental History: 10,000 BC to AD 2000. Edinburgh University Press

Chapter 2: Natural Resources and Sustainable Development

[08 hours]

Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, renewable and non-renewable.

Biotic resources: Major type of biotic resources- forests, grasslands, wetlands, wildlife and aquatic (fresh water and marine); 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, renewable and non-renewable sources of energy; Conventional energy sources- coal, oil, natural gas, nuclear energy; Non-conventional energy sources- solar, wind, tidal, hydro, wave, ocean thermal, geothermal, biomass, hydrogen and fuel cells; Implications of energy use on the environment.

Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs.

Suggested Readings

1. Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future. 10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson.
2. John W. Twidell and Anthony D. (2015). Renewable Energy Sources, 3rd Edition, Weir Publisher (ELBS)
3. William P. Cunningham and Mary A. (2015) Cunningham Environmental Science: A Global Concern, Publisher (Mc-Graw Hill, USA)
4. Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering and Science, Ela Publisher (Pearson)
5. Singh, J.S., Singh, S.P. & Gupta, S.R. 2006. Ecology, Environment and Resource Conservation. Anamaya Publications <https://sdgs.un.org/goals>

Chapter 3: Environmental Issues: Local, Regional and Global [08 hours]

Environmental issues and scales: Concepts of micro-, meso-, synoptic and planetary scales; Temporal and spatial extents of local, regional, and global phenomena.

Pollution: Impact of sectoral processes on Environment, Types of Pollution- air, noise, water, soil, municipal solid waste, hazardous waste; Transboundary air pollution; Acid rain; Smog.

Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Biodiversity loss: past and current trends, impact.

Global change: Ozone layer depletion; Climate change.

Suggested Readings

1. Harper, Charles L. (2017) Environment and Society, Human Perspectives on Environmental Issues 6th Edition. Routledge.
2. Harris, Frances (2012) Global Environmental Issues, 2nd Edition. Wiley- Blackwell.
3. William P. Cunningham and Mary A. (2015). Cunningham Environmental Science: A global concern, Publisher (Mc-Graw Hill, USA)
4. Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press. <https://doi.org/10.1201/9781003096238>
5. Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press.

Chapter 4: Conservation of Biodiversity and Ecosystems

[08 hours]

Biodiversity and its distribution: Biodiversity as a natural resource; Levels and types of biodiversity; Biodiversity in India and the world; Biodiversity hotspots; Species and ecosystem threat categories.

Ecosystems and ecosystem services: Major ecosystem types in India and their basic characteristics- forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and their significance.

Threats to biodiversity and ecosystems: Land use and land cover change; Commercial exploitation of species; Invasive species; Fire, disasters and climate change.

Major conservation policies: in-situ and ex-situ conservation approaches; Major protected areas; National and International Instruments for biodiversity conservation; the role of traditional knowledge, community-based conservation; Gender and conservation.

Suggested Readings

1. Bawa, K.S., Oomen, M.A. and Primack, R. (2011) Conservation Biology: A Primer for South Asia. Universities Press.
2. Sinha, N. (2020) Wild and Wilful. Harper Collins, India.
3. Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors) (2022) Conservation through Sustainable Use: Lessons from India. Routledge.
4. Bhagwat, Shonil (Editor) (2018) Conservation and Development in India: Reimagining Wilderness, Earthscan Conservation and Development, Routledge.
5. Krishnamurthy, K.V. (2003) Textbook of Biodiversity, Science Publishers, Plymouth, UK

VEC-151-T: Environment Education-II

Course type: VEC (Theory)

No. of Credits: 2

Semester : II

Course Outcomes

After the completion of this course, student will be able to-

CO-1: identify various types of environmental pollution and their impacts on health.

CO-2: explain the basic concepts of climate change, including its causes and effects.

CO-3: analyze different strategies for adapting to and mitigating the effects of climate change.

CO-4: evaluate various environmental management practices and their effectiveness.

CO-5: apply the principles of key environmental treaties and legislation to case studies.

CO-6: create action plans that address specific environmental issues based on current policies and management practices.

Course Content

Chapter 1: Environmental Pollution and Health

[08 hours]

Understanding pollution: Production processes and generation of wastes; Assimilative capacity of the environment; Definition of pollution; Point sources and non-point sources of pollution.

Air pollution: Sources of air pollution; Primary and secondary pollutants; Criteria pollutants- carbon monoxide, lead, nitrogen oxides, ground-level ozone, particulate matter and sulphur dioxide; Other important air pollutants- Volatile Organic compounds (VOCs), Peroxyacetyl Nitrate (PAN), Polycyclic aromatic hydrocarbons (PAHs) and Persistent organic pollutants (POPs); 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 Water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life.

Soil pollution and solid waste: Soil pollutants and their sources; Solid and hazardous waste; Impact on human health.

Noise pollution: Definition of noise; 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.

Suggested Readings

1. Jackson, A. R., & Jackson, J. M. (2000). Environmental Science: The Natural Environment and Human Impact. Pearson Education.

2. Masters, G. M., & Ela, W. P. (2008). Introduction to environmental engineering and science (No.60457). Englewood Cliffs, NJ: Prentice Hall.
3. Miller, G. T., & Spoolman, S. (2015) Environmental Science. Cengage Learning.
4. Central Pollution Control Board Web page for various pollution standards. <https://cpcb.nic.in/standards/>
5. Ahluwalia, V. K. (2015). Environmental Pollution, and Health. The Energy and Resources Institute (TERI).

Chapter 2: Climate Change: Impacts, Adaptation and Mitigation **[06 hours]**

Understanding climate change: Natural variations in climate; Structure of atmosphere; Anthropogenic climate change from greenhouse gas emissions– past, present and future; Projections of global climate change with special reference to temperature, rainfall, climate variability and extreme events; Importance of 1.5 °C and 2.0 °C limits to global warming; Climate change projections for the Indian sub-continent.

Impacts, vulnerability and adaptation to climate change: 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, urban infrastructure; the concept of vulnerability and its assessment; Adaptation vs. resilience; Climate-resilient development; Indigenous knowledge for adaptation to climate change.

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; Renewable energy sources; Carbon capture and storage, National climate action plan and Intended Nationally Determined Contributions (INDCs); Climate justice.

Suggested Readings

1. Pittock, Barrie (2009) Climate Change: The Science, Impacts and Solutions. 2nd Edition. Routledge.
2. www.ipcc.org; <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>.
3. Adenle A., Azadi H., Arbiol J. (2015). Global assessment of technological innovation for climate change adaptation and mitigation in developing world, Journal of Environmental Management, 161 (15): 261-275.
4. Barnett, J. & S. O'Neill (2010). Maladaptation. Global Environmental Change—Human and Policy Dimensions 20: 211–213.
5. Berrang-Ford, L., J.D. Ford & J. Paterson (2011). Are we adapting to climate change ? Global Environmental Change—Human and Policy Dimensions 21: 25-33.

Chapter 3: Environmental Management

[06 hours]

Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights; Introduction to environmental legislations on the forest, wildlife and pollution control.

Environmental management system: ISO 14001 Life cycle analysis; Cost-benefit analysis Environmental audit and impact assessment; Environmental risk assessment, Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Ecomark scheme

Suggested Readings

1. Jørgensen, Sven Marques, Erik João Carlos and Nielsen, Søren Nors (2016) Integrated Environmental Management, A transdisciplinary Approach. CRC Press.
2. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press.
3. Barrow, C. J. (1999). Environmental management: Principles and practice. Routledge.
4. Tiefenbacher, J (ed.) (2022), Environmental Management - Pollution, Habitat, Ecology, and Sustainability, Intech Open, London. 10.5772/
5. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.

Chapter 4: Environmental Treaties and Legislation

[10 hours]

An overview of instruments of international cooperation; bilateral and multilateral agreements; conventions and protocols; adoption, signature, ratification and entry into force; binding and non-binding measures; Conference of the Parties (COP)

Major International Environmental Agreements: Convention on Biological Diversity (CBD); Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-sharing; Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); Ramsar Convention on Wetlands of International Importance; United Nations Convention to Combat Desertification (UNCCD); Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol on Substances that Deplete the Ozone Layer and the Kigali Amendment; Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; Stockholm Convention on Persistent Organic Pollutants; Minamata Convention on Mercury; United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement; India's status as a party to major conventions

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; The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; Noise Pollution (Regulation and Control) Rules, 2000; Industry-specific environmental standards; Waste management rules; Ramsar sites; Biosphere reserves; Protected Areas; Ecologically Sensitive Areas; Coastal Regulation Zone; Status phase-out of production and consumption of Ozone Depleting Substances by India; National Green Tribunal; Some landmark Supreme Court judgements

Major International organisations and initiatives: United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN), World Commission on Environment and Development (WCED), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC), and Man and the Biosphere (MAB) programme.

Suggested Readings

1. UNEP (2007) Multilateral Environmental Agreement Negotiator's Handbook, University of Joensuu, ISBN 978-952-458-992-5
2. Ministry of Environment, Forest and Climate Change (2019) A Handbook on International Environment Conventions & Programmes. <https://moef.gov.in/wp-content/uploads/2020/02/convention-V-16-CURVE-web.pdf>
3. Kanchi Kohli and Manju Menon (2021) Development of Environment Laws in India, Cambridge University Press.
4. India Code – Digital repository of all Central and State Acts: <https://www.indiacode.nic.in/>
5. Bohra, Saroj, Judicial Intervention and Evolution of Environmental Principles and Doctrines (January 7, 2019). Available at SSRN: <https://ssrn.com/abstract=3311406> or <http://dx.doi.org/10.2139/ssrn.3311406>

Note: Case Studies and Field Work is compulsory

The students are expected to be engaged in some of the following or similar identified activities:

1. Discussion on one national and one international case study related to the environment and sustainable development.
2. Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report.
3. Documentation of campus biodiversity.
4. Campus environmental management activities such as solid waste disposal, water management, and sewage treatment.