SEMESTER V

CH5CRT05 - Environment, Ecology and Human Rights

Credits – 4 (72 Hrs)

Environmental Chemistry (54 h)

Objectives: Environmental awareness is to understand the fragility and sensitivity of our environment, in particular the biosphere and the importance of its protection. Promoting environmental awareness is an easy way to become an environmental steward and participate in creating a brighter future for our next generations. The most important goal of this paper is to impart awareness on various environmental aspects, with some glimpses of contemporary issues. This will help them foster a *sense* of responsibility and "*proactive citizenship*".

Module I: Introduction to environmental studies: Natural resources

10 h

Definition, scope and importance of environmental studies for sustainable development, need for public awareness.

Natural Resources: Classification of natural resources; renewable and non-renewable resources:

Natural resources and associated problems;

1.1 Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

1.2 Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

1.3 Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

1.4 Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, industrial farming of livestock and effects on global warming, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, mass production of biodiesel for energy needs and *food security*.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Module II: Environment: Pollution and Social Issues

18 h

Fundamental ideas of pollution and pollutant. Cause, effects and preventive measures of various types of pollutions including; air, water, soil, marine, noise and thermal pollutions. Nuclear energy as a source of energy and its hazards. Solid waste management; causes, effects and control mechanisms of urban and industrial wastes. Prevention of pollution: role of individual. Disaster management mechanisms; disaster management of; floods, earthquake, cyclone and landslides.

Movement from unsustainable to sustainable development. Urban crisis related to energy. Water conservation, rain water harvesting, watershed management, Environmental ethics: Issues and possible solutions. Introduction to important green house gases (GHGs), sources of the primary greenhouse gases in Earth's atmosphere including water vapor, carbon dioxide, methane. The lesser GHGs- nitrous oxide, ozone and fluorinated gases. Carbon cycle, CO_2 sources, Keeling curve and Natural ‘sinks’ for CO_2. Green house effect, climate change,

global warming, acid rain, ozone layer depletion, role of CFCs in ozone depletion, and its mechanism, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products. Environment Protection Act (EPA). Air (prevention and control of pollution) Act. Water (prevention and control of pollution) Act, Wildlife Protection Act, Forest Conservation Act. Issues involved in the enforcement of environmental legislation. Introduction to the concept of green chemistry, atom economy (with suitable examples) and the twelve principles of green chemistry.

Module III: Population and Environmental issues

8 h

Human population growth, *Malthusian theory (basic idea) and* theory of evolution by natural selection, *Malthusian* catastrophe. Global challenges, *environmental* problems of population growth, impacts on human health and welfare, variation among nations, population explosion and Family Welfare Programme. Socio- economic, and geo-political dimensions of poverty, absolute and relative poverty, poverty scale, variation among nations, international food crisis. Resettlement and rehabilitation of project affected population. Environmental movements in India: Chipko, Silent valley, Bishnois of Rajasthan etc.

Module IV: Ecological Chemistry

18 h

Definition and scope of ecological chemistry, ecological stress posed upon ecosystems by the presence of chemicals. Origin of chemical toxicants; natural sources, and man-made. Organization of chemicals as xenobiotic, essential or nonessential substances. Release of chemicals in the environment, Transport Processes, Classification of transformation processes, biotic and abiotic. Structure- activity relationships in degradation and biodegradation of organic chemicals. Transformation processes including general, hydrolysis, oxidation, reduction, photochemical degradation, microbial degradation, and phytodegradation, environmental fate determining processes, bioavailability, exposure of species to (bio)available fractions, uptake (accumulation), metabolism, biomagnifications, distribution in organisms, and subsequent toxic effects. Risk assessment of chemicals-assessment of contaminated soils.

Persistent organic pollutants (POPs), natural and anthropogenic origin of POCs and characteristic properties; half-lives, K_{ow}, K_{aw} and K_{oa}. Adverse effects of persistent chemicals. Legislation on the use of POPs and twelve persistent organic pollutants. The sources, the uses, some of the physico-chemical properties, the half-lives in the environmental compartments of air, water and soil. Behaviour of the priority persistent organic pollutants identified by the United Nations Economic Commission for Europe (UNECE) including; polychlorinated biphenyls, dieldrin, aldrin, dichlorodiphenyltrichloroethane (DDT), Mirex, Heptachlor and Polychlorinated furans. Agency for Toxic Substances and Disease Registry (ATSDR) list, **the ATSDR 2017 Substance Priority List,** Restriction of Hazardous Substances (RoHS) directive, Material Safety Data Sheet (MSDN), Toxic Substances Control Act (TSCA) and banned/severely restricted chemicals list.

Suggested reference books

1. S. Manahan, *Fundamentals of environmental chemistry*, CRC-Press, 1993.
2. S. Manahan, *Fundamentals of Environmental and Toxicological Chemistry*: Sustainable Science, CRC Press, 2013
3. R.C. Brunner, *Hazardous Waste Incineration*, McGraw Hill Inc., 1989
4. W.P. Cunningham, T.H. Cooper, E Gorhani, and M.T. Hepworth, *Environmental Encyclopedia*, Jaico Publishing House, Mumbai, 2001.
5. A.K. De, *Environmental Chemistry*, Wiley Eastern Ltd.

6. V. Subramanian, *A Textbook of Environmental Chemistry*, I.K. International Publishing House Pvt. Ltd. 2011.
7. S.K. Tiwari, *Environmental Science: Volume I and II*, Atlantic Publishers and Distributers Pvt. Ltd., 2011.
8. R. M. Harrison (ed.), *Understanding Our Environment An Introduction to Environmental Chemistry and Pollution*, Royal Society of Chemistry, 1999
9. D. E. Newton, *Chemistry of the Environment***,** Facts On File Inc., 2007
10. V. Udai, Modern *Teaching of Population Education*, Anmol Publications Pvt. Ltd., 2005.
11. B. McGuire, Global *Catastrophes: A Very Short Introduction*, Oxford University Press, 2002.
12. A. E. Dessler, E. A. Parson, *The Science and Politics of Global Climate Change*, Cambridge University Press, 2006.
13. J. Firor, J. Jacobsen, *The Crowded and Greenhouse- Population, Climate Change, and Creating a Sustainable World,* Yale University Press, 2002.
14. B. Lomborg, *Cool It: The Skeptical Environmentalist's Guide to Global Warming,* Alfred A. Knopf Publisher- New York, 2007.

Further readings

1. S. V. S. Rana, *Essentials of Ecology and Environmental Science*, 5th Edition, Rupa publications, 2013.
2. V.H. Heywood, and R.T. Waston, *Global Biodiversity Assessment*. Cambridge Univ. Press, 1995.
3. H. Jadhav, V.M. Bhosale, *Environmental Protection and Laws*. Himalaya Pub. House, Delhi, 1995.
4. M.L. Mckinney, and R.M. School, *Environmental Science Systems and Solutions*, Web enhanced edition. 1996.
5. P. H., H. Raven, D.M. Hassenzahl, and L. R. Berg, *Environment*, 8th Edn. John Wiley & Sons, 2012.
6. A. Wreford, D. Moran, N. Adger , *Climate Change and Agriculture: impacts*, *adaptation and mitigation*, OECD publications, 2010.
7. R.S. Boethling D. Mackay, *Handbook of Property Estimation Methods for Chemicals.* Boca Raton, FL, USA: Lewis Publishers, 2000.
8. J.L.M. Hermens C. J. Van Leeuwen *Risk Assessment of Chemicals: An Introduction*, *Dordrecht*, The Netherlands, Kluwer Academic Press, 1995.
9. D. Mackay, W.Y.,Shiu, K.C. Ma *Physical-Chemical Properties and Environmental Fate*, *Degradation Handbook*. (CD-ROM), Boca Raton, FL, USA, Chapman & Hall CRC netBASE, CRC, 1999.
10. W. J. G. M. Peijnenburg, *Ecological Chemistry*, *Environmental and Ecological Chemistry- Vol. III*, *Encyclopedia of Life Support Systems* (EOLSS).
11. M. Ali, *Climate Change Impacts on Plant Biomass Growth*, Springer Dordrecht Heidelberg, 2013

Special Notes and Suggestions:

The purpose of the paper is to create general awareness on various dimensions of environmental sciences with a special focus on contemporary issues. The BoS in Chemistry recommend case studies or sample surveys (maybe in groups) rather than seminars. Students can undertake an assignment based on any of the following highly relevant and current topic;

- Edutainment film "*Samaksham"*, produced by Mahatma Gandhi University, Kottayam.
- Case Studies on the *important natural resources* of Kerala.

- Case Studies on the Indian *mining scams and consequent environmental* damages of; illegal mining in the *Aravali Ranges, Goa, Ganges river bed, Bellary* etc.
- Case Studies on the *disaster management mechanisms* of floods, landslides, earthquake, cyclone etc.
- Case Studies on the water conservation, rain water harvesting, watershed management in a local contest.
- Case studies on environmental movements like Narmada Bachao Andolan, Appiko Movement, Save Ganga Movement etc.

Module - V (18 h)

V.I Human Rights

An Introduction to Human Rights, meaning, concept and development –History of Human Rights- Different Generations of Human Rights- Universality of Human Rights- Basic International Human Rights Documents - UDHR, ICCPR, ICESCR.-Value dimensions of Human Rights

V-II Human Rights and United Nations

Human Rights co-ordination within UN system- Role of UN secretariat- The Economic and Social Council- The Commission (of) Human Rights?-The Security Council and Human rights- The Committee on the Elimination of Racial Discrimination- The Committee on the Elimination of Discrimination Against Women- the Committee on Economic, Social and Cultural Rights- The Human Rights Committee- Critical Appraisal of UN Human Rights Regime.

V-III Human Rights National Perspective

Human Rights in Indian Constitution – Fundamental Rights- The Constitutional Context of Human Rights- directive Principles of State Policy and Human Rights- Human Rights of Women-children –minorities- Prisoners- Science Technology and Human Rights- National Human Rights Commission- State Human Rights Commission- Human Rights Awareness in Education.

References and suggested readings

1. H.O. Agarwal, *Implementation of Human Rights Covenants with Special Reference to India*,
2. P. Alston, *The United Nations and Human Rights*, Clarendon Press, London, 1995.
3. Amnesty International, *Political Kings by Governments*, Amnesty International, London, 1983.
4. Bajwa, G.S. and D.K. Bajwa, *Human Rights in India: Implementation and Violations* , D.K. Publishers, New Delhi, 1996.
5. UNESCO, Yearbook on Human Rights.
6. NHRC, Annual Reports since 1993.
7. V.K. Bansal, *Right to Life and Personal Liberty*, Deep and Deep, New Delhi, 1986.
8. M. Banton, *International Action against Racial Discrimination* Clarendon Press, Oxford, 1996.
9. D.D. Basu, Human Rights in Constitutional Law, Prentice Hall, New Delhi, 1994.
10. N.Bava (ed.,) *Human Rights and Criminal Justice Administration in India*, Uppal Publishing House, New Delhi, 2000.
11. UN Centre for Human Rights, *Civil and Political Rights: The Human Rights Committee*, World Campaign for Human Rights, Geneva, 1997.
12. UN Centre for Human Rights, *Discrimination against Women*, World Campaign for Human Rights, Geneva, 1994.
13. UN Centre for Human Rights, Minority Rights, World Campaign for Human Rights, Geneva, , 1998.

14. UN Centre for Human Rights, *Human Rights Machinery*, World Campaign for Human Rights, Geneva, 1987.
15. Ian Brownlie, *Basic Documents Human Rights*
16. Jack Donelli, *Universal Human Rights in Theory and practice*
17. Upendra Baxi, *Future of Human Rights*
18. O P Dhiman, *Understanding Human Rights-An Overview*
19. D P Khanna, *Reforming Human Rights*
20. Chiranjivi J Nirmal, *Human Rights in India-Historical, social and political perspectives*
21. *Human Rights in Post-Colonial India,* Edited by Om Prakash Dwivedi and V G Julie Rajan