

SREE SANKARA COLLEGE KALADY



POST GRDUATE DEPARTMENT ENVIRONMENT SCIENCE AND MANAGEMENT

SYLLABUS OF POSTGRADUATE PROGRAMME

2019 ONWARDS

(UNDER MAHATMA GANDHI UNIVERSITY PGCSS REGULATIONS 2019)

	<p style="text-align: center;">ENVIRONMENT SCIENCE AND MANAGEMENT Sree Sankara College, Kalady</p> <p style="text-align: center;"><i>Affiliated to Mahatma Gandhi University</i></p>
<p>Programme:</p>	<p style="text-align: center;">MSc. Environment Science and Management</p>

PROGRAMME SPECIFIC OUTCOMES (PSO)

1. To understand the basic concepts of environment and its interactions with the earth and environmental systems and various ecosystems associated with it.
2. Capability to analyse, evaluate and interpret the causes and effects of various environmental problems at local, regional and global scale and to develop management strategies.
3. Capacity to analyse and determine the magnitude of different kinds of environmental pollution, their sources using environmental analytical techniques, quantitative and computational techniques.
4. Acquire interdisciplinary knowledge on the global aspects of climate change, its effects on the environment and its governance.
5. Capacity to use biotechnological methods in water and wastewater treatment technology. Ability to apply appropriate techniques for efficient solid waste management practices and to find the solutions to the air pollution problem.
6. Ability to use different tools for the management of energy resources, biodiversity conservation, natural disasters and technical knowhow of remote sensing & GIS applications in environment management.
7. Ability to analyse a given research problem, identify research gaps, developing suitable research methodology with suitable research design, data collection, data analysis with suitable statistical tool, interpretation of the findings leading to perfect solution to the problem given.

8. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.
9. Master the core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
10. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
11. To understand the basic concepts of environment, its interaction with the earth systems, and various ecosystems associated with it in relation to the disasters.
12. Attain capacity to describe, analyse and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
13. Enhance the capability to analyse, evaluate and interpret the causes and effects of various environmental problems in relation to disasters at local, regional and global scale and to develop management strategies.
14. Acquire basic knowledge, understanding and implementation of the International strategy on Disaster Reduction (UN-ISDR); to increase the skills and abilities for disaster risk reduction (DRR).
15. Ability to coordinate community based disaster management strategies, in local and regional levels.

THE PROGRAM STRUCTURE

Course Code	Title of the Course	Type of the Course	Hours per week	Credits
FIRST SEMESTER				
ES010101	Ecology and Biodiversity Conservation	Core	3	4
ES010102	Environmental Geosciences	Core	3	4
ES010103	Environmental Chemistry, Instrumentation and Analytical Techniques	Core	3	4
ES010104	Environmental Pollution and Management	Core	3	4
ES010105	Research Methodology and Statistics	Core	3	3
ES010106	Laboratory Course Part 1	Core	10	5
SECOND SEMESTER				
ES010201	Eco Toxicology and Occupational Health Hazards Management	Core	3	4
ES010202	Environmental Microbiology	Core	3	4
ES010203	Introduction to Geo-informatics	Core	3	3
ES010204	Environmental Laws, Education and Policies	Core	3	4
ES010205	Laboratory Course Part 2	Core	10	5
THIRD SEMESTER				
ES010301	Environmental Engineering	Core	3	4
ES010302	Environmental Planning and Resource Management	Core	3	4
ES010303	Laboratory Course Part 3	Core	10	5
Elective 1			3	4
Elective 2			3	3
FOURTH SEMESTER				
ES010401	Environmental Biotechnology and Waste Management	Core	3	3
Elective 3			3	3
ES010403	Project Work (Report/Thesis)	Core		5
ES010404	Comprehensive Viva Voce	Core		5

Elective Group-A				
Sl No	Course Code	Title of the Course	Credits	
1	ES800301	Environmental impact assessment and Audit	4	
2	ES800302	Environmental Economics and Sustainable Development	3	
3	ES800403	Disaster Management	3	
Elective Group-B				
Sl No	Course Code	Title of the Course	Credits	
1	ES810301	Green Chemistry and Nanotechnology	4	
2	ES810302	Natural and Anthropogenic Disasters	3	
3	ES810403	Climate Change and Governance	3	

SEMESTER 1



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010101

Name of the Course: Ecology and Biodiversity Conservation

Programme	M.Sc. Environment Science and Management					
Course Name	Ecology and Biodiversity Conservation					
Type of Course	Core					
Course Code	ES010101					
Course summary & Justification	This course is designed to provide a structured and comprehensive understanding of Ecology and Biodiversity. It covers both theoretical concepts and practical applications in biodiversity assessment.					
Semester		1	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						64
Pre-requisite	The students have basic understanding and readings on ecology and Environmental science.					

CO No.	Expected Course Outcome	Taxonomic Level (TL)	PSO No.
1.	Explain the concept of ecology and relevance of environmental science	U	1
2	Able to distinguish the structure, organization and processes in various ecosystems	A	1, 10
3.	Develop a knowledge on the structural and functional aspects of a population as an ecological unit	Ap	1, 2



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Course code: ES010101

Name of the Course: Ecology and Biodiversity Conservation

4	Understand and analyse the concept of biological community, changes and interactions within community	U, A	6,9
5	Develop skill on applied aspects of ecology including mathematical or conceptual model of population or community dynamics to analyse the various factors of Population growth and regulation.	Cr	7, 8

Unit	Course Description	Hours	CO No.
1.0	Introduction	5	1,2
1.1	Basic concepts of Environment, Definition, principles and scope of Environmental Science, Multidisciplinary approach, Basic concepts - Science, Matter and Energy, Global environmental issues– an introduction	5	1,2
2.0	Ecology	15	2,3
2.1	Definition-History of ecology-Subdivisions of ecology (Autecology and Synecology)-Ecology and other subjects (Relationship), Fundamental ecological variables (Matter, light, Time, Space & Diversity)-Ecology and environment management:- Holistic approach, Gaia Hypothesis	2	2
2.2	Ecosystems-Definition –classification: Terrestrial: Biomes; Aquatic-lentic-lotic-Fresh and marine water, Components of Ecosystem-Structure-function and size of ecosystem	2	2, 3
2.3	Nutrient cycles-Energy Flow- Biogeochemical cycles	3	2
2.4	Trophic relations-Food chain, Food-web and Ecological pyramids	3	2
2.5	Productivity and ecological efficiencies	2	2,3
2.6	Biogeography:-Definition and history-Classification of Biogeography zones-Phytogeography:-Floristic regions of the World and India-Zoogeography:-Zoogeographical regions of the World and India	3	2,3



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Name of the Course: Ecology and Biodiversity Conservation

3.0	Population Ecology	10	3,5
3.1	Definition-Structure and measurements:-Density-Growth-Natality-Mortality	2	3
3.2	Population dispersal and distribution-Population growth:-Factors affecting population-Carrying capacity-Population Regulation	2	3
3.3	Strategies of species survivability (r- selection and k- selection)	1	3,5
3.4	Population Genetics:-Mendelian population-Gene frequency-Gene pool and genetic drift-Hardy- Weinberg-equilibrium-Change in Gene Frequencies	2	3,5
3.5	Ecotypes and other related terms	1	3
3.6	Human Population:-Historical overview-Characteristics of human population growth-Exponential growth-Age-Sex distribution-Trends in human population growth	2	3,5
4.0	Community Ecology	10	4, 5
4.1	Concepts of Community- Community gradients (Ecotone, Edge Effect, Continnum Concept)	2	4
4.2	Primary production in Terrestrial and Aquatic Communities-Productivity measurements	2	4
4.3	Ecological Succession-Kinds of Succession (Hydrarch and Xerarch)	2	4
4.4	Community Organization: Ecological Niche	2	4,5
4.5	Interactions between species:Competition-Predation-Mutualism-Commensalism-Parasitism-Allelepathy, Stress Ecology and Adaptation	2	4,5



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Name of the Course: Ecology and Biodiversity Conservation

5.0	Applied Ecology	4	3,4,5
5.1	Estimating Abundance:-Mark and Recapture Method -Quadrat and Line Transect's-Distance and Removal Methods-Trapping and Collection techniques-Census technique for Avifauna and Wildlife	2	3
5.2	Species Diversity measures:-Species richness-Species Heterogeneity (Simpson's Indices, Shannon-Wiener Indices)-Vegetational Profile assessments- Taxonomy and Biosystematics, Eco-informatics-concepts and principles	2	5
6.0	Concept of Biodiversity Conservation	10	5
6.1	Biodiversity: An introduction- Definition- Types of biodiversity-Composition and levels of biodiversity- Biodiversity Hotspots, Biodiversity depletion-causes and consequences	4	1,2
6.2	Recent International, National and Regional Biodiversity Initiatives (CBD, Global Biodiversity Strategy, National Biodiversity Action Plans, Biodiversity Registries), Conservation of Biodiversity, Biodiversity with special reference to Kerala	6	1,2,5
7.0	Conservation Biology	10	2,4,5
7.1	Introduction-Origin, concepts and definition of conservation biology, Fitness and Viability of Population:-Minimum Viable Population-Heterozygosity and Fitness-Pattern of Diversity and Rarity, including Endemism-Habitat Fragmentation and its effects	3	2,4
7.2	Community processes:-Community Stability and Structure- Co-adaptation and co-evolution (plant and animal interactions-basic concepts only)	3	2,4,5
7.3	Keystone Species and Dominant species-Infectious diseases and conservation biology-Conservation of Habitats-Threats and management of habitats-Theory and practice of conservation (basics only)-Restoration, reclamation and regeneration of habitats (measures and steps introduction only)	4	2,4,5



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010101

Name of the Course: Ecology and Biodiversity Conservation

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning (Video), interactive Instruction:, Active co-operative learning, Seminars, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student/ Group representative; Field work and field visits
Assessment Types	<ol style="list-style-type: none">1. Continuous Internal Assessment (CIA) Internal test Assignments based on the theory Seminar Presentation Field visit report2. Semester End examination




MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010101

Name of the Course: Ecology and Biodiversity Conservation

References

1. Brewer R(1994), The Science of Ecology, saunders College Publishing, New York
2. Chapman J. L and Reiss M J (1992), Ecology-Principles and Applications, Cambridge University Press, Cambridge
3. Colin R, Townsend, Michael Begon and John L Harper (2012), Essentials of Ecology, third edn, Blackwell publishing
4. Rana.S.V.S.(2005)Essentials of Ecology and Environmental Science,Prentice Hall of India,New Delhi.
5. Heywood V H(Ed)(1995), Global Biodiversity Assessment (UNEP), Cambridge University Press, Cambridge
6. Krebs C J (1989), Ecological methodology, Harper Collins Pub. New York
7. Maxted N, B V Ford-Lloyd and J G Hawkes (ED) (1997). Plant Genetic Conservation- Thein situ approach. Chapman & Hall, Madras
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11. Nayar, M P (1996). Hot spots of Endemic Plants of India, Nepal and Bhutan. TBGRI,Trivandrum
12. .Odum E P (1971), Fundamentals of Ecology, W B Saunders Company, Philadelphia
13. .Odum E P (1983), Basic Ecology, Saunders College Publishing, Philadelphia
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15. Rajagopalan.R.(2005)Environmental Studies,Oxford University Press,New Delhi

	MSc ENVIRONMENT SCIENCE AND MANAGEMENT
	Course code: ES010102 Name of the Course: Environmental Geosciences

Programme	M.Sc.EnvironmentScienceandManagement					
CourseName	Environmental Geosciences					
TypeofCourse	Core					
CourseCode	ES010102					
Coursesummary &Justification	This course is designed to provide a comprehensive understanding of various processes related to Earth and explain how these physical systems interact.					
Semester		1	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						60
Pre-requisite						

CO No.	Expected Course Outcome	Taxonomic Level(TL)	PSO No.
1.	Give a basic understanding of Earth and its various physical or abiotic environment systems	U	1
2	Explain the structures and processes within the Earth, particularly with regard to plate tectonics and the resulting geologic structures.	E	1
3.	Describe the composition of different physical systems.	A	1
4.	Outline the features of land, water, soil and oceans	U	1
5	Explain the importance of climate and weather to the global and regional environment	E	4



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Course code: ES010102

Name of the Course: Environmental Geosciences

6	Define and elucidate the various terms related to the physical environment.	R	11
7	Explain the basics of Geomorphology, its processes and landforms	U	2
8	Identify and distinguish the major land forms formed by the action of various geological agents	Ap	1
9	Understanding the basics of Oceanography, various energy resources and factors influencing productivity	U	1,4
10	Examine the causes and behaviors of ocean waves, currents, and tides and their influence on coastal zone	C	10



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Course code: ES010102

Name of the Course: Environmental Geosciences

Unit	Course Description	Hours	CONo.
1	Introduction	16	
1.1	Origin, evolution and structure of Universe and solar system; The Earth in relation to the Universe-Origin, evolution, and structure of the earth -Origin of ocean, atmosphere and lithosphere; Geological Time Scale; Origin and evolution of biosphere and life -Origin of life evolution.	5	1,3
1.2	Introduction to geodynamics - Continental drift -Sea floor spreading-Plate tectonics-Isostasy	2	1,6
1.3	Plate tectonics	3	2
1.4	Mineralogy-Minerals- Atomic Structure, Chemical Composition and Physical Properties of major rock forming minerals-quartz, feldspars, micas, amphibole, pyroxene, olivine, garnet	2	1,2
1.5	Rocks- Classification-igneous-sedimentary –metamorphic; Rock cycle; Mineralogy and texture of major rocks-basalt, gabbro, granite, charnockite, khondalite, gneiss, sandstone, shale, limestone; Structures in rocks-strike, dip, fold, fault, joints.	2	2
1.6	Biogeography- Definition and history- Classification of Biogeographic zones; Phytogeography-Floristic regions of the World and India; Zoogeography- Zoogeographical regions of the World and India	2	3
2	Introduction to Physical Systems	16	2, 3
2.1	Biosphere and its divisions-Atmosphere-Lithosphere-Hydrosphere	1	4
2.2	Solar radiation -Absorption-Scattering-Reflection	2	1,3
2.3	Atmosphere-Stratification- Pressure gradient	4	3
2.4	Thermodynamics of atmosphere-Lapse Rate-Atmospheric stability (Stable, Unstable, & Neutral Equilibria); Inversions; Spatial and temporal ranges of variation in temperature	3	5,6
2.5	General circulation of air; Ferrel's law and Corioli's effect; Global air circulation system and heat transport from equator to poles; Heat budget.	2	2,3
2.6	Wind-Formation-Classification	2	5,6
2.7	Clouds-Formation-Classification; Aerosols-Condensation nuclei, Precipitation mechanism, Cloud seeding.	2	6




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Course code: ES010102

Name of the Course: Environmental Geosciences

3	Weather and Climate	12	
3.1	Definitions and scope of Climatology; Weather and climate; Components of Climate system. Classification of Climate-Koepfen's classification and Thornthwaite's scheme-Climatic types and zones	2	5
3.2	Climate of India-Indian Monsoon (onset of Monsoon and retreat of monsoon, rain bearing systems, Break in the monsoon); MONEX. Climatic regions of India	2	5
3.3	Oceanic and Continental influence (Air- Sea interaction). Global climatic phenomena-El Nino & La Nina	1	4,5
3.4	Climate Change-Causes and factors; Global actions on climate change; Effect of climate change in ecosystems	2	4,5,6
3.5	Weather and Climate monitoring equipment (Familiarization only). Meteorological data collection and analysis (Rainfall, Evaporation, Temperature, Relative humidity, wind speed, wind direction, Wind-rose etc).	2	5,6
3.6	Applied Meteorology-influence of Weather and Climate on agriculture; Heat Islands	2	5,6
3.7	Influence of meteorological factors on air pollutants (Diffusion, Turbulence, Transportation, and Plume rise and stability conditions)	1	5
4	Geomorphology	10	
4.1	Geomorphology: an introduction. Coastal Geomorphology (Formation of lakes, Backwaters & Estuaries); Geomorphology of India and Kerala	2	7
4.2	River (River formation, erosion, transportation and deposition)	2	7,8
4.3	Slope process (Flows, Fall, Slides, Subsidence etc)	2	8
4.4	Watershed, Drainage pattern and their significance	1	6,7,8
4.5	Water-Hydrological cycle-Global water balance. Types of water- The surface water-Relationship of surface and ground water. Ground water-Origin, Movement and Storage.	2	8
4.6	Hydrological classification of water bearing formations	1	6,8
5	Oceanography	6	
5.1	Oceans: an introduction. Marine resources(physical,biological and marine energy resources). Productivity of Oceans, Ocean circulation, Coastal protection methods (Conventional & environment friendly)	4	4,9,10
5.2	Tides and tidal environment-Tidal inlets-Bays-Lagoons-Estuaries	2	9,10

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	Course code: ES010102 Name of the Course: Environmental Geosciences

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning(Video), interactive Instruction:, Active co-operative learning, Seminars, Group Assignments, Authentic learning, Library work and Group discussion, Presentation by individual student/ Group representative and field visits
AssessmentTypes	<ol style="list-style-type: none"> 1. Continuous Internal Assessment(CIA) <ul style="list-style-type: none"> • Internal Test • Assignments based on the theory • Seminar Presentation 2. Semester End Examination

References

1. Barry, R G and Chorley R J (1998). Atmosphere, weather and Climate (7th Edn). Routledge, London
2. Brady N C (1996) The Nature and Properties of Soil (10th Edn). Prentice hall of India Pvt. Ltd, New Delhi
3. Clark J R (1995) Coastal Zone Management- Hand Book, CRC –Lewis Publishers
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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010102

Name of the Course: Environmental Geosciences

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22. Todd D K (1995) Ground Water Hydrology (2nd Edn) John Wiley & Sons New York.
23. Tom Garrison,Oceanography,Wadsworth Publishing Company.P336.



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010103

**Name of the Course: ENVIRONMENTAL CHEMISTRY,
INSTRUMENTATION AND ANALYTICAL TECHNIQUES**

Programme	M.Sc. Environment Science and Management					
Course Name	Environmental Chemistry, Instrumentation and Analytical Techniques					
Type of Course	Core					
Course Code	ES010103					
Course summary & Justification	This course is designed to provide a basic understanding of the chemistry involved in various environmental processes. It involves the study of the effects of the chemicals on the different environmental matrices (Air, Water and Soil) and their impacts on Environment and Human health. The course also discusses the various analytical techniques and the students will generate an understanding about the gravimetric, volumetric and Instrumental methods of analysis.					
Semester		1	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						64
Pre-requisite	The students have basic understanding and readings on Environmental chemistry and basic analytical techniques.					

CO No.	Expected Course Outcome	Taxonomic Level (TL)	PSO No.
1.	Apply basic chemical concepts to attain knowledge about the chemical characteristics and various reactions occurring in the environmental matrices	AP	1
2	Recall the basic concepts of thermodynamics	R	1
3.	Interpret the basics of chemical kinetics and solutions	U	3



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Course code: ES010103

**Name of the Course: ENVIRONMENTAL CHEMISTRY,
INSTRUMENTATION AND ANALYTICAL TECHNIQUES**

4	Demonstrate knowledge of chemical and biochemical principles of fundamental environmental processes in air water and soil	U	2
5	Provide advanced skillsets of analytical techniques pertinent to environment and climate domain	U	3
6	To provide scientific understanding of instrumentation, operation, analysis and interpretation of experimental data and its applications	U	3
7	To be able to handle appropriate instrumental methods for analysis	A	3
8	Gain familiarity with working principles, tools and techniques for analysis and interpretation	E	3
9	Make use of the 12 principles of Green Chemistry	AP	4
10	Be able to describe the organic and inorganic compounds that are hazardous for human health and environment	AP	4



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010103

**Name of the Course: ENVIRONMENTAL CHEMISTRY,
INSTRUMENTATION AND ANALYTICAL TECHNIQUES**

Unit	Course Description	Hours	CO No.
1.0	Fundamental Concepts (Basic understanding only)	11	1,2,3
1.1	Chemical equations and Stoichiometry, Concept of Normality, molarity, molality, molecular weight, equivalent weight, Avogadro hypothesis, isotopes, oxidation, reduction, oxidation number.	2	1
1.2	Solutions- types; ionization, primary and secondary standards-preparations, calculations of concentrations of solutions using specific gravities and molecular weights, units of concentrations of solutions- inter conversions. Colligative properties, ionic product of water, pH and pOH, buffer solutions	3	3
1.3	Chemical Kinetics: Control of reaction/First, second and zero order reactions	1	3
1.4	Thermodynamics- Laws of thermodynamics, reversible and irreversible processes, thermodynamic functions, exothermic and endothermic reactions, spontaneous and non-spontaneous reactions. Order and molecularity of a reaction, basic kinetic laws- zero, first, second, pseudo-order reactions, determination of rate constants, common ion effect, ionic product of water.	2	2
1.5	Concept of Energy, enthalpy, entropy/Gibbs energy and chemical potential, Laws of mass action; Chemical equilibria/Acid-base equilibria/Redox reactions and redox potential/ Radionuclide's, solubility products	2	1
1.6	Unsaturated and saturated hydrocarbons	1	1
2.0	Chemistry of Air, Water and Soil	16	1,4
2.1	Chemistry of Air- History of evolution of the earth's atmosphere- Role of chemical constituents in atmospheric processes (water, CO _x , NO _x , SO _x , O ₂ & Ozone)-Ozone layer- Chemistry of the Ozone layer- Ozone depletion and the chemicals that cause ozone depletion-Greenhouse gases and greenhouse effect-Photochemical smog- Origin and Occurrence, Oxidizing and reducing smog- Ecological effects- Acid rain and its ecological effects	6	1,4



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Course code: ES010103

**Name of the Course: ENVIRONMENTAL CHEMISTRY,
INSTRUMENTATION AND ANALYTICAL TECHNIQUES**

2.2	Chemistry of Water-Composition and structure of pure water-Physical properties of water and aqueous solutions-Solubility of solids, liquids and gases in water- Chemical reactions and equilibria in water-carbonate equilibria, metal ion equilibria, redox equilibria- Natural organic components in water- Concepts of DO, BOD and COD	5	4
2.3	Chemistry of Soil-Introduction -Weathering and pedogenesis -Factors of soil formation -Development of soil profile-Structure of Soil- Gross composition-Texture and structure, method of analysis of texture (International pipette method)-Organic and inorganic components of soil- Physico-Chemical characteristics of soil- Ion-exchange and adsorption processes in the soil- Soil quality parameters and assessment-Classification of types of soil (Reference to India and Kerala)-Fate of chemicals in the soil	5	4
3.0	Analytical Techniques and Instrumentation – I (Principles and application)	16	5,6,8
3.1	Gravimetric Methods - Principle and application of gravimetric methods in determination of total, dissolved, suspended, volatile and fixed solids present in water and waste water.	2	5
3.2	Estimation of moisture content of soil, phytomass, compost and vermicompost using moisture balance	3	5
3.3	Volumetric Methods- Importance of volumetric analysis-Standardization of reagents using volumetric titrations	3	6
3.4	Electrochemical Methods- pH meters – Glass and Reference electrodes-Ion selective electrodes- Electrical conductivity measurements: Conductivity Meters	2	6,8
3.5	Photometric methods- Nephelometry and Turbidometry-Spectrophotometry- Optical design of filter photometer, single beam spectrophotometer, double beam – UV – Visible – Spectrophotometer-Flame photometry (FP)	3	6,8
3.6	Atomic Absorption Spectrophotometry (AAS)- X-ray Fluorescence - X-ray Diffraction	2	6,8



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010103

**Name of the Course: ENVIRONMENTAL CHEMISTRY,
INSTRUMENTATION AND ANALYTICAL TECHNIQUES**

3.7	Dosimetry - Geiger Muller Counter- Scintillation counter	1	6
4.0	Analytical Techniques and instrumentation-II (Principles and application)	15	7,8
4.1	Chromatography- Paper chromatography- Thin layer chromatography- Column chromatography- Gas liquid chromatography- GC-MS- High Performance Liquid Chromatography (HPLC)	4	7
4.2	Electrophoresis- Gel electrophoresis- Immuno electrophoresis (ELISA, Blotting Techniques, RFLP, etc)	5	7
4.3	Microscopy- Light microscope, Bright field, Dark field, Phase contrast and Fluorescent microscope- Electron Microscopy – Transmission Electron Microscope (TEM) and Scanning Electron Microscopy (SEM)	4	7
4.4	Flow Cytometry-Micrometry-Microtechniques- Fixation, Sectioning, Histological and Histo-chemical staining	2	8
5.0	Green Chemistry	6	9,10
5.1	Introduction- Basic principles of green chemistry (12 principles)	2	9
5.2	Tools of green chemistry- green starting materials, green reagents, green reactions, green methodologies, green chemical products	2	9
5.3	Concept of green engineering	2	9
5.4	Applications of green chemistry- zero waste technology	2	10



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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010103

**Name of the Course: ENVIRONMENTAL CHEMISTRY,
INSTRUMENTATION AND ANALYTICAL TECHNIQUES**

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning (Video), interactive Instruction, Active co-operative learning, Seminars, Group Assignments Authentic learning, Library work and Group discussion, Presentation by individual student/ Group representative
Assessment Types	1. Continuous Internal Assessment (CIA) Internal test Assignments based on the theory Seminar Presentation Field visit report 2. Semester End examination

References

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010103

**Name of the Course: ENVIRONMENTAL CHEMISTRY,
INSTRUMENTATION AND ANALYTICAL TECHNIQUES**

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010103

**Name of the Course: ENVIRONMENTAL CHEMISTRY,
INSTRUMENTATION AND ANALYTICAL TECHNIQUES**



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010104

Name of the Course: Environmental Pollution and Management

Programme	M.Sc. Environment Science and Management					
Course Name	Environmental Pollution and Management					
Type of Course	Core					
Course Code	ES010104					
Course summary & Justification	The course describes different types of environmental pollution like air, water, soil etc. and types and sources of pollutants including emerging contaminants. The course explains the interaction and movement of pollutants through the environment. It will also describe the control measures for various pollution.					
Semester		1	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						48
Pre-requisite						

CO No.	<i>Expected Course Outcome</i>	Taxonomic Level (TL)	PSO No.
1.	Discuss local and global environmental issues	C	1,2,3,4
2	Identify and distinguish the sources and types of water, air, and soil pollution.	Ap	1,2
3.	Develop knowledge about impact and control measures of water, air, and soil pollution.	Ap	1,2,3



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010104

Name of the Course: Environmental Pollution and Management

4	Describe environmental analysis for various water, air and soil quality parameters	U	1,2
5	Explain Fate and transport of pollutants and distinguish the regional and global impact of pollution	U	1,2,3
6	Describe various pollutions and waste management methods	U	1,3
7	Discuss the Historic pollution episodes	C	1

Unit	Course Description	Hours	CO No.
1.0	Introduction - Environmental Concerns	3	1
1.1	Growing environmental concerns (History from 17th to 21st century)	1	1
1.2	Major environmental issues in India and Kerala	1	1
1.3	Readings in Environment Perspectives (eg. Silent Spring, Our Common Future)	1	1
2.0	Environmental Pollution and its impacts	12	2,3
2.1	Air Pollution – air pollutants: Type, source and nature-Primary and Secondary pollutants, Natural and Anthropogenic sources, gaseous, solid-particulate and bio pollutants	2	2
2.2	Transport and diffusion of atmospheric pollutants- factors influencing, Impact of air pollutants on - Human beings- Animals-Plants-Materials, buildings and climate, Vehicular pollution and urban air quality .	3	2,3



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Course code: ES010104

Name of the Course: Environmental Pollution and Management

2.3	Water pollution: Types, sources and impact, Surface water, ground water pollution, sources of water pollution -Domestic, industrial, agricultural and natural, Eutrophication.	2	2,3
2.4	Impacts on human beings, animals, plants and environment.	1	2,3
2.5	Epidemiological and other water pollution related health impacts (Goitre, Fluorosis, Arsenic).	1	2,3
2.6	Sources of soil pollution-Natural sources-Anthropogenic sources, Types of soil pollutants- Soil microorganisms and their functions, Different kinds of synthetic fertilizers and their interactions with different components of soil -fertilizers Industrial waste effluents and heavy metals-their interactions with soil components, Pesticides and metals in water, air and soil	3	2,3
3.0	Environmental Monitoring	12	2,3,4,5
3.1	Definition-aim, Environmental analysis-stages-sampling, processing, detection and interpretation- significance, Sampling methods-random-stratified-systematic, Water sampling-grab/composite-Air sampling-high volume air sampler-soil/sediment sampling-grab and core samplers	2	2,3,4
3.2	Processing methods-Digestion-Extraction-Filtration, Detection methods-analytical-classical-modern (instruments).	1	3,4
3.3	Water, air and soil quality analysis-Units.	1	2,3
3.4	Methods of monitoring air pollutants, Air quality standards.	1	2,3,4
3.5	Air quality monitoring studies: wind roses, air sampling, analysis for NO _x , SO _x , CO, O ₃ and particulate matter, Stack monitoring.	1	2,4,5
3.6	Water quality studies, Characteristics of water- physical, chemical and biological, Physico – chemical and bacteriological sampling and analysis of water quality. Water quality standards, Physico chemical analysis-Microbiological analysis.	1	2,3,4
3.7	Characteristics of industrial wastewater-paper & pulp, textile, cement, chemical etc, Assessment of the level of pollution based on BOD, COD , nitrogen, phosphate and microbiological analysis.	2	2,3
3.8	Water sampling- types, selection of sampling points, equipment used, sample preservation, maintenance of chain of custody records.	1	2,3
3.9	Physico-chemical and bacteriological sampling and analysis of soil quality, Soil pollution control measure-Soil pollution monitoring.	2	2,3
4.0	Pollution control techniques	4	1,3,4
4.1	Control measures of air, water and soil pollutants – control and treatment at source.	2	3,4



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Course code: ES010104

Name of the Course: Environmental Pollution and Management

4.2	International treaties and their impact.	2	1
5	Noise Pollution	5	1,6
5.1	Sources of noise pollution -Anthropogenic, natural sources, Impacts of noise pollution. Measurement of noise: decibels and noise levels, Noise propagation and noise attenuation.	2	1
5.2	Effect of meteorological parameters in Noise propagation, Noise exposure levels and standards.	1	1
5.3	Control measures of noise pollution.	2	6
6	Radioactive, Thermal and Marine Pollution	6	2,5,6
6.1	Sources of radioactivity-Radioactivity: Natural and manmade, Causes of radioactive pollution-Radioactive pollution from nuclear power plants-Radioactive pollution episodes.	1	2,6
6.2	Effect of radioactive pollution	1	5,6
6.3	Radioactive waste management, Radio nuclides-Origin of radio nuclides.	1	6
6.4	Thermal pollution-Causes of thermal pollution-Effects of thermal pollution.	1	5
6.5	Marine pollution-Sources: Natural and Anthropogenic source, Effect of marine pollution- specifically oil spills- on ocean flora and fauna.	1	5,6
6.6	Control of marine pollution-Controls for the disposal of pollutants in marine ecosystems, Biofouling: impact and management strategies.	1	5,6
7	Pollution Case Studies	6	7
7.1	Historic pollution episodes- oil spills, smog, industrial accidents etc. Bhopal Gas Tragedy-The Ganga Pollution-The Yamuna Pollution-Minamata TragedyLondon smog disaster-TajMahal Issue-Delhi air pollution problems- restoration of Indian lakes	6	7



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010104

Name of the Course: Environmental Pollution and Management

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning (Video), interactive Instruction: Active co-operative learning, Seminars, Group Assignments Authentic learning, Library work and Group discussion, Presentation by individual student/ Group representative; Field work and field visits
Assessment Types	1. Continuous Internal Assessment (CIA) Internal test Assignments based on the theory Seminar Presentation Field visit report 2. Semester End examination

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010104

Name of the Course: Environmental Pollution and Management

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010105

Name of the Course: Research Methodology and Statistics

Programme	M.Sc. Environment Science and Management					
Course Name	Research Methodology and Statistics					
Type of Course	Core					
Course Code	ES010105					
Course summary & Justification	This course would help students to understand various research methodologies and basic Mathematics. Also helps to learn Statistical Methods for data collection, analysis and interpretation.					
Semester		1	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						54
Pre-requisite	Basic research aptitude and knowledge in statistics					

CO No.	<i>At the end of the course, the student will be able to:</i>	Taxonomic Level(TL)	PSO
1.	Describe the various research methods and statistical Technique for doing research	U	7
2	Infer the literature; data collection and analysis procedures.	U	7
3.	Develop hypothesis for research and taking inference.	A, Ap	7
4	Evaluate data using Statistical methods	E	8
5	Understand basic mathematical models and evaluate	U, E	7,8
6	Apply statistical softwares for data analysis	A	8



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010105

Name of the Course: Research Methodology and Statistics

Unit	Course Description	Hours	CO No.
1	Research Methodology	16	
1.1	Meaning-Objectives-motivation-Significancesofresearch,Typesofresearch,Researchmethodsandmethodology,ResearchandScientificMethod,CriteriaofGoodresearch,Problemsof researcher	2	1,2
1.2	Selection of the problem: Criteria for selection of problem andevaluatingproblems,Statementofproblemformulationanddefinition.	2	1
1.3	Research design: Meaning, need for research design, Featuresand important concepts relating to research design, Differentresearchdesign,Basic principlesofexperimental design.	2	1
1.4	Survey of literature: Different methods of surveying literature,different sources of information, internet, search engines, websites,recordingsurveyingininformation.	2	2
1.5	Hypothesis: Nature, types and sources of hypothesis, characteristics of a good hypothesis.	2	3
1.6	Sample and Sampling: population, sampling techniques, characteristics of good samples, different types of sample, sampling errors and ways to reduce them.	2	1,2
1.7	Collection, analysis and interpretation of data: Procedure of data collection, scoring of data, tabulation, editing andanalysis and interpretation of data.	2	2,3,4
1.8	Research Report: Meaning, definition, features of report. Composition, pagination, Title pages, references pattern , Bibliography, Appendices.	2	1



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Course code: ES010105

Name of the Course: Research Methodology and Statistics

2	Basic Mathematics	10	
2.1	Functions and Progression : Definition of constant, parameter, variable and functions, Sequences and Series, Arithmetic progression's Geometric progressions	2	5
2.2	Matrix Algebra and application: Matrix theory, addition and multiplication of matrices, inverse of matrix, rank of matrix, eigen matrix; solution of simultaneous equation using matrix inverse, introduction to vectors (addition and multiplication)	6	5
2.3	Basic Calculus and applications: Limits and continuity, concept of derivative, rule of differentiation.	2	5
3	Fundamental Statistics		
3.1	Fundamental Statistics : Introduction, Importance and limitation.	1	1
3.2	Classification and Tabulation of data	1	1,2
3.3	Graphical Representation	2	1,2
3.4	Measures of Central Tendencies – Mean, Median, Mode	2	4
3.5	Measures of Dispersion - Range, Standard Deviation and Co-efficient of Variation	2	4
3.6	Moments, Skewness and Kurtosis	2	4
3.7	Correlation and Regression – Scatter diagrams – Karl Pearson's Coefficient of correlation – Rank correlation – Linear and Curvilinear regressions.	3	4,5
3.8	Probability – Frequency approach- Addition and multiplication theorems- Binomial, Poisson and Normal Distribution- Probit analysis (Graphic Method only)	4	5
3.9	Testing of Hypothesis: Null and Alternative Hypothesis – Two types of error – Level of significance Test based on t, Z, F	8	4,5,6
4	Application of Computer in Statistics		
4.1	Data analysis using packages - MS excel	3	6



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010105

Name of the Course: Research Methodology and Statistics

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning (Video), interactive Instruction:, Active co-operative learning, Seminars, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student/ Group representative; Field work and field visits
Assessment Types	<ol style="list-style-type: none">1. Continuous Internal Assessment (CIA) Internal test Assignments based on the theory Seminar Presentation Field visit report2. Semester End examination



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010105

Name of the Course: Research Methodology and Statistics

References

1. Brewer R(1994), The Science of Ecology, saunders College Publishing, New York
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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010106

Name of the Course: Laboratory Course Part 1 (Ecology and Environmental Chemistry)

Programme	M.Sc. Environment Science and Management						
Course Name	Laboratory Course Part 1 (Ecology and Environmental Chemistry)						
Type of Course	Core						
Course Code	ES0102106						
Course summary & Justification	The course will enable students to understand various physico-chemical parameters determining water, air and soil quality and to carry out environmental sampling and analysis. The students will understand biodiversity and can carry out biodiversity assessment.						
Semester		1	Credit			5	
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs	
						24	
Pre-requisite							

CO No.	Expected Course Outcome	Taxonomic Level (TL)	PSO No.
1.	Understand the basic principles of the analysis of water and soil quality parameters	U	1, 2, 3
2	Carry out analysis of physico-chemical parameters of water and soil	U	1, 2,
3.	Conduct noise pollution measurement	Ap	1, 3
4	Carry out ecological assessment	Ap	1, 3,



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010106

Name of the Course: Laboratory Course Part 1 (Ecology and Environmental Chemistry)

Unit	Course Description	Hours	CO No.
1.0	Introduction to laboratory techniques	4	1,2
1.1	Basic laboratory rules	1	1,2
1.2	Environmental samples-Sampling methods-preparation-preservation and analysis	2	1, 2
1.3	Biometry-Data representation-Bar diagram-Component Bar diagram.-Superimposed Bar diagram- Line diagram-Pie diagram	1	1,2
2.0	Ecology	8	1,3,4,5
2.1	Community study: quadrat method; flora and fauna study by frequency, density and abundance – line transect method.	4	1,3,5
2.2	Estimation of primary productivity – Light and dark bottle method – effects of depth and light	2	1,3,5
2.3	Identification of phytoplankton and zooplankton (either freshwater or marine).	1	4
2.4	Windrose	1	6



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010106

Name of the Course: Laboratory Course Part 1 (Ecology and Environmental Chemistry)

3.0	Instrumentation	2	5,6
3.1	pH Meter-BOD Incubator-Lux Meter-Wet & Dry bulb Hygrometer- Max-min Thermometer-TDS Meter-Sound Level Meter	2	5,6
4.0	Environmental Chemistry	10	1,2,3
4.1	Basic Water Quality Studies:-pH, conductivity, turbidity, Acidity, Alkalinity ,Total Solids ,Total Dissolved Solids and Total Suspended Solids of Water Sample	6	1,2,3
4.2	DO,BOD of Water Sample	4	1,2,3

Teaching and Learning Approach	Laboratory practical's
Assessment Types	1. Continuous Internal Assessment (CIA) Internal test Review of Book /Article Seminar Presentation Field visit report 2. Semester End examination



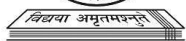
MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010106

Name of the Course: Laboratory Course Part 1 (Ecology and Environmental Chemistry)

References:

1. APHA (1995). Standard methods for the examination of water and wastewater. 19th edition American Public Health Association, Washington, DC
2. Abbasi S A, Water quality sampling and analysis, Discovery Publishing New Delhi
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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010106

Name of the Course: Laboratory Course Part 1 (Ecology and Environmental Chemistry)


Teaching and Learning Approach

Laboratory Practicals

Assessment Types

1. Continuous Internal Assessment (CIA)
Internal test
Review of Book /Article
Seminar Presentation
Field visit report
2. Semester End examination

SEMESTER 2

	MSc ENVIRONMENT SCIENCE AND MANAGEMENT
	Course code: ES010201 Name of the Course: Eco Toxicology and Occupational Health Hazards Management

Programme	M.Sc.EnvironmentScienceandManagement					
CourseName	Eco Toxicology and Occupational Health Hazards Management					
TypeofCourse	Core					
CourseCode	ES010201					
Coursesummary &Justification	This course is designed to provide introduction to basic principle and concepts of toxicology with respect to ecosystem.					
Semester		1	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						58
Pre-requisite						

CO No.	Expected Course Outcome	Taxonomic Level(TL)	PSO No.
1	Understand the basic concept of Toxicology	U	1
2	Distinguish toxicants; its interactive effects and various factors influencing toxicology	A	1
3	Describe sources and fates of chemicals in terrestrial and aquatic environment, its interactions and effect on food chain	R, E	3
4	Create understanding on biotransformation of toxins	C	1
5	Examine the movement and distribution of toxins	A	1
6	Demonstrate methods of toxicological testing	U	2,3
7	Understand biomonitoring approaches	U	3,7



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010201

Name of the Course: Eco Toxicology and Occupational Health Hazards Management

8	Estimate the risk for adverse effects of a chemical on different biological organization levels based on knowledge about the toxicity, degradability, and bioavailability of the chemicals	C	1
9	Explain the significance of Health and Hygiene	E	1
10	Understand Occupational safety and management measures	U	1



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010201

Name of the Course: Eco Toxicology and Occupational Health Hazards Management

Unit	Course Description	Hours	CONo.
1	Introduction	13	
1.1	Principles of toxicology, history of toxicants, concepts in toxicology.	3	1
1.2	Classification of toxicants-toxicants terms-carcinogens-mutagens-teratogens.	2	1,2
1.3	Biological and chemical factors influencing toxicity.	1	2
1.4	Interactive effects of toxicants (Additive effects, Synergistic effects, Antagonistic effects, Potentiation).	1	2,3
1.5	Toxicants- entry into the environment, cycles and residence time.	2	3,8
1.6	Movement and distribution of toxins in organisms (ADME studies). Case studies-mercury and cadmium (related).	4	2,5
2	Ecotoxicology and Toxicity Testing and Indicators	16	
2.1	Toxicants in ecosystem. Fate of Toxins-dispersion, transformation, degradation-physical, chemical and biological.	3	2, 3,5
2.2	Biotransformation.	3	4
2.3	Bioavailability, Bio-concentration, Bio-accumulation and Bio-magnification—Biodegradation.	2	4,5
2.4	Effect of interspecific interactions in the environment-food chain. Terrestrial and Aquatic Toxicology.	2	3
2.5	Principles of toxicity testing, Factors to be considered in toxicity testing. Methods of toxicity evaluation at cellular and molecular level by in vitro and in vivo methods.	4	6
2.6	Ecotoxicological testing methods – single species testing, microcosms etc.	1	2,3
2.7	Biomonitoring of toxicity- Bioindicators, lacustrine communities as indicators of ecosystem stress.	1	1,7
3	Biomonitoring of Toxicity	15	
3.1	Biosensors– concept and approach.	1	6,7
3.2	Biomarkers- classification, relationship of biomarkers to adverse effects.	2	2,7
3.4	Molecular tools in biomonitoring- metabolites as indicators, protein induction, cytochrome P450 enzymes, stress proteins and metallothioneins.	2	7
3.5	Toxicity of biohazard.	2	8




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Course code: ES010201

Name of the Course: Eco Toxicology and Occupational Health Hazards Management

3.6	Toxicity-Local and Systematic Toxicity- Immediate and Delayed Toxicity-Reversible and Irreversible.	2	1,8
3.7	Toxicity-Acute and Chronic Toxicity-Toxicity of mixtures-Variation in Toxic responses.	2	8
3.8	Toxicity of organs and organ system.	4	
4	Occupational Hazards and Safety; Health and Hygiene	14	
4.1	Environmental and occupational safety- Definitions, concept and scope. Occupational exposure- Permissible Limits of exposure.	1	9
4.2	Occupational hazards and diseases.	2	10
4.3	Occupational safety and management measures.	2	10
4.4	Health and Hygiene- Epidemiology and health ecology. Epidemiological diseases due to pollution problems.	3	9
4.5	Health effects of cosmetics and drugs.	1	2,8
4.6	Occupational and industrial health management.	2	9,10
4.7	Ecological risk assessment in environmental management. Legislative perspective in ecological risk assessment. Human health risk assessment.	3	9,10

	MSc ENVIRONMENT SCIENCE AND MANAGEMENT
	Course code: ES010201 Name of the Course: Eco Toxicology and Occupational Health Hazards Management

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning(Video), interactive Instruction:, Active co-operative learning, Seminars, Group Assignments Authentic learning, Librarywork and Group discussion, Presentation by individual student/ Group representative.
Assessment Types	<ol style="list-style-type: none"> 1. Continuous Internal Assessment(CIA) <ul style="list-style-type: none"> • Internal Test • Assignments based on the theory • Seminar Presentation 2. Semester End Examination

References

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010202

Name of the Course: Environmental Microbiology

Programme	M.Sc. Environment Science and Management					
Course Name	Environmental Microbiology					
Type of Course	Core					
Course Code	ES010202					
Course summary & Justification	The goal of this course is to give students a basic understanding of environmental microbiology, including the functional diversity of microorganisms in the environment and how it affects human welfare and ecosystem health, microbial interactions with pollutants in the environment, and microbial pathogens' fate in the environment.					
Semester		2	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						60
Pre-requisite						

CO No.	Expected Course Outcome	Taxonomic Level (TL)	PSO No.
1.	Various microorganisms in the environment with their basic characteristics	R	1,2
2	Understand and apply the various techniques for the isolation and characterization of microorganisms from environmental compartments	U, A	3, 5
3.	Understand and evaluate the role of microorganisms in various biogeochemical cycles and other environmental processes	U, E	3, 5



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010202

Name of the Course: Environmental Microbiology

4	Understand and analyse the role of microorganism in various diseases	U	5, 7
5	Analyse and apply the role of microorganisms in various environmental applications	A, Ap	5, 7
6	Analyse and apply the applications of genetically engineered microorganisms in environmental sector	A, Ap	5,7

Unit	Course Description	Hours	CO No.
1	Microorganisms in the environment	15	1
1.1	Ubiquity of microorganisms in the environment – general account of microorganisms in the environment – bacteria, fungi, protists, algae and viruses - characteristic features and their role in the environment.	1	1
1.2	Bacteria-Morphology and Ultra structure of Bacteria-Plasma membrane, cell wall	2	1
1.3	Bacteria-flagella, pili, capsule, slime layer, glycocalyx ,nucleoid, ribosomes and cytoplasmic inclusions	2	1
1.4	Basics of Gram staining	2	1
1.5	Fungi-Morphology and structure of fungal hyphae and mycelium-Physiology, nutrition, reproduction and life cycle-Classification of fungi	2	1
1.6	Protozoans- Ecology of free living, symbiotic and parasitic protozoans-Reproduction and life cycle of important parasitic protozoans (Giardia, entamoeba histolytica, plasmodium etc.)	2	1
1.7	Viruses- Chemical composition, structure architecture of viruses	2	1
1.8	viruses- Multiplication and life cycle- Bacteriophages- Lytic and lysogenic cycle- T4 and Lambda phages	2	1



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Course code: ES010202

Name of the Course: Environmental Microbiology

2.0	Microbial nutrition and growth	10	1,2,5,6
2.1	Nutritional diversity among prokaryotes – various types of autotrophy and heterotrophy among bacteria.	1	1,2
2.2	Nutritional requirements – macronutrients, micronutrients and trace elements in microbial nutrition; Culture media – complex and synthetic media	1	1,5
2.3	Use of specialized media (selective media, selective and differential media) for the isolation of specific microorganisms.	2	1,2,5
2.4	Microbial growth – cytological and population growth – factors affecting growth of bacteria. Characteristic features of bacteria growth curve.	2	1,2,5
2.5	Continuous culture systems – chemostat and turbidostat.	2	5,6
2.6	Physical and chemical control of bacterial growth – disinfectants, antibacterial agents, antibiotics and chemotherapeutic agents	2	5,6
3.0	Isolation and characterization of bacteria from the environment	4	1, 2
3.1	Isolation of bacteria from the environment – pour plate and streak plate method. Use of different media and culture techniques.	2	1,2
3.2	Pure culture techniques – streak plate method – quadrant streak and continuous streak methods-Maintenance of bacteria on agar slants and long term preservation as glycerol stock.	2	1,2
4.0	Microorganisms and the environment	16	1,2,3,4,5
4.1	Soil microbiology-Soil microorganisms and their association with plants—bipartite and tripartite associations - rhizosphere microflora, mycorrhizae – ecto and endomycorrhizae – VAM – actinorrhizae	3	2,3
4.2	Role of microorganisms in biogeochemical cycles with special reference to carbon, nitrogen, phosphorus and sulphur cycles	3	1,3



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Course code: ES010202

Name of the Course: Environmental Microbiology

4.3	Pesticides and microorganisms-Soil microorganisms interactions with the atmosphere	2	1,2,5
4.4	Aquatic microbiology- Microbial community and important microorganisms in marine and fresh water environments-Nutrient levels, gradients, surfaces and biofilms-Microbial mats- microbial loop	2	1,2
4.5	Water borne pathogens – diseases causes and symptoms – routes of infection and control measures. Microbial indicators of water quality – coliforms, faecal coliforms, Escherichia coli and faecal streptococci	2	3,4
4.6	Foreign derived microorganisms in the environment – fate and survival.	1	5,6
4.7	Genetically modified microorganisms in the environment – fate and effects.	1	5,6
4.8	Microorganisms in extreme environments – Archaeobacteria – Psychrophiles, Thermophiles, Halophiles, Barophiles, Methanogenes etc.	2	1,3
5.0	Genetically engineered microorganisms and their applications in the environment		2,6
5.1	Prokaryotic DNA and its characteristic features - Recombinant DNA techniques – restriction endonucleases and cloning vectors – plasmids, cosmids, phagemids etc.		2,6
5.2	Polymerase chain reaction (PCR) technique for amplification and detection of specific genes		2,6
5.3	Application of genetically engineered organisms in the clean-up of the environment – bioremediation strategies for polluted soil and water ecosystems		2,6



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010202

Name of the Course: Environmental Microbiology

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning (Video), interactive Instruction:, Active co-operative learning, Seminars, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student.
Assessment Types	<ol style="list-style-type: none">1. Continuous Internal Assessment (CIA) Internal test Assignments based on the theory Seminar Presentation2. Semester End examination



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010202

Name of the Course: Environmental Microbiology

References

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010203

Name of the Course: INTRODUCTION TO GEO-INFORMATICS

Programme	M.Sc. Environment Science and Management					
Course Name	Introduction to Geo-informatics					
Type of Course	Core					
Course Code	ES010203					
Course summary & Justification	This course is designed to inculcate the basic data interpretation skills and Research skills by allowing the students to think critically and spatially. Geoinformatics has wide application across many science disciplines; we evaluate how this contributes to critical spatial thinking. The discipline of GIS covers the whole process of spatial decision-making in environmental issues and relevant research areas. We outline how some existing GIS and Remote sensing principles can be utilized for mapping and monitoring of earth resources and creating feasible solutions for their management.					
Semester		1	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						64
Pre-requisite	The students have basic computer handling skills and knowledge					

CO No.	Expected Course Outcome	Taxonomic Level (TL)	PSO No.
1.	Demonstrate the basics of Cartography, Mapping Concepts and Map projections	U	1
2.	Familiarize basic tools and techniques in GIS	U	6
3.	Understand the principle of Remote Sensing and Geographical Information systems (GIS) data acquisition and its applications	U	6



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Course code: ES010203

Name of the Course: INTRODUCTION TO GEO-INFORMATICS

4.	To analyze and evaluate the information obtained by applying Remote Sensing and GIS technologies	A	3
5.	Examine the basics of GPS	A	6
6.	To apply Remote Sensing and GIS in various fields of research and social needs	AP	7
7.	To create feasible solution in different fields of application of Remote Sensing and GIS	C	6



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Course code: ES010203

Name of the Course: INTRODUCTION TO GEO-INFORMATICS

Unit	Course Description	Hours	CO No.
1.0	Geodetical aspects, mapping concepts and surveying	12	1,5
1.1	Earth System – Geodesy: Datum/Spheroids and coordinate systems, map projection - different projections and their characteristics	4	1
1.2	Features on the earth's surface: their basic properties – discrete vs continuous and geometries of representation	3	1
1.3	Cartography: Maps – their characteristics and elements, types - Basic surveying principles and techniques: EDMs and GNSSs; GNSSs – segments, various constellations, errors, differential correction and precise positioning	3	1,5
1.4	Map reading and interpretation; Global, national and state mapping agencies and their authorized reference maps – general & thematic	2	1
2.0	Remote sensing: Introduction	17	3,4
2.1	Remote sensing system – components and principles – platforms, sensors, medium, target, interactions and their characteristics including various resolutions, concept of DN value, radiance, reflectance, emission.	3	3
2.2	Electromagnetic spectrum - energy interaction with atmosphere and earth surface, atmospheric windows, spectral properties of various objects on the earth's surface and the concept of spectral signature, active and passive remote sensing	3	3
2.3	Space borne earth observation: various orbits and their characteristics, operations, image acquisition and various data products.	2	3



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Name of the Course: INTRODUCTION TO GEO-INFORMATICS

2.4	Indian remote sensing programme & Other satellites and sensors like Landsat, SPOT, etc. Digital Image Processing: Basics	2	3
2.5	Various image formats, loading and visualization – panchromatic and multispectral colour visualization – TCC and FCCs	2	4
2.6	Image interpretation – visual and digital; visual interpretation elements and key.	2	4
2.7	Digital image classification – unsupervised and supervised; accuracy assessment	3	3
3.0	Geographical Information System (GIS): Basics	12	2,3,4
3.1	Concepts, components and organization of GIS	2	2
3.2	Representing & modelling spatial features and processes - vector and raster structures, relationship between features – topology; raster data compressions and storage formats	4	4
3.3	Non-spatial/attribute Database Management Systems (DBMS), significance of DBMS, principles, data types, models – RDBMS, data storage, query and retrieval	3	3,4
3.4	Basic GIS functions: data inputting methods & various data sources, data management, data manipulation and geographic analysis and output presentation	4	2
4.0	GIS: Geographic analysis	12	3,4
4.1	Exploration, query, vector spatial analysis & geoprocessing – extraction, proximity, overlay	3	4
4.2	Raster based spatial modeling and analysis – density, distance, map algebra – arithmetic & weighted overlay: multi-criteria decision making	4	4
4.3	Surface modeling and analysis: DEM creation – input sources, interpolation; slope, aspect, volume, profile, hillshade, viewshed, visibility, contouring	4	3,4



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Course code: ES010203

Name of the Course: INTRODUCTION TO GEO-INFORMATICS

5.0	GIS: Applications in Ecology & Environment Management	11	4,6,7
5.1	Sampling and ecological survey design	1	4
5.2	Mapping of natural resources – minerals, soil, water and bio-resources	2	6
5.3	Modelling and analysis of ecosystems and ecological processes – marine, forest, mountain, rivers & streams, coastal areas and wetlands – global ecosystem dynamics, climate change monitoring and modelling	2	7
5.4	Detailed vegetation and built environment characterization using high spatial and spectral resolution remote sensing images and in-situ hyper-spectral data	2	6
5.5	Landscape level biodiversity characterization, disturbance analysis including forest fire vulnerability analysis and conservation planning	2	6
5.6	Applications in EIA and Cost-Benefit Analysis: quantifying impacts and use in the preparation of EMP, Pollution dispersion modelling: water, air & soil – various quality indices, Soil erosion estimation, zonation and modelling	2	7



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Course code: ES010203

Name of the Course: INTRODUCTION TO GEO-INFORMATICS

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning (Video), interactive Instruction: Active co-operative learning, Seminars, Group Assignments Authentic learning, Library work and Group discussion, Presentation by individual student/ Group representative
Assessment Types	1. Continuous Internal Assessment (CIA) Internal test Assignments based on the theory Seminar Presentation Field visit report 2. Semester End examination

References

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010203

Name of the Course: INTRODUCTION TO GEO-INFORMATICS

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010204

Name of the Course: Environment Laws, Education and Policies

Programme	M.Sc. Environment Science and Management						
Course Name	Environment Laws, Education and Policies						
Type of Course	Core						
Course Code	ES010204						
Course summary & Justification	The course deals with the history of environmental laws and their evolution to modern environmental laws. The course discusses various international treaties and conventions conducted for environmental protection. It also describes various policies and laws in India for the protection of the environment. The course explains the principles of international laws. Environmental education, its history and present status in India are also described in this course.						
Semester		2	Credit			4	
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs	
						56	
Pre-requisite							

CO No.	Expected Course Outcome	Taxonomic Level (TL)	PSO No.
1.	Describe the history of environmental law	U	2,10
2	Understand the environmental laws and policies in Kerala and India	U	4, 9,10
3.	Describe principles of international laws	U	9,10



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010204

Name of the Course: Environment Laws, Education and Policies

4	Describe the significance of environmental education	R	2
5	Evaluate the development activities based on environmental laws	E	9
6	Understand Environmental Information Networks	U	10
7	To impart Environmental awareness	R	2

Unit	Course Description	Hours	CO No.
1.0	Introduction to United Nation	5	1
1.1	Introduction to United Nation Organization-introduction only	1	1
1.2	Introduction to United Nation and its Organization and its various agencies- UNEP, UNDP, IUCN, UNESCO,FAO, IMO, EPA,WCED.	2	1
1.3	UN agencies- GEMS, GEF, WWF, EARTHWATCH	1	1
1.4	Role of UN authorities in protection of Global Environment	1	1
2.0	International Treaties	18	1,2,3,7
2.1	Evolution and Development of International Laws with Reference to-Stockholm Conference and Nairobi Conference.	3	1, 2



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Course code: ES010204

Name of the Course: Environment Laws, Education and Policies

2.2	Rio Conference, Rio +5, Rio +10, Rio+20.	2	1,2
2.3	Global environmental issues and international laws to control global warming, ozone depletion, Hazardous waste- Vienna Convention and Montreal Protocol, Basel Convention, CITES.	4	2,3,7
2.4	UNFCCC- Kyoto protocol and Agenda 21.	2	2,3
2.5	CBD, Antarctica Convention, Desertification Convention.	3	2,3
2.6	International agreements on wetlands.	1	2,3
2.7	International agreements on oceans and mangroves, migratory species and forests.	2	2,3
2.8	Global Initiatives for sustainable development.	1	7
3.0	Environmental Laws in India	22	1,2,3,5
3.1	National Environmental Policy and Fundamental Principles of Environmental Laws	1	1,2
3.2	Environmental Laws in India-The Wildlife (Protection) Act, 1972- The Water (Prevention and Control of Pollution) Act.	3	1,2,3
3.3	The Air (Prevention and Control of Pollution) Act, 1981 ,The Environment (Protection) Act, 1986, The National Environment Tribunal Act, 1992 and its amendment in 2012	5	2,3
3.4	The Biological Diversity Act, 2002-The Factories Act, 1948.	2	2,3
3.5	The Forest (Conservation) Act, 1980, with amendments made in 1998.	2	2,3
3.6	The Energy (Conservation) Act,2001-The Motor Vehicles Act, 1988--The public Liability Insurance Act, 1991.	3	2,3
3.7	Rules and Notifications made under- Hazardous waste management- Hazardous microorganisms	2	5
3.8	Biomedical Waste-Recycles Plastics-Ozone depleting substances.	2	5
3.9	Noise Pollution (Regulation and Control) Rules, 2000	2	5
4.0	Environmental Information, Education and Communication	6	6,4
4.1	Information Networks- ENVIS Centre and INFOTERA	3	6
4.2	Environmental education-background, Goals, Objectives, Guiding principles and strategies for environmental education	3	4
5.0	Environmental movements, Participation and Awareness	5	7
5.1	Need for Public Awareness of Environmental Studies	1	7



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Course code: ES010204

Name of the Course: Environment Laws, Education and Policies

5.2	Environmental movements and Peoples participation	1	7
5.3	Well Known Environmental Movements in India	1	7
5.4	Role of Tribal people, Women and NGOs in Environmental Protection	1	7
5.5	Various national and international NGOs	1	7



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010204

Name of the Course: Environment Laws, Education and Policies

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning (Video), interactive Instruction: Active co-operative learning, Seminars, Group Assignments Authentic learning, Library work and Group discussion, Presentation by individual student/ Group representative; Field work and field visits
Assessment Types	<ol style="list-style-type: none">1. Continuous Internal Assessment (CIA) Internal test Assignments based on the theory Seminar Presentation2. Semester End examination

References

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010205

Name of the Course: Laboratory Course Part 2 (Microbiology and Environmental Chemistry)

Programme	M.Sc. Environment Science and Management					
Course Name	Laboratory Course Part 2 (Microbiology and Environmental Chemistry)					
Type of Course	Core					
Course Code	ES010205					
Course summary & Justification	The course will enable students to understand various physico-chemical parameters determining water, air and soil quality and to carry out environmental sampling and analysis. It will also enable students to identify microbial pollution of water and soil environment. The students will be able to identify and isolate microbes from the environment					
Semester		2	Credit			5
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						24
Pre-requisite						

CO No.	<i>Expected Course Outcome</i>	Taxonomic Level (TL)	PSO No.
1.	Assess microbial pollution	Ap	3
2	Identify and isolate various microbes from the environment	Ap	3,6
3.	Preparation and characterization of bacteriological media – use of autoclave and hot air oven for sterilization	Ap	3,6



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010205

Name of the Course: Laboratory Course Part 2 (Microbiology and Environmental Chemistry)

4	Isolation and enumeration of microorganisms in environmental samples (soil and water)	Ap	3,6
5	Understand the basic principles of the analysis of water, soil quality parameters	R	3
6	Carry out analysis of physico-chemical parameters of water and soil	Ap	3,5,8

Unit	Course Description	Hours	CO No.
1.0	Environmental microbiology		
1.1	Preparation and sterilization of bacteriological media – use of autoclave, laminar air flow and hot air oven for sterilization	2	4,7
1.2	Isolation and enumeration of microorganisms in environmental samples (soil and water)	2	4,5,7
1.3	Pure culture techniques – quadrant streaking, continuous streaking methods	1	4,5,7
1.4	Use of compound microscope	1	4,7
1.5	Staining techniques – Simple stain, Gram stain	2	4,7
1.6	Endospore staining	1	4,7
1.7	Detection of bacterial motility – hanging drop method, use of semi-solid agar	1	4,7



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Course code: ES010205

Name of the Course: Laboratory Course Part 2 (Microbiology and Environmental Chemistry)

1.8	Basic biochemical test for characterisation of bacteria – Oxidase test and catalase test and oxidation/ fermentation (O/F) test	1	4,7
1.9	Water quality testing – MPN method to detect total coliforms, faecal coliforms and faecal streptococci	2	4,7
1.10	Membrane filter technique to detect faecal coliforms in water and Escherichia coli	2	4,7
1.11	Indole, Methyl Red (MR), Voges-Proskauer and Citrate (IMViC) tests for the characterization of E. coli	2	4,7
2.0	Environmental Chemistry		
2.1	Water Quality Studies:- Salinity –Hardness-Iron-COD-Oil and Grease in Water Sample	4	1,2,7
2.2	Soil Quality Studies:-Moisture- pH-Organic matter-Organic carbon-Chloride content in Soil	4	1,3,7



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010205

Name of the Course: Laboratory Course Part 2 (Microbiology and Environmental Chemistry)

Teaching and Learning Approach	Laboratory Practicals
Assessment Types	1. Continuous Internal Assessment (CIA) Internal test Review of Book /Article Seminar Presentation Field visit report 2. Semester End examination

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SEMESTER 3



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010301

Name of the Course: Environmental Engineering

Programme	M.Sc. Environment Science and Management				
Course Name	Environmental Engineering				
Type of Course	Core				
Course Code	ES010301				
Course summary & Justification	Application of Environmental Engineering principles in Air, Water resources and Solid Waste Management. The course has been designed with very essential components of Engineering concepts so that the science graduates can understand and appreciate the course. Aimed to train science graduates with essential inputs from (Environmental) Engineering so that a capacity building can be attained among the students in order equip themselves.				
Semester		3	Credit		4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others
					Total Hour
					50
Pre-requisite					

CO No.	Expected Course Outcome	Taxonomic Level(TL)	PSO No.
1.	Understand air and water resource management, solid waste management through the concept of System approach.	U	1,2,3
2	Describe the basics of mass balance analysis in Environmental Engineering	C	2,3
3.	Understand various steps and techniques of water and waste water treatment.	U	1,2,3
4.	Apply system approach in water resource management.	Ap	1,2,3



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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010301

Name of the Course: Environmental Engineering

5	Describe air quality standards and to understand different air pollution control techniques for both point and non-point sources.	C	3,5
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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010301

Name of the Course: Environmental Engineering

Unit	Course Description	Hours	CO No.
1	Introduction; Water and Wastewater Treatment	26	1,2,3,4,5
1.1	Environmental Engineering and Environmental Systems	1	1
1.2	Water resource management-Air resource management	1	1,3,4,5
1.3	Solid waste management systems	1	1
1.4	Mass-balance approach to problem solving	1	2
1.5	Water quality studies-Sampling technique- Sampling devices-Sample preservation.	2	1,2
1.6	Importance of Physical – Chemical and Biological examination of water-Water quality standards.	3	1,2
1.7	Water Treatment-Filter Plants-Mixing and flocculation, Coagulation, Jar Test-Softening – lime soda and ion exchange process- Filtration – slow, rapid and high – rate sand filters.	4	1,2,3
1.8	Disinfection – Chlorination, Ozonation and UV application.	3	2, 3
1.9	Wastewater treatment- Introduction, characteristics of wastewater-BOD, COD, Turbidity.	2	1,3,4
1.10	Classification of wastewater-municipal, industrial wastewater.	2	1,3,4
1.11	Municipal wastewater treatment System-Unit operations of pre-treatment - Bar racks, grit chambers, comminutors and equalization tank.	3	1,3
1.13	Unit operations of primary treatment- Screening-sedimentation aided with coagulation-filtration.	3	1,3
2	Secondary (Biological) Wastewater Treatment Systems	9	1,3,4
2.1	Unit Process of Secondary treatment: (Biological unit processes)-Nature and kinetics of biological growth.	2	1,3
2.2	Aerobic Treatment-Aerobic activated sludge processes.	2	1,3
2.3	Oxidation ponds- Attached growth systems-trickling filters-Rotating biological contactors (RBCs).	2	1,3
2.4	Anaerobic wastewater treatment Systems-High rate and low rate reactors examples- Evolution of high-rate anaerobic reactors-CSTRs- Up-flow anaerobic filters (UAFs)- UASBs, Expanded/Fluidized bed reactors.	3	1,3,4
3	Tertiary/Advanced Treatment Systems	8	1,3,4



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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010301

Name of the Course: Environmental Engineering

3.1	Chemical unit Processes-Filtration-Adsorption-Nitrogen and Phosphorous Removal-Biological nutrient removal (BNR) systems.	3	1,3,4
3.2	Land treatment- slow rate, overland flow, rapid infiltration.	2	1,3
3.3	Sludge treatment-Sludge disposal.	1	1,3
3.4	Application of nanotechnology in wastewater treatment systems.	2	1,3,4
4	Air Quality Management	7	1,5
4.1	Air quality standards –Ambient air quality management	1	1,5
4.2	Control of particulate matters: Air pollution control techniques: Particulate matters control devices-gravitational chambers, centrifugal (cyclones), electrostatic and fabric and wet precipitators-scrubbers-design concepts.	2	1,5
4.3	Gaseous air pollution control methods-absorption-adsorption-condensation-combustion.	2	1,5
4.4	Industrial emission-stack emission monitoring and management.	1	1,5
4.5	Automobile emission control.	1	1,5



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010301

Name of the Course: Environmental Engineering

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning(Video), interactive Instruction: Active co-operative learning, Seminars, Group Assignments Authentic learning, Library work and Group discussion, Presentation by individual student /Group representative
Assessment Types	1. Continuous Internal Assessment(CIA) <ul style="list-style-type: none">• Internal Test• Assignments based on the theory• Seminar Presentation 2. Semester End Examination

References

1. Abbasi, S.A., Ramasamy, E.V., 1999b. Biotechnological Methods of Pollution Control. Universities Press of India Ltd. India.
2. Abbasi, S.A., Krishnakumari, P.K. and Khan, F.I. 1999. Hot topics, Oxford University Press, Chennai.
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12. Tchobanoglaus, G. Theisen, H and Vigil, S.A 1993 Integrated Solid waste Management: engineering principles and management issues, Mc Graw Hill International.



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010302

Name of the Course: Environmental Planning and Resource Management

Programme	M.Sc. Environment Science and Management					
Course Name	Environmental Planning and Resource Management					
Type of Course	Core					
Course Code	ES010302					
Course summary & Justification	This course allows the students to learn the fundamentals theories and concepts of Environment Management. Understand and analyze the fundamental concepts of environmental planning and Management.					
Semester		3	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						54
Pre-requisite						

CO No.	Expected Course Outcome	Taxonomic Level (TL)	PSO No.
1.	Understand the basic concepts of Environment Management	U	1,2
2	Understand and evaluate the fundamental concepts of ecosystem management	U	1,2
3.	Understand and analyze the fundamental concepts of environmental planning and Management with various standards	U	1,2



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010302

Name of the Course: Environmental Planning and Resource Management

4	Discover and apply the application of environmental planning and management in managing disasters	An	1
5	Apply the ecosystem restoration methods in environment management	Ap	1
6	Understand and analyze the management of various physical and biological resources	U	1,2

Unit	Course Description	Hours	CO No.
1.0	Introduction	7	1,2,3
1.1	Basic Principles of Environment Management, Environment management – tools and techniques.	2	1,2
1.2	Environment Management Systems (EMS).	2	1,2,3
1.3	Introduction to environmental quality models- input and output models, linear programming models of environmental quality management, Natural resources and their management .	3	1,2
2.0	Ecosystem Management	9	1,2,5
2.1	Grassland and forest management .	2	1,2,5
2.2	Wetland Management.	2	1,2,5
2.3	Management of coastal and marine ecosystems.	3	1,2,5
2.4	People's participation in ecosystem management, Case studies.	2	1,2
3.0	Water Resource Management	14	1,2,5
3.1	Global Water Budget, global water availability-depletion of water resources.	3	1,2



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010302

Name of the Course: Environmental Planning and Resource Management

3.2	Interrelation of water resources with other natural resources and the environment.	2	1,2,5
3.3	Dams and water resources-Watershed management.	2	1,2
3.4	Irrigation water management, Integrated Water Resources Management (IWRM).	3	1,2,5
3.5	Concept of sustainable water resources development.	2	1,2
3.6	Global Efforts - water resource management, Local water organizations-World water organizations- UN, GWP, WWC.	2	1,2
4.0	Physical Resources	12	1,2,5,6
4.1	Soil and mineral resources- status and significance, problems facing, Soil quality management – engineering and ecological solutions.	2	1,2,5,6
4.2	Control of soil erosion, Eco-restoration of degraded land.	2	1,5,6
4.3	Soil Management in Kerala.	1	1,5,6
4.4	Radioactive minerals and their management.	2	1,2,5,6
4.5	Metals and other minerals – management strategies.	1	1,2
4.6	Forest resource management – NTFPs, biodiversity, medicinal plants, Sustainable Management of biological resources of Kerala.	2	1,2,5
4.7	Integrated management of wild life population.	2	1,2,5
5	Environment Planning and Management	12	1,2,3,4,5
5.1	Principles of EPM-Principles, concepts and scope of environmental planning-Ecological aspects of EPM.	2	1,2,3
5.2	Steps in Environmental planning-Identification and formulation of strategies of EPM Environmental analysis and EPM-Physical planning in relation to environmental and land use classification.	3	1,3,5
5.3	EPM for Town and urban lands, Rural and agricultural lands, Waste lands, Wetlands, Mining areas, Industrial areas, Transportation and urban planning.	3	1,3,5
5.4	Environmental hazards in Environmental Planning and Management, Types of environmental hazards- Flood, drought, landslides, earthquakes, cyclones etc.	2	1,3,4
5.5	Significance and characteristics of hazards in environmental planning and development, Opportunities and regional planning for hazard management.	2	1,3,4



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010302

Name of the Course: Environmental Planning and Resource Management

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning (Video), interactive Instruction: Active co-operative learning, Seminars, Group Assignments Authentic learning, Library work and Group discussion, Presentation by individual student/ Group representative; Field work and field visits
Assessment Types	<ol style="list-style-type: none">1. Continuous Internal Assessment (CIA) Internal test Assignments based on the theory Seminar Presentation2. Semester End examination

References

1. Abbasi, S.A. (2001) Water resources projects and their environmental impacts. Discovery publishing house, New Delhi.
2. Gangstad, I. (1990). Natural Resource management of water and land. Van Nostrand Reinhold, New York.
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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010303

Name of the Course: Laboratory Course Part 3 (Environmental Chemistry and Toxicology)

Programme	M.Sc. Environment Science and Management					
Course Name	Laboratory Course Part 3 (Environmental Chemistry and Toxicology)					
Type of Course	Core					
Course Code	ES010303					
Course summary & Justification	The course will enable students to understand the instrumental analysis. The students will get hands on training on the spectrophotometric and flame photometric equipment And the students will also get acquainted with the toxicity testing methods.					
Semester		1	Credit			5
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						24
Pre-requisite						

CO No.	Expected Course Outcome	Taxonomic Level (TL)	PSO No.
1.	To understand gravimetric, volumetric, spectroscopic analysis.	Ap, R	3,5,8
2	To understand the applications of gravimetric and volumetric methods.	Ap,R	3,5,8
3.	To understand the applications of spectroscopic and flame photometric methods.	Ap	3,5,8
4	To understand the mechanisms for adverse effects of toxicants on plants.	U, An Ap	3,5,8




MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010303

Name of the Course: Laboratory Course Part 3 (Environmental Chemistry and Toxicology)


Unit	Course Description	Hours	CO No.
1.0	Environmental Chemistry	20	1,2,3,4
1.1	Water quality- Sulphate, Nutrients (Nitrite, Nitrate, Phosphate), hexavalent chromium	10	1,2,3,4
1.2	Soil/Sediment quality- Available Nitrogen, Available Phosphorous, Available potassium	10	1,2,3,4
2.0	Environmental Toxicology	4	2,5
2.1	2.1 Toxicology tests (LC50)	4	2,5

Teaching and Learning Approach	Laboratory Practical
Assessment Types	1. Continuous Internal Assessment (CIA) Internal test Review of Book /Article Seminar Presentation Field visit report 2. Semester End examination

	<p style="text-align: center;">MSc ENVIRONMENT SCIENCE AND MANAGEMENT</p> <hr/> <p>Course code: ES010303 Name of the Course: Laboratory Course Part 3 (Environmental Chemistry and Toxicology)</p>
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1. Abbasi S A, Water quality sampling and analysis, Discovery Publishing New Delhi
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4. Christian Gary D, Analytical Chemistry, John Wiley & Sons New York
5. Conklin Alfred R. Introduction to Soil chemistry, analysis and Instrumentation, John Wiley & Sons New York
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	MSc ENVIRONMENT SCIENCE AND MANAGEMENT
	Course code: ES010303 Name of the Course: Laboratory Course Part 3 (Environmental Chemistry and Toxicology)

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010303

**Name of the Course: Laboratory Course Part 3 (Environmental
Chemistry and Toxicology)**



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010303

Name of the Course: Laboratory Course Part 3 (Environmental Chemistry and Toxicology)

References:

1. APHA (1995).Standard methods for the examination of water and wastewater. 19th edition American Public Health Association, Washington, DC
2. Abbasi S A, Water quality sampling and analysis, Discovery Publishing New Delhi
3. Christian Gary D, Analytical Chemistry, JhonWiley& Sons New York.
4. Conklin Alfred R. Introduction to Soil chemistry, analysis and Instrumentation, John Wiley & Sons New York
5. Maiti, S.K. (2003) Handbook of methods in environmental studies, Vol. 2: Air, noise, soil, overburden, solid waste and ecology. ABD Publishers, Jaipur.
6. Marc Pansu, Jacques Gautheryou, Hand book of soil analysis- Mineralogical, organic and inorganic methods, Springer, New York
7. Maria Csuros and Csaba Csuros, Environmental Sampling and Analysis for Metals, Lewis Publishers
8. Miroslav Radojevic and Vladimir N Bashkin, Practical Environmental Analysis, RSC Publishing
9. Mamata Tomar, Quality Assessment of Water and Waste Water, Lewis Publishers London
10. NEERI, Air quality monitoring, A course manual (Photostat), NEERI Nagpur.




MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES010303

Name of the Course: Laboratory Course Part 3 (Environmental Chemistry and Toxicology)

Teaching and Learning Approach	Laboratory Practicals
Assessment Types	<ol style="list-style-type: none">1. Continuous Internal Assessment (CIA) Internal test Review of Book /Article Seminar Presentation Field visit report2. Semester End examination

	MSc ENVIRONMENT SCIENCE AND MANAGEMENT
	Course code: ES800301 Name of the Course: Environmental Impact Assessment and Audit

Programme	M.Sc. Environment Science and Management					
Course Name	Environmental Impact Assessment and Audit					
Type of Course	Elective					
Course Code	ES800301					
Course summary & Justification	The course is designed to teach students about Environmental Impact Assessment (EIA) and how it applies to various sorts of development projects. Students will be familiar with the standard procedure for conducting EIA studies for various governmental and non-governmental organisations. The course will also help students to understand and carry out the environmental auditing and life cycle assessment.					
Semester		3	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						54
Pre-requisite						

CO No.	Expected Course Outcome	Taxonomic Level (TL)	PSO No.
1	Describe the global changes and sustainability	R	2,9
2.	Explain the EIA process, LCA, Environmental audit	R, U	2,6,8,9
3	Explain the role of various agencies in EIA	R	2,6,9
4.	Assess the project impacts and role of public participation in EIA	E	2,6,9



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES800301

Name of the Course: Environmental Impact Assessment and Audit

5	Do EIA using various methodologies	Ap	6,8,9
6	Do Environmental Audit	Ap	6,8,9
7	Explain the LCA and EMS	U	6,8,9
8	Understand and analyse the fundamental concepts of environmental planning and Management with various standards	U, An	1, 2, 9, 10

Unit	Course Description	Hours	CO No.
1.0	Environment Impact Assessment (EIA)	10	2,3
1.1	Introduction to EIA-EIA Guidelines and notification of Govt. of India- Procedure for reviewing Environmental Impact Analysis and statement.	4	2,3
1.2	EIA- Definition, aim, principles, concepts, purposes and Components or participants of EIA.	4	2
1.3	Types of EIA- Rapid EIA- Comprehensive EIA, Strategic Environment Assessment (SEA).	2	2
2.0	Processes of EIA and	18	2,4
2.1	Screening, Scoping, Consideration of alternatives.	2	2
2.2	Environmental Base line data collection.	2	2,4
2.3	Factors causing environmental effects in development projects-Physical, biological and other factors.	2	4
2.4	Identification and Prediction of Impacts.	2	4



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES800301

Name of the Course: Environmental Impact Assessment and Audit

2.5	Types of Impact-Primary & Secondary-Short Term & long term-Reversible and Non reversible-Positive and Negative impacts.	2	4
2.6	Evaluation and assessment of impact-Assessment of effects on -Human beings, buildings and man-made features.	2	2,4
2.7	Evaluation and assessment of impact-Assessment of effects on Flora, fauna and geology-Land, water, air, and climate.	3	2, 4
2.8	Mitigation Measures, Public Consultation and Participation, Environment Impact Statement Preparation.	3	2,4
3.0	Methods of EIA	10	4,5
3.1	Matrices Method (Leopold Matrix).	2	4,5
3.2	Networks Method And Overlays Method.	2	4,5
3.3	Index Method-Simulation Mode and Cost Benefit Analysis.	2	4,5
3.4	Smith Study-Warner and Preston Study.	2	4,5
3.5	Terms of Reference (TOR.	2	2,4
4.0	Environment Management Plans (EMP)	6	2,6,4,5
4.1	Objectives and Components of Environment Management Plans (EMP).	2	4,5
4.2	Environmental Monitoring-Principles & types of monitoring.	2	2, 6
4.3	Environmental auditing-Guidelines for Auditing-Objectives, scope and benefits, Steps in Environmental Auditing.	2	2, 6
4.4	Different types of Environmental Auditing.	4	2,6
5.0	Environmental Management Systems (EMS) and EIA case studies	10	2,4,7,8
5.1	Environmental Management Systems (EMS)- Benefits of EMS-International Standard Organization and ISO 14001.	4	2,7,8
5.2	Life Cycle Assessment.	2	2,7,8
5.3	Case studies of EIA-Nuclear Power plants-Hydroelectric Projects-Thermal power plants-Mining projects.-Transportation projects-industries-development projects Preparation of checklist for various stages of projects (examples only)	4	2,4



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES800301

Name of the Course: Environmental Impact Assessment and Audit

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Authentic learning, case-based learning, collaborative learning, seminar, group activities.
Assessment Types	Mode of Assessment 4. Continuous Internal Assessment (CIA) 5. Seminar Presentation – 6. Assignments B. Semester End examination



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES800301

Name of the Course: Environmental Impact Assessment and Audit

1. Abbasi, S.A. (2001). Water Resources Projects and their Environmental Impacts *Discovery Publishing House, New Delhi*
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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES800302

Name of the Course: Environmental Economics and Sustainable Development

Programme	M.Sc. Environment Science and Management					
Course Name	Environmental Economics and Sustainable Development					
Type of Course	Elective					
Course Code	ES800302					
Course summary & Justification	The purpose of this course is to provide students with a basic understanding of the cost of environmental growth and environmental degradation, sustainable policy approach to check environmental degradation, sustainable development approaches, green accounting, methods of environmental valuation					
Semester		3	Credit			3
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						54
Pre-requisite						

CO No.	<i>Expected Course Outcome</i>	Taxonomic Level (TL)	PSO No.
1	Explain the basics concepts and theories of environmental economics and sustainable development	U	1,2
2	Describe the environmental problems and its impacts	C	2
3	Understand resource economics	U	8
4	To synthesize the new field of environment and economics in a holistic approach towards solution of environmental problems	Ap	1,2



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES800302

Name of the Course: Environmental Economics and Sustainable Development

5	Understand the importance of environmental education in attaining Sustainable Development	U	1,2
6	Identify methods, tools, and techniques for sustainability	Ap	1,7,9
7	Discuss various industrial developments and its relation with environment	C	1,2

Unit	Course Description	Hours	CO No.
1.0	Environmental Economics	18	1,2,3,4
1.1	From economics to Environmental Economics	1	1
1.2	Definition and scope of Environmental Economics	2	1
1.3	Externalities- types and importance problem of second best and solution to Externality - Market failure - Solution.	3	1,3
1.4	Properties of public goods - Coase theorem-Common pool resources - Tragedy of commons	2	1,3,4
1.5	Basic theories of EE - Material Balance Approach and law of entropy.	1	1,3
1.6	Welfare aspects of Environmental Economics - Principle of maximum social welfare - Pareto Criterion	3	1,3,4
1.7	Environment Cost- Benefit Analysis (CBA) - Introduction and concept of CBA ; Efficiency in pollution control ; Environmental pollution-control, private cost and social cost , Social CBA - Application of CBA	4	1,3,4
1.8	Environmental cost of Economic growth	2	1,2,4
2.0	Resource Economics	12	1,2,3,4



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES800302

Name of the Course: Environmental Economics and Sustainable Development

2.1	Economics of Natural Resources-Theories of natural resource use, natural resource scarcity and indicators of scarcity – Role of natural resources on economic development.	3	1,2
2.2	Resource Pricing Techniques; Green Accounting	2	3,4
2.3	Consumption – consumer behavior – theories of consumption, over consumption.	2	3,4
2.4	Income – income inequalities – extent of poverty, poverty and environment (at the global and national levels) HDI – new concepts of development.	2	3,4
2.5	Population as resource - Size and density of population, population. Concepts of overpopulation and over consumption-North Vs South. Demonstration effects, Globalization and new strategy of marketing	3	1,2,3
3.0	Industrial development & Environment	6	1,2,7
3.1	Traditional Industries- cottage and small scale production, marketing and natural resource use techniques and rural setup	1	1,7
3.2	Modern large scale industries- nature process and techniques of production- impact on environment	1	1,7
3.3	Problems related to modernization and urbanization-pollution, health etc	2	1,2,7
3.4	Green Policies of industrialization – Green technology, Green Productivity and Green Marketing etc	2	1
4.0	Sustainable Development	12	1,2,3,4,6
4.1	From problems to crises- Depletion of resources and degradation of environment	2	1,2
4.2	From modern development to Sustainable Development	1	1,3,4,6
4.3	Definition, World Commission on Environmental Development (WCED)	1	1,6
4.4	Indicators of SD, Criteria – Strategies for measurement of SD,	2	1,6
4.5	Sustainable human development index and Sustainability pillars	1	1,6
4.6	Gandhian model of SD	2	1,6
4.7	Definition, Importance of sustainable production and consumption	3	1,6
5.0	Educations for Environment and Sustainable Development	6	1,5,6
5.1	Environmental education	2	1,5
5.2	Education for Sustainable Development	2	1,5,6



MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES800302

Name of the Course: Environmental Economics and Sustainable Development

5.3	Eco – School	2	1,5,6
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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES800302

Name of the Course: Environmental Economics and Sustainable Development

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning (Video), interactive Instruction:, Active co-operative learning, Seminars, Group Assignments Authentic learning, , Library work and Group discussion, Presentation by individual student/ Group representative; Field work and field visits
Assessment Types	1. Continuous Internal Assessment (CIA) Internal test Assignments based on the theory Seminar Presentation 2. Semester End examination

References

1. Abhijit Dutta et.al (2005), Environmental Economics, APH Publishing Corporation, New Delhi
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MSc ENVIRONMENT SCIENCE AND MANAGEMENT


Course code: ES800302

Name of the Course: Environmental Economics and Sustainable Development

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SEMESTER 4

	MSc ENVIRONMENT SCIENCE AND MANAGEMENT
	Course code: ES010401 Name of the Course: Environmental Biotechnology and Waste Management

Programme	M.Sc.Environment Science and Management					
CourseName	Environmental Biotechnology and Waste Management					
TypeofCourse	Core					
CourseCode	ES010401					
Coursesummary &Justification	This course is designed understand various applications of biotechnology in solving environment problems such as pollution control, remediation of polluted sites etc.					
Semester		1	Credit			4
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						40
Pre-requisite						

CO No.	Expected Course Outcome	Taxonomic Level(TL)	PSO No.
1.	Describe the basics of molecular biology and environmental biotechnology and its relevance	R	1,5
2	Understand the techniques involving Biotechnology applicable to combat air, soil and water pollution. To assess the efficiency of different wastewater treatment techniques.	U, E	3,5
3.	Analyse and compile different methods of treatment of solid wastes and solid waste management steps	A, C	5
4.	Understand the significance of 3 R's and concept of zero waste	U	10
5	Identify and comprehensively discuss the benefits and drawbacks of both conventional and ecological sanitation.	Ap	10



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Course code: ES010401

Name of the Course: Environmental Biotechnology and Waste Management

Unit	Course Description	Hours	CONo.
1	Introduction; Water and Wastewater Treatment	7	
1.1	Cell: Structure and function – Prokaryotes and Eukaryotes. Nucleic Acids, Central dogma - Protein synthesis Recombinant DNA (r DNA) techniques.	3	1
1.2	Fermentation Technology.	1	1
1.3	Plant tissue culture techniques.	2	1
1.4	Environmental Biotechnology: an overview.	1	1
2	Biotechnological Methods in Pollution Control	13	
2.1	Air pollution control: Bio-desulphurization of coal; Green belts.	3	2
2.2	Water pollution control: Aerobic and Anaerobic wastewater treatment Systems.-microbial and algal fuel cells.	2	2
2.3	Bioremediation: Soil / land contaminated with oil spills, PCBs, PAHs.	2	2,3
2.4	Bioremediation technology.	3	2,3
2.5	Phytoremediation.	1	2,3
2.6	Biosensors: Concept and principle.	1	1
2.7	Biosensors for environmental monitoring.	1	1
3	Emerging Trends in Environmental Biotechnology	11	
3.1	Agro-biotechnology: Plant genetic engineering – role of r DNA technique; transgenic plants - GM crops.	2	1
3.2	Bio-pesticides and Bio-fertilizers.	1	1,2
3.3	Phyto-reactors- Plants used to produce genetically engineered products.	2	2
3.4	Ecological Engineering Aquatic macrophyte based wastewater treatment systems (AMS)- constructed/ artificial wetlands.	3	3
3.5	Nutrient Film Technique (NFT)- Overland flow irrigation of treated effluents.	2	2,3
3.6	Biodegradable plastics– PHBs and PHAs.	1	2,3
4	Solid Waste Management	10	




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Course code: ES010401

Name of the Course: Environmental Biotechnology and Waste Management

4.1	Municipal Solid Waste: Types, sources , properties and impacts.	1	3
4.2	Techniques for treatment / processing: Concept of three R's, Thermal processes – incineration, Pyrolysis, RDF. Biological processes – Anaerobic digestion, Composting and vermicomposting.	4	4
4.3	Disposal techniques: Landfills – design, operation and management.	2	3,4
4.4	Hazardous waste management.	1	3,4
4.5	Concept of Zero waste.	2	4
5	Ecosanitation	9	
5.1	Conventional sanitation: a linear flow system – its limitations.	2	5
5.2	Eco San–Circular flow and closing the loop: concept, goals and advantages.	2	5
5.3	Eco San for human night soil management: Dry Toilets, Composting Toilets UDDT, UDFT.	2	5
5.4	Grey water management.	2	5
5.5	Eco San - Human Health and Food Security.	1	5

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	Course code: ES010401 Name of the Course: Environmental Biotechnology and Waste Management

Teaching and Learning Approach	Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning(Video), interactive Instruction:, Active co-operative learning, Seminars, Group Assignments Authentic learning, Librarywork and Group discussion, Presentation by individual student/ Group representative.
AssessmentTypes	<ol style="list-style-type: none"> 1. Continuous Internal Assessment(CIA) <ul style="list-style-type: none"> • Internal Test • Assignments based on the theory • Seminar Presentation 2. Semester End Examination

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MSc ENVIRONMENT SCIENCE AND MANAGEMENT

Course code: ES800403

Name of the Course: Disaster Management

Programme	M.Sc. Environment Science and Management					
Course Name	Disaster Management					
Type of Course	Elective					
Course Code	ES800403					
Course summary & Justification	The course deals with the major natural and anthropogenic disasters its environmental constraints. The course also elaborates on the basic disaster management strategies employed worldwide.					
Semester		4	Credit			3
Course Details	Learning approach	Lecture	Tutorial	Practical	Others	Total hrs
						60
Pre-requisite						

CO No.	Expected Course Outcome	Taxonomic Level (TL)	PSO No.
1	Explain the relation between Earth's processes and disasters	U	1, 2
2	Distinguish various types and causative factors of disasters	An	1, 2
3	Illustrate the key concepts of disaster management	U	2
4	Analyse the International disaster management system	An	6
5	Assess the disaster management strategies in India	E	9, 10



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Course code: ES800403

Name of the Course: Disaster Management

Unit	Course Description	Hours	CO No.
1.0	Introduction		
1.1	Introduction to Disaster Management (Concepts and terminologies), Distinguishing between an emergency and a disaster situation.	4	3
1.2	Types of natural disasters (Typology and classification of disasters- HPC classification, 5 class and 31 types).	4	1,2
1.3	Types of non natural/man made disasters .	2	1,2
1.4	Implications of disasters on environment (disasters and development).	2	2
1.5	Environmental Planning and management for environmental hazards (resilience and capacity development).	2	3
2.0	Introduction, Disaster Management Cycle		
2.1	Introduction, Disaster Management Cycle (The four phase approach in modern emergency management- Mitigation, Preparedness, Response and Recovery).	2	3
2.2	Disaster Mitigation .	2	3
2.3	Mitigation Aspects:Hazard identification and vulnerability analysis (Risk assessment),Mitigation measures (Structural and non-structural).	2	3
2.4	Disaster Preparedness.	2	3
2.5	Disaster Risk Reduction (DRR).	2	3
2.6	The Emergency Operation Plan (EOP).	2	3
2.7	Disaster Response and Modern methods of disaster response.	2	3
2.8	The Recovery plans.	2	3
3.0	The Disaster Education and Public Awareness	2	3
3.1	Community-based Initiatives-CBDP(Community Based Disaster Preparedness).	2	3, 5



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Name of the Course: Disaster Management

3.2	Community-based Initiatives-CBDRM(Community Based Disaster Risk Management).	2	3,4
3.3	Community-based Initiatives - CBEWS(Community Based Emergency Warning System).	2	3,4
3.4	Stakeholders' Roles and Responsibilities, Categories of stakeholders-Government, Non-Government Organizations (NGOs),Regional and International Organizations-Donor Agencies, Island Councils / Local Government, Community Workers, National and Local Disaster Managers, Trainers, Policy Makers and Grass-roots people.	4	3,4,5
3.5	Advantages and Disadvantages of the Community-Based Approach.	2	3,4
3.6	Duties of Response Personnel, Pre-Disaster Mitigation Plan.	2	3,4,5
3.7	Hazardous Materials-Ways of storing and safely handling hazardous materials-Opportunities and regional planning for hazard management.	2	3,4,5
4.0	Physical and Scio-economic Impacts of Disasters		
4.1	The Role of Technology in Disaster Management-Geographic Information Systems (GIS) and Disaster Management.	2	3
4.2	The Role of Media in Disaster Management.	2	3,4
4.3	Disaster Associated Health issues - Emergency Health Services in Disasters (Public health sector and disaster management)-Infrastructure and procedures in accessing emergency situations.	2	3,4
4.4	Communicable diseases common in disaster situations-Monitoring and Evaluation of Communicable Diseases Control Programme.	3	3,4,5
4.5	Disaster and Development-The impact of disasters on development programmes-Vulnerabilities caused by development.	3	3,4,5



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Course code: ES800403

Name of the Course: Disaster Management

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Authentic learning, case-based learning, collaborative learning, seminar, group activities.
Assessment Types	Mode of Assessment 4. Continuous Internal Assessment (CIA) 5. Seminar Presentation – 6. Assignments B. Semester End examination



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Course code: ES800403

Name of the Course: Disaster Management

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