

ENVIRONMENTAL SCIENCE SYLLABUS

M.Sc. SEMESTER – I 2017

Course	Title of the Paper	Course Credit
ENV 401	NATURAL AND BIOLOGICAL ENVIRONMENT	4
ENV 402	ENVIRONMENTAL ISSUES AND IMPACTS	4
ENV 403	ENERGY AND ENVIRONMENT	4
ENV 404	ENVIRONMENT AND SOIL	4
ENV 405 PR	ECOLOGICAL EXPERIMENTS	4
ENV 406 PR	SOIL ANALYSIS	4

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ENV 401 NATURAL AND BIOLOGICAL ENVIRONMENT

UNIT-1 Biological Communities and Ecosystem

Introduction, Interactions between species, Natural selection, Species richness, Ecological succession, Food chains and food webs, Primary production, Energy flow in ecosystems, Secondary productivity, Decomposition, Ecosystem stability.

UNIT-2 Terrestrial Biomes and Forest Resources

Introduction, Tundra and Taiga, Temperate deciduous forest, Mediterranean vegetation, Temperate and tropical grasslands, Desert and tropical rainforest, Forest Resources-Uses, Forest Type and Management, World Forest Cover, Forest Resources of India, Deforestation, Effect of Deforestation on Tribal People, Effect of Dams on Forest, Forest Degradation in India, Sustainable Forest Management.

UNIT-3 Mineral and Food Resources

Introduction, Exhaustibility, Localized Occurrence, Uses and Exploration of Mineral Resources, Environmental Effects of Mineral Exploration and Usage, World Food Problems and Production, Pesticides in Modern Agriculture and Environmental Problems, Environmental Limits for Increasing Food Production, Solutions : Sustainable Agriculture, Impact of Irrigation on Environmental Quality.

UNIT-4 Conservation of Natural Resources and Environmental Management

Conservation of Natural Resources, Role of Individuals in Sustainable Environmental Management, Value System and Equitable Resources Use for Sustainable Life System, Role of Individuals in Conservation and Prevention of Pollution

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ENV 401 NATURAL AND BIOLOGICAL ENVIRONMENTAL

REFERENCES

- 1) Y. Anjaneyulu, “*Introduction to Environmental Science*”, BS Publications, Hyderabad, India, 2004.
- 2) H. Kaur, “*Environmental Studies*”, Pragati Prakashan, 2006.
- 3) Andrew R.W., Jackson & Julie M. Jackson, “*Environmental Science – The Natural Environment and Human Impact*”, Addison Wesley Longman Limited, 1996.
- 4) S.C. Santra, “*Environmental Science*”, 2nd Edition, New Central Book Agency (P) Ltd, Kolkata, India, 2005.
- 5) Richard T. Wright, “*Environmental Chemistry*”, Pearson Education Inc., South Asia, 2007.
- 6) Sharma B.K., “*Environmental Chemistry*”, Goel Publ. House, Meerut, 2001.
- 7) Wanger K.D., “*Environmental Management*”, W.B. Saunders Co. Philadelphia, USA, 1998.
- 8) Krebs J.R., Davies N.B., “*Behavioral Ecology : An Evolutionary Approach*”, 3rd Edition, Oxford : Blackwell Scientific, 1991.
- 9) Ricklifs R.E., “*Ecology*”, 3rd Edition, W.H. Ereeman, New York, 1990.
- 10) O’ Neill P., “*Environmental Chemistry*”, 2nd Edition, Chapman & Hall, London, 1993.
- 11) Bunce N. J., “*Environmental Chemistry*”, Wuerz, Winnipeg, 1990.

M.Sc. SEMESTER – I

ENV 402

ENVIRONMENTAL ISSUES AND IMPACTS

UNIT-1 The Atmosphere and Acid Rain

Composition of the atmosphere, Residence times, sources and sinks, Evolution of the primitive atmosphere, Temperature profile of the atmosphere, Atmospheres around the other planets, Nature and Development of Acid Rain, Acid Rain and its impacts on geological Environment, Terrestrial Environment, and Build Environment, Impact of Acid Rain on Human Health and Mitigation of its problems.

UNIT-2 Stratospheric Ozone and Tropospheric Chemistry

The ozone layer, Formation and destruction of ozone, Chlorofluorocarbons, The Montreal Protocol, CFC replacement compounds, Nitrogen oxides as ozone depleters, The hydroxyl radical as an oxidant, Oxidation of carbon monoxide by OH, Oxidation of methane, Photochemical smog, Tropospheric concentration of OH, Particles in the atmosphere, London smog, Particles and climate, Control of particles.

UNIT-3 Global Warming and Climate Change

Introduction, Greenhouse Gases and Global Climate Changes, Global Warming Potential, Possible Impact of Global Warming, Greenhouse Effect – Policy Response, Kyoto Protocol, El Niño-Climate Cycle, Ozone in the Atmosphere, Ozone Hole, Worldwide Ozone Trends, Consequence of Ozone Depletion, Consequences of global CO₂ changes, Strategies for Conservation of Environmental Changes Induced by CO₂ Rise.

UNIT-4 Radiation Hazardous and Environmental Degradation

Introduction, Radiation: Atomic and Natural Background, Measurement of Radio Activity, Nuclear Winter, Radioactive Waste, Ionizing Radiation, Anthropogenic Sources and Effects of Radioactive Pollution, Preventive Measurements.

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ENV 402

ENVIRONMENTAL ISSUES AND IMPACTS

REFERENCES

- 1) Nigel J. Bunce, “*Environmental Chemistry*”, Wuerz Publishing Ltd, Winnipeg, Canada, 1991.
- 2) S.C. Santra, “*Environmental Science*”, 2nd Edition, New Central Book Agency (P) Ltd, Kolkata, India, 2005.
- 3) H. Kaur, “*Environmental Studies*”, Pragati Prakashan, 2006.
- 4) Joner J.AA., “*Global Hydrology : Processes, Resources and Environment*”, Longman, Essenx, England, 1997.
- 5) Wilson E.O., “*Biodiversity*”, National Academy Press, Washinton, DC, 1988.
- 6) Tudge, Colin, “*Global Ecology*”, Oup, New York, 1991.
- 7) Mauahan S.E., “*Environmental Chemistry*”, Willaw Grant Press, Beston, USA, 1983.
- 8) Moeller, Dave W., “*Environmental Health*”, Mass : Harvard University Press, Cambridge, 1992.
- 9) R.P. Wayne, “*Chemistry of Atmospheres*”, Oxford University Press, Oxford, England, 1985.
- 10) Eds. J.D. Coyle, R.R. Hill and D.R. Roberts, “*Light, Chemical Change and Life*”, Open University press, Milton Keynes, England, 1982.
- 11) B.J. Finlayson-Pitts and J.N. Pitts, “*Atmospheric Chemistry*”, Wiley-Interscience, New York, 1986.
- 12) T.C. Elliott and R.C. Schwieger, “*The Acid Rain Sourcebook*”, McGraw Hill, New York, 1984.

M.Sc. SEMESTER – I

ENV 403

ENERGY AND ENVIRONMENT

UNIT-1 **Energy Flow and Equilibrium**

Introduction, The laws of energy flow, Dynamic equilibrium and spontaneous change, Chemical kinetics, Atoms and elements, Molecules and covalent compounds, Valency and periodic table of the elements, Oxidation states, Compound mixtures, Chemical species and chemical reactions, The atomic nucleus and nuclear reactions.

UNIT-2 **Energy Production and Management**

Introduction, Energy Production and Consumption, Sources of Energy, Renewable Energy, Energy Conservation, Solar Energy Input, Conventional Fuels, Natural Gas, Uranium, Nuclear Energy and Nuclear Reactions, The Risk of Nuclear Accidents.

UNIT-3 **Non-Conventional and Biological Energy**

Introduction, Photovoltaics, Solar Heating, Wind Energy, Tidal Power, Biomass and Biofuels, Natural Vegetation, Energy Tree Plantations, Specific Energy Crops, Power From Biomass, Biomass Programs, Biomass and the Environment.

UNIT-4 **Energy from Wastes**

Introduction, Water-Based Biomass, Energy from Wastes, Solid Wastes, Research and Development, Biogas Plants in India and its use, Utilization of Effluent, Cost of Installation and Annual Savings, Financial Assistance from Government, Organization of the Biogas Sector, Potential for Biogas Generation and Digester Construction, Future Energy Scenario of the World.

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ENERGY AND ENVIRONMENT

REFERENCES

- 1) Andrew R.W., Jackson & Julie, M. Jackson, “*Environmental Science – The Natural Environment and Human Impact*”, Addison Wesley Longman Limited, 1996.
- 2) S.C. Santra, “*Environmental Science*”, 2nd Edition, New Central Book Agency (P) Ltd, Kolkata, India, 2005.
- 3) Fowler, John M., “*Energy and the Environment*”, 2nd Edition, McGraw Hill, New York, 1984.
- 4) Atkins P.W. and J.A. Beran, “*General Chemistry*”, 2nd Edition, W.H. Ereeman, New York, 1992.
- 5) Weast R.C., “*Handbook of Chemistry and Physics*”, CRC Press, 1994.
- 6) Ebbing, D.D., “*General Chemistry*”, (International 4th Edition) MA : Houghton Mifflin, Boston, 1993.
- 7) Carless, Jennifer, “*Renewable Energy : A Concise Guide to Green Alternative*”, Walker, New York, 1993.
- 8) Gray, N.E., “*Biology of Wastewater Treatment*”, Oxford University Press, New York, 1992.

M.Sc. SEMESTER – I

ENV 404

ENVIRONMENT AND SOIL

UNIT-1 Soil Composition, Formation and Morphology

Preview and Historical Perspectives, Weathering of Soil Minerals, Soil Formation and the factors, Land, Development and Horizons, Degradation and Destruction, Quality Assessment, Soil Individual and Mapping Units, GIS and GPS for Soil.

UNIT-2 Physical Properties of Soil

Soil Texture, Rock Fragments, Soil Structure, Particle Density and Bulk Density, Soil Porosity and Permeability, Soil Air, Rhizotrons, Soil Consistence, Soil Color, Soil Temperature, Other Soil Physical Properties.

UNIT-3 Soil Water Properties

Water and its Relation to Soil, Terminology and Classifications for Soil Water, Soil as Water Reservoirs, Soil Water Content, Instruments for determining Water Content or Potential, Water Flow into and through Soils, Water Uptake by Plants, Consumptive Use and Water Efficiency, Reducing Water Loss.

UNIT-4 Chemical and Acidic Properties of Soil

Soil Clays, Organic Colloids, Cation/Anion Exchange and Adsorption, Reactions and Buffering in Soils, Ecological Relation of Soil Acidity, Composition and Reactions of Lime, Crops, Lime and Soil, Lime Balance Sheet, Acidifying Soils.

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ENV 404

ENVIRONMENT AND SOIL

REFERENCES

- 1) Raymond W. Miller, Duane T. Gardiner, “*Soil in our Environment*”, 8th Edition, Upper Saddle River, New Jersey, 1998.
- 2) Dr. H. Kaur, “*Environmental Chemistry*”, 2nd Edition, Pragati Prakashan, Meerut, 2007.
- 3) E.A. FitzPatrick, “*Soils : Their Formation, Classification and Distribution*”, Longman Publishers, 1980.
- 4) Karl Terzaghi, Ralph B. Peck and Gholamreza Mesri, “*Soil Mechanics in Engineering Practice*”, 3rd Edition, John Wiley & Sons, New York, 1996.
- 5) R.G.Burns, “*Soil Enzymes*”, Academic Press, New York, 1978.
- 6) S.L. Tisdale, W.L. Nelson, J.P. Beaton and John L. Havlin, “*Soil Fertility and Fertilizers*”, 5th Edition, Macmillan, New York, 1993.
- 7) F.R. Troch, J.A. Hobbs, and R.L. Donahue, “*Soil and Water Conservation*”, 2nd Edition, Prentice-Hall Englewood Cliffs, NJ, 1991.

M.Sc. SEMESTER – I

ENV 405 PR

Ecological Experiments

1. Determination of minimum size quadrat by the Species Curve method.
2. Determination of minimum no. of quadrat to be laid down in the field under the study.
3. Study of vegetation using line transect method.
4. Study of vegetation using belt transect method.
5. Study of vegetation using chart quadrat method.
6. Determination of important value index (IVI).

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Soil Analysis

1. Soil moisture measurement.
2. Determination of soil pH.
3. Determination of salt in soil.
4. Determination of calcium and magnesium in soil.
5. Determination of chloride in soil.
6. Determination of carbonate and bicarbonate in soil.
7. Determination of total phosphorus.