Integral University, Lucknow

Department of Environmental Science

M.Sc. (Environmental Science), 1st Year/1st Semester

Subject Name: Advance Studies in Environment and Ecology, Subject Code: ES401

w.e.f. July-2017

L T P 3 1 0

UNIT- I **08**

Introduction

Environmental Science - Definition, Scope and Importance - Components of the environment: Atmosphere, Hydrosphere, Lithosphere and Biosphere – Structure and composition - History and scope of Ecology - Terminologies in ecology.

UNIT – II **08**

Functional Aspects of Ecosystem

Functional aspect of ecosystem analysis; Energy flow (food chain, food web, ecological pyramid), energy resources and use efficiency, ecological energetic and energy models, Biomass production (gross and net), biomass estimation methods, Litter production and decomposition in different ecosystem, Biogeochemical cycles (nutrient cycle: carbon, nitrogen, sulphur, phosphorus, hydrological cycle); Homeostasis

UNIT – III **08**

Population ecology

Population ecology - Levels of Organization, population characteristics - density, natality, mortality, survivorship curves, age distribution, growth curves and models - Population interactions - Co-evolution, Neutralism, symbiosis, commensalism, mutualism, antagonism, antibiosis, parasitism, predation; competition- inter and intra specific.

UNIT – IV **08**

Resource Depletion

Natural resources-definition and types, Natural resources degradation-types and causes, loss of biodiversity, land degradation, deforestation, ecological and social impact of resource depletion.

UNIT – V **08**

Public Participation In Restoration

Role of public participation, government agencies and NGOs in conservation and restoration, environmental education and its role in conservation and restoration

Suggested Books/Reading:

- Jha LK (1997) Natural Resource Management. APHA Publishing Corporation, New Delhi.
- Odum EP (1996) Fundamentals of Ecology. W.B. Saunders, USA. Indian Reprint 1996, Natraj Publishers, Dehradun, India.
- Ramade F (1991) Ecology of Natural Resources. John-Wiley & Sons, New York.
- Rana SVS (2005) Essentials of Ecology and Environmental Sciences, Prentice-Hall of India Private Limited, New Delhi, India.
- Sharma PD (2000) Ecology and Environment. Rastogi Publications, Meerut, India.

Integral University, Lucknow

Department of Environmental Science

M.Sc. (Environmental Science), 1st Year/1st Semester

Subject Name: Energy And Green Technologies, Subject Code: ES402

w.e.f. July-2017

L T P 3 1 0

UNIT- I **08**

Energy Sources

Introduction – renewable energy sources, non-renewable energy sources, non-conventional and inexhaustible energy resources. Geothermal energy, wind driven power station, Tidal power plants, Glacier power plants, solar energy, nuclear energy, natural radio activity, nuclear power plant, fast breeder reactors, nuclear fusion, Gobar gas.

UNIT – II **08**

Energy Management

Energy management – solar energy input conventional fuels – oil, coal, natural gas, uranium, risk of nuclear accidents

UNIT – III **08**

Bio energy

Bio energy – Biomass and bio fuels – Woody biomass for bio fuel - Biogas technology - Petro plants (energy plantations) used for bio fuel – Cellulosic ethanol production

UNIT – IV **08**

Energy from wastes

Waste as renewable sources of energy- types of waste, classification based on chemical nature and physical state, composition of the waste, conversion of methane in to synthetic gas, factors effecting methane formation.

UNIT – V **08**

Green Chemistry

Biotic interactions, bio film, Green chemistry - Introduction- inception and evolution - Importance of solvents - Types of catalysts and their role - Biological alternatives – Applications - Principles of green chemistry, Advances in green chemistry

Suggested Books/Reading:

- Calle FR, de Groot P, Hemstock SL, Woods J (2007) The Biomass Assessment Handbook: Bioenergy for a sustainable environment, Earthscan, UK.
- El Bassam N (2010) Handbook of Bioenergy Crops – A Complete Reference to Species, Development and Applications, Earthscan, UK.
- Khanal SK, Surampalli RY, Zhang TC, Lamsal BP, Tyagi RD, Kao CM (2010) Bioenergy and Biofuel from Biowastes and Biomass, American Society of Civil Engineers, Virginia, USA.
- Lee S and Shah YT (2013) Biofuels and Bioenergy: Processes and Technologies, CRC Press, Boca Raton, FL, USA.
- Rashmi Sanghi and Srivasta MM (2006) Green Chemistry, Narosa Publishing House, New Delhi.
- Stanley E Manahan (2001) Environmental Chemistry, Lewis Publications, USA.
- Wang L (2014) Sustainable Bioenergy Production, CRC Press, Boca Raton, FL, USA.

Integral University, Lucknow

Department of Environmental Science

M.Sc. (Environmental Science), 1st Year/1st Semester

Subject Name: Basics of Environmental Microbiology, Subject Code: ES403

w.e.f. July-2017

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UNIT- I **08**

Introduction

History and scope of microbiology - Ultra structure of Prokaryotic and Eukaryotic cell - Sterilization techniques used in microbiology - Preparation of media for isolation and culture of microorganisms- Microbial growth and multiplication of bacteria, virus and fungi – Nature of virulence, toxins, extra cellular enzymes of pathogenic bacteria

UNIT- II **08**

Geo-microbiology

Distribution of microorganisms in soil - Factors influencing the soil microflora – Role of microorganisms in soil fertility - Interactions among microorganisms: Mutualisms, comensalism, competition, amensalism, parasitism, predation - Interactions between microbes and plants: Rhizosphere, phyllosphere, mycorrhizae

UNIT- III **08**

Biogeochemical Cycles

Biogeochemical cycles: Carbon cycle - Role of microbes in carbon cycle - Nitrogen cycle - Mechanism of biological nitrogen fixation – Ammonification, nitrification, denitrification and microorganisms involved in such processes - Phosphorous cycle and Sulphur cycle.

UNIT- IV **08**

Air and Water-borne Diseases

Microbial air pollutants – Bio aerosols, Aero allergen - Airborne diseases, Symptoms and preventive measures - Water pollution: Sources and nature of pollutants in water – waterborne diseases. Assessment of microbiological quality of water - MPN technique and Biological Oxygen Demand. Domestic solid (compost) and liquid waste treatment – Eutrophication

UNIT- V **08**

Applied Microbiology

Microbial conversion of solid waste to food (Mushroom, SCP), fuels (Biogas, Ethanol), Bioleaching of Ores, Biodegradation of Lignin – Pesticides – Recalcitrant – Bioremediation: Types and its application – Bio deterioration of paper, wood and paints - Metal corrosion

Suggested Books/Reading:

- Subba Rao NS (2004) Soil Microbiology. 4th Edition, Oxford & IBH Pubilshing Co. Pvt. Ltd., New Delhi.
- Subba Rao NS (1995) Biofertilizers in Agriculture and Forestry. 3rd Edition, Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.
- Robert L Tate (1995) Soil Microbiology. 1st Edition, John Wiley & Sons, Inc. New York.
- Atlas RN & Bartha R (1998) Microbial Ecology, 4th Edition, Benjamin Cummings.
- Jogdand SN (2004) Environmental Biotechnology. Reprinted & Published by Himalaya Publishing House, Mumbai.
- Singh DP & SK Dwivedi (2005). Environmental Microbiology and Biotechnology. 1st Edition, New Age International (P) Ltd., Publishers, New Delhi.

Integral University, Lucknow

Department of Environmental Science

M.Sc. (Environmental Science), 1st Year/1st Semester

Subject Name: Environmental Chemistry/Industrial Chemistry, Subject Code: CH404

w.e.f. July-2015

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UNIT-I **08**

Air pollutants

CO, CO_2, Ozone, CFC, & NOx, ozone depletion, global warming, Harmful effects of pollutants on living and non-living species, Analytical methods for monitoring air pollutants, international and national standards.

UNIT-II **08**

Physical, chemical and biological water quality parameters

Water pollution; water pollutants; toxicity aspects; international and national standards; control; Water sampling techniques; Water treatment processes: aeration, solid purification, nanofiltration, chemical treatments, reverses osmosis, desalination**.** Waste water treatment processes. Water table maintenance & harvesting methods.

UNIT-III **08**

Composition of soil

Inorganic and organic components, micro and macronutrients; Soil pollution; Fertilizers, insecticides, pesticides, plastics, toxic metals, dyes, surfactants; toxicity aspects; international and national standards; control.

UNIT-IV **08**

Industrial waste

Toxic aspects of industrial waste, its management and disposal, Radioactive, municipal, agricultural and biomedical waste – toxicity hazards. Bhopal gas tragedy, Chernobyl disaster etc.

UNIT-V **08**

Heavy metal in the environment

Sources of heavy metals, Poisoning of heavy metals, Mercury, Copper, Chromium, Cadmium, Cobalt, Lead, Arsenic etc.

Suggested Books/Reading:

- Environmental Chemistry Manahan, Stanley E, 2004, Taylor & Francis Ltd
- Basic Concepts of Environmental Chemistry, Desley W. Connell, 1 edition, CRC-Press
- Environmental Chemistry: A Global Perspective, Gary W. Vanloon Stephen J. Duffy, Oxford Univ Pr (Sd).
- Introduction To Environmental Chemistry, Reid, Brian J. Blackwell Science Ltd.
- Chemistry of the Environment, Thomas G. Spiro, William M. Stigliani, 2nd Edition, Prentice Hall publication.

Integral University, Lucknow

Department of Environmental Science

M.Sc. (Environmental Science), 1st Year/1st Semester

Subject Name: Climate Change and Current Issues, Subject Code: ES404

w.e.f. July-2017

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UNIT- I **08**

Elements and Components of Climate Change

Elements of climate: Temperature, precipitation, atmospheric circulation and atmospheric chemistry– Components of climate change processes: Human activities (Fossil fuel burning, industrial processes, land use), Natural influences (Plate tectonics, orbital cycles, ocean circulation, solar variability), Natural aerosols (volcanoes, sea spray and dust) and Natural greenhouse gases - Radioactive forcing - Classification of climate: Koppen's and Thornthwaite' scheme

UNIT- II **08**

Surface and Atmospheric Climate Change

Air masses: Definition, Classification of air masses, Types of air masses – Fronts: Definition, Types of fronts - SW and NE monsoon - Jet stream, tropical and extra-tropical cyclone - Extreme events of climate change: Heat and cold waves, drought, floods, hurricanes – Recent extreme events in the world – El Nino, La Nina and ENSO - Global consequences of El Nino

UNIT- III **08**

Global Warming

Global warming and climate change: Green house gases – Green house effect and climate change – Facts and figures of current global warming scenarios in the world – Remedial measures to control/combat global warming – India's Forest and Tree cover contribution as a carbon sink.

UNIT- IV **08**

Climate Change and its Impacts

Climate change impact on water and food security – Climate change impact on species extinction – Climate change impact on human health – Global Climate Risk Index

UNIT- V **08**

Global/National Action Plans to Combat Climate Change Issues

Key steps taken by UNFCCC to combat climate change: Kyoto Protocol – Bali Action Plan 2007 – Cancun Agreements 2010 – Durban outcomes – Doha Climate Gateway 2012 – Warshaw outcomes 2013 – Green climate funds – Clean Development Mechanism (CDM) – Climate Change Information Network (CCiNet) – National Action Plan on Climate Change – Recent Initiatives related to climate change in India.

Suggested Books/Reading:

- Barrie Pittock A (2009) Climate Change: The Science, Impacts, and Solutions, CSIRO, Australia.
- Botkin DB (1989) Changing the Global Environment, Academic Press, USA.
- Cowie J (2007) Climate Change: Biological and Human Aspects, Cambridge University Press, UK.
- Dogra N and Srivastava S (2012) Climate Change and Disease Dynamics in India, TERI, New Delhi.
- Filho WL (2012) Climate Change and the Sustainable Use of Water Resources, Springer-Verlag, Berlin, Heidelberg.

Integral University, Lucknow
Department of Environmental Science
M.Sc. (Environmental Science), 1st Year/1st Semester
Subject Name: Environmental Ecology Lab, Subject Code: ES405
w.e.f. July-2017

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List of Experiments

- Lab rules and regulations. Glassware maintenance, sterilization and Disinfection techniques.
- Examination of Prokaryotic and Eukaryotic cells.
- Estimation of BOD, COD, DO for given water samples.
- Determination of minimum quadrat size for community study.
- Estimation of pH and conductivity.
- Estimation of Total Suspended Solids & Total Dissolved Solids.
- General instructions, Microbiology laboratory and its discipline.
- Handling of microscopes, Calibration and measurement of microscopic objects.
- Enumeration of bacteria from soil samples.
- Enumeration of fungi from soil samples.
- Isolation of Rhizobium from nodules.
- Estimation of chlorophyll.

Suggested Books/Reading:

- Cappuccino, J. C. and Sherman, N. (1992). Microbiology: A laboratory manual, Addison Wesley Pub. Co Benson HJ (1994).

Integral University, Lucknow

Department of Environmental Science

M.Sc. (Environmental Science), 1st Year/2nd Semester

Subject Name: Natural Resources and Management, Subject Code: ES406

w.e.f. July-2017

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UNIT- I **08**

Introduction

Natural resources – Classification, Concepts and approaches of natural resource conservation - Natural resources of India

UNIT II **08**

Soil Resources Management

Distribution of Soil resources – Role of agricultural practices in soil degradation - Soil erosion – Soil Fertility and Nutrient Management: Role of organic matter and its significance in soil quality – Diagnosis of soil nutrient deficiencies – Organic Farming: Principles, Benefits and Methods of organic farming; Green manuring, Animal manures and Composting - Wasteland development strategies

UNIT III **08**

Mineral Resources Management

Resources and reserves – Origin, distribution and uses of economic minerals - Exploration of mineral resources from oceans - Steps in mineral exploitation, Impact of exploitation of economic minerals on environment - Conservation of economic mineral resources.

UNIT IV **08**

Water Resources Management

Integrated water resource management - Watershed management – Rain water harvesting – Interlinking of rivers and river basin management - Wetland conservation – Coastal zone management strategies - Ecological significance of mangroves, Coral reefs and its conservation

UNIT V **08**

Forest Resources Management

Significance for the conservation of forest resources – Distribution of forests, Wood production, Forest land use changes in India, Future demand of forest land, Carbon sequestration - *Forest management tools*: Social forestry, Agro-forestry and Urban forestry - Eco development committees, Ecotourism, Climate change reduction, Carbon trading and Management of grasslands.

Suggested Books/Reading:

- Dutta A (2001) Biodiversity and Ecosystem Conservation. Kalyani Publisher, Kolkata.
- Jha LK (1997) Natural Resource Management. APH Publishing Corporation, New Delhi.
- Kumar HD (1995) Modern Concepts of Ecology. Vikas Publishing House (P) Ltd., New Delhi.
- MaDicken KG and Vergora NT (1990) Agroforestry: Classification & Management. John Wiley & Sons, New York.
- Nalini KS (1993) Environmental Resources and Management, Anmol Publications (P) Ltd., New Delhi.
- Nautiyal S and Kaul AK (1999) Forest Biodiversity & its Conservation Practices in India.

Integral University, Lucknow

Department of Environmental Science

M.Sc. (Environmental Science), 1st Year/2nd Semester

Subject Name: Disasters, Mitigation & Management, Subject Code: ES407

w.e.f. July-2017

L T P 3 1 0

UNIT- I **08**

Introduction to Disaster

Concepts of Hazard, Vulnerability, Risks, Natural Disasters, and Man Made Disaster, Technological disasters, Risks, Political, Social, Economic impacts of Disasters, Equity issues in disasters, Relationship between Disasters and Development and vulnerabilities, Human Resettlement and Rehabilitation issues during and after disasters, Inter-sectoral coordination during disasters.

UNIT-II **08**

Approaches to Disaster Risk Reduction

Disaster Risk Reduction Strategies, Disaster Cycle, Phases of Disaster, Preparedness Plans, Action Plans and Procedures, Early warning Systems Models in disaster preparedness, Components of Disaster Relief, Community based DRR, Public Awareness and Warnings, Conducting a participatory capacity and vulnerability analysis, DRR Master Planning for the Future, Capacity Building, Rehabilitation measures and long term reconstruction.

UNIT- III **08**

Principles of Disaster Medical Management

Introduction to disaster medicine, Various definitions in disaster medicine, Disaster recovery in relation to disaster medical management, National Assessing the nature of hazardous material - Types of injuries caused, Self protection contaminated area and decontaminated area – Pre hospital medical management of victims – Triaging medical & psychosocial identification of hospitals and other medical facilities to offer efficient disastrous medical service – Safe patient transportation –Identification of valuable groups.

UNIT-IV **08**

Public Health Response and International Cooperation

Principles of Disaster Epidemiology, Rapid Health Assessment, Outbreak Investigation Environment health hygiene and sanitation issues during disasters, Preventive and prophylactic measures, International cooperation in funding on public health during disaster, International Health Regulation, United Nation International Strategy for Disaster Risk Reduction, United Nation Disaster Management Team, International Search and Rescue Advisory Group.

UNIT-V **08**

Disaster Risk Management in India

Hazard and Vulnerability profile of India, Disaster Management Indian scenario, Disaster Management Act 2005 and Policy guidelines, National Institute of Disaster Management, National Disaster Response Force, National Disaster Management Authority, States Disaster Management Authority, District Disaster Management Authority. Cases Studies like Bhopal Gas Disaster, Gujarat Earth Quake, Orissa Super-cyclone, South India Tsunami etc, best practices in disaster management, Appropriate Technology and local Responses, Indigenous Knowledge, Development projects in India and their impacts, Logistics management in specific emergency situation.

Suggested Books/Reading:

- Natural Disasters – A Guide for relief workers– JAC Adhyatme Sadhma Kendra, Mehrauli, N. Delhi.
- Parasuraman S and Unnikrishnan PV (2000) Indian Disasters – Report towards a policy initiative, Oxford University Press, UK.
- Petalc WJ and Allissoon AA (1982) Natural Hazards Risk Assessment and Public Policy Anticipating Unexpected, Springer-Verlag, New York.
- Shailendra K. Singh, Subash C, Kundu and Shobu Singh (1998) Disaster Management, Mittal Publications, New Delhi.

Integral University, Lucknow
Department of Environmental Science
M.Sc. (Environmental Science), 1st Year/2nd Semester
Subject Name: Environmental Toxicology, Subject Code: ES408
w.e.f. July-2017

L T P 3 1 0

UNIT- I **08**

Introduction

Toxicology - Introduction, scope and types - Classification of toxic agents, toxicity, hazard, risk, Routes of exposure, duration and frequency of exposure - Drug toxicity, biochemical basis of toxicity and mechanisms of toxicity, receptor mediated events - Acute and chronic toxicity, Dose response relationship and graded response time action curves, LC50 LD50, Margin of safety levels.

UNIT- II **08**

Toxicity testing

Toxicity testing – (i) laboratory animals, (ii) toxicity testing in animals, (iii) toxicological field studies, Interpretation of laboratory data (i) distinction between adverse and non-adverse effects. Human data – (i) ethical consideration, (ii) need for human investigation (iii) clinical toxicology.

UNIT- III **08**

Pesticide toxicology

Bioaccumulation and Biomagnifications of toxic materials in food chain, Types, mechanism and Toxicology of major pesticides - Environmental impacts of pesticides, biotransformation, bio-monitoring, concept of bio-indicator groups and examples.

UNIT- IV **08**

Bioassay

Concepts of Bioassay, Types and characteristics - Field based microbial bioassay, Test models and classification - Immunotoxicity, histotoxicity and cell toxicity. Basic concepts of Environmental forensics.

UNIT- V **08**

Xenobiotics

Xenobiotics, Interaction between xenobiotics, Combined effect of xenobiotics on physiology and biochemistry of aquatic organisms - Drug Development and safety, Drugs and chemicals induced hepatotoxicity, food toxicity, genotoxicity, Molecular neurotoxicity.

Suggested Books/Reading:

- Anisa Basheer (1995) Environmental Epidemiology, Rawat Publications, New Delhi.
- Meera Asthana and Astana D.K (1990) Environmental Pollution and Toxicology, Alka Printers, Chandigarh.
- Park JE and Park K (1985) Text Book of Preventive and Social Medicine, Banosidas Bharat Publishers, Jabalpur.
- Sharma PD, Rastogi and Lamporary (1994) Environmental Biology and Toxicology, Rajpal and Sons Publishing, New Delhi.
- Sood A (1999) Toxicology, Sarup and Sons, New Delhi.Toxicology, Biochemistry and Pathology of Mycotoxins, by Kenji Uroguchi a mikio, Yamazadi Kodanshoa Ltd., Tokyo, 1978.

Integral University, Lucknow

Department of Environmental Science

M.Sc. (Environmental Science), 1st Year/2nd Semester

Subject Name: Ecotourism and Wildlife Management, Subject Code: ES409

w.e.f. July-2017

L T P 3 1 0

UNIT- I **08**

Introduction to Eco-Tourism

Principles of Ecotourism – Types of Ecotourism – Concepts of Ecotourism – Origin of Ecotourism – Objectives of Ecotourism – Benefits of Ecotourism – Trends affecting Ecotourism. Concepts of Tourism - Classification – Religious Tourism – Cultural Tourism – Heritage Tourism – Monumental Tourism – Adventure Tourism – Mass Tourism – Sustainable Tourism – Consumptive and Non-Consumptive Tourism.

UNIT- II **08**

Interesting Eco-tourism

Places of interests of Ecotourism – Ecocircuit of the Western Ghats – Infrastructural facilities for Ecotourism – Maintenance of Ecological Centers – Important Biosphere Reserves. Target group of Ecotourism – Ecotourism and Conservation – Study of different Ecosystem – Rain forest Ecotourism – Mountain Ecotourism – Polar, Islands and Coasts Ecotourism – Wilderness – Marine Ecosystem.

UNIT- III **08**

Impact of Eco-tourism

Impact of Ecotourism – Economic Impacts (Fiscal Impacts, Concept and Methods) – Types and Degree of Impacts from Ecotourism activities – Socio-cultural Impacts – Ecotourism related organization – Ecotourism Research - Disasters and Ecotourism.

UNIT- IV **08**

Wildlife Conservation

Wildlife conservation - Protected Areas Network in India - Goals of management, Strategies for planning. Factors influencing wildlife management such as habitats, population, behaviour, food-habits, health, etc. - Tools for data collection and analysis.

UNIT- V **08**

Wildlife Management

Human land-use and wildlife management units - Important projects for the conservation of wildlife in India - Role of local communities in wildlife management – Man-wildlife conflicts - Poaching of wildlife - Wild life conservation laws - The Wildlife (Protection) Act, 1972 (2002 amendment).

Suggested Books/Reading:

- Dasman RF (1968) Environmental Conservation: John Wiley and Sons, New York.
- Mukherjee N (2008) Ecotourism and sustainable Development. Cybetech Publications, New Delhi.
- Prabhas Chandra (2003) Global Ecotourism, Kaniskha Publishers, New Delhi.
- Sinha, P.C (2003) Encyclopedia of Ecotourism, Volume I, II and III, Anmol Publications Pvt. Ltd., New Delhi.
- Weaver DB (2001) The Encyclopedia of Ecotourism, CABI Publishing, UK.

Integral University, Lucknow

Department of Environmental Science

M.Sc. (Environmental Science), 1st Year/2nd Semester

Subject Name: Environmental Pollution and Management, Subject Code: ES410

w.e.f. July-2017

L T P 3 1 0

UNIT- I **08**

Air Pollution and Management

Air pollution - Natural and anthropogenic sources - Major air pollutants – Types and effects of air pollutants - Acid rain, Green house effect and global warming - Meteorology and Plume Dispersion – Sampling of air pollutants – SOx, NOx, ozone, methane, hydrocarbons and particulate matter. Particulate matter control equipments: Settling chamber, cyclones, fabric filter, electrostatic precipitator and wet scrubbers - Air quality and emission standards.

UNIT- II **08**

Water Pollution and Management

Water pollution - Sources of water pollution – Organic, inorganic and heavy metals - Phenomenon of Eutrophication – Transport of pollutants in the aquatic ecosystem - Water quality parameters - Water quality standards – Sources, effects and control measures of Ocean, Oil and Ground water pollution - Water sampling techniques - Water remediation techniques: Rhizofiltration, wetlands, lagoon, oxidation pond and oxidation ditch.

UNIT- III **08**

Water Treatment Methods & Management Strategies

Water treatment: Drinking water and wastewater treatment technologies – Physical, chemical and biological - Primary, secondary and tertiary treatments - Sludge dewatering and its disposal. Designs and functioning of ETP: Concept of ETP, Need of ETP in industry, Concept of CETP, Major units in ETP and their functions - Water management strategies: Rain water harvesting, Recharging of ground water, Use of domestic waste water, Recycling of waste water, Recycling of industrial effluent after treatment.

UNIT- IV **08**

Soil Pollution and Management

Soil pollution: Sources- Industrial, Domestic, Agricultural (Pesticides, heavy metals, industrial effluents, waste disposal) - Effects of soil pollutants on plants, animals and ground water - Soil sampling devices, methods and analysis-Soil remediation techniques: Physical, chemical and biological (bioremediation and phytoremediation).

UNIT- V **08**

Noise and Radioactive Pollution and Management

Noise Pollution: Sources, sound pressure levels, decibels, intensity and duration - Effects of noise pollution on human and animals - Noise permissible standards - Noise control measures - greenbelt and noise protective instruments - Radioactive pollution: Sources, radioactive elements, Effects of radiation on surrounding environment - Radioactive waste disposal methods.

Suggested Books/Reading:

- Khopkar SM (1993) Environmental Pollution Analysis, John Wiley & Sons, New York.
- Saxena HM (2011) Environmental Geography, Rawat Publications, Jaipur.
- Rao CS (1993) Environmental Pollution Control, Wiley Eastern Ltd., New Delhi.
- Sharma PD (1985) Environmental Biology and Toxicology. Rastogi Publications, Meerut.
- Sharma PD (1994) Ecology & Environment. Ashish Publications, New Delhi.

Integral University, Lucknow
Department of Environmental Science
M.Sc. (Environmental Science), 1st Year/2nd Semester
Subject Name: Natural Resource Management Lab, Subject Code: ES411
w.e.f. July-2017

L T P 0 0 8

List of Experiments

- Estimation of Dissolved Oxygen and Biological oxygen Demand
- Estimation of Chemical oxygen demand
- Flame Photometric analysis of Na, K, & Ca & Mg
- Phosphate estimation
- Sampling and Analysis of SO_2 and NO_X
- Determination of noise levels at various sites
- Estimation of particle size distribution of the soil
- Determination of Specific gravity and moisture content of the soil
- Study Tour