

M.Sc. ENVIRONMENTAL SCIENCE (Self Financing Course)
(Two Year) Four Semester Programme under Choice Based Credit System
(Applicable for students admitted in July, 2018 & onwards)

Semester I:	Max
Marks	
Paper I: The Earth and its Environment	100 (04 credits)
Paper II: Biotic community and Dynamics	100 (04 credits)
Paper III: Biotic responses I	100 (04 credits)
Paper IV: Biotic responses II	100 (04 credits)
Practical: Based on Papers I – IV	<u>100</u> (04 credits)
Total	<u>500</u> (20 credits)

Semester II:

Paper V: Abiotic Natural resources	100 (04 credits)
Paper VI: Biotechnology and Agriculture	100 (04 credits)
Paper VII: Biotic resources	100 (04 credits)
Paper VIII: Air Pollution	100 (04 credits)
Project: Based on Papers V –VIII	<u>100</u> (04 credits)
Total	<u>500</u> (20 credits)

Semester III:

Paper I: Water and Soil Pollution	100 (04 credits)
Paper II: Radiation, Noise, Industrial and Thermal Pollution	100 (04 credits)
Paper III: Environmental Toxicology	100 (04 credits)
Paper IV: Environmental policy and management	100 (04 credits)
Practical: Based on Papers I – IV & Academic Tour	<u>100</u> (04 credits)
Total	<u>500</u> (20 credits)

Semester IV:

Project Dissertation	300 (12 credits)
Project Presentation	100 (04 credits)
Project Viva-Voce	<u>100</u> (04 credits)
Total	<u>500</u> (20 credits)

Total Maximum Marks for all 4 Semesters:	2000 (80 credits)
+ 1 Elective Course/ semester: 03 credits - 100 marks	<u>400</u> (12 credits)
	Total 2400 (92 credits)

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - I)
PAPER - I
THE EARTH AND ITS ENVIRONMENT: 05 Credits
(w.e.f. July 2018)

Total: 40 Hours

Unit - I : 01 Credit	Hrs
Definition, principle and relevance of Environmental Science	2
Biosphere, its resources and diversification	3
Atmosphere, atmospheric layers	3
Types of winds and inversion	2
Unit - II: 01 Credit	
Lithosphere : Basic concept : Land forms, Rocks and their classes	4
Origin and development and soils , physico –chemical properties of soil	4
Soil profile: O,A,B,C, R horizons	2
Unit - III: 01 Credit	
Hydrosphere, Watershed, Snow & Ice, Ground water	4
Definition, structure, Precipitation, precipitation index, Hydrological cycle, run-off formation, flow in channels, lake storage.	4
Physio-chemical properties of fresh water and marine environment.	2
Unit - IV : 01 Credit	
Energy: non-renewable and renewable energy sources National and Global Energy Scenarios, potentials and limitations of conventional energy sources.	4
Energy Conservation: Efficiency in production, transportation and utilization of energy	4
Future sources of Energy : Energy crops, Hydrogen, Alcohol, Biodiesel, Fuel cells	2
Practical based on unit I –IV : 01 Credit	

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - I)
PAPER - II
BIOTIC COMMUNITY AND DYNAMICS: 05 Credits
(w.e.f. July 2018)

Total: 40 Hours

Unit - I : 01 Credit	Hrs
Ecosystem: Concept of ecosystem, composition, production, consumption, decomposition, biogeochemical cycles	3
Ecosystem function: Energy flow, energy budget, food chains & food webs, ecological pyramids and biotic interactions	3
Ecosystem disturbance: resilience, decline	2
Ecosystem Modeling: Concept, basic categories of models their architecture , parameter estimation and sensitivity analysis	2
Unit - II: 01 Credit	
Population Ecology: Definition, population, characteristics (Population size and density, dispersion, age structure, natality, mortality) , population dynamics and population regulation	6
Life Tables: Probability of surviving any particular year of age, remaining life expectancy for people at different ages	4
Unit - III: 01 Credit	
Community Ecology: Definition, structure and its composition	3
Community Organization and characteristics	3
Succession, Types of succession Trends of succession and community retrogression, general process of succession, climax community	4
Unit - IV: 01 Credit	
Ecological Equivalent	3
Ecological Niche	3
Ecotone and concept of Edge effect	4
Practical based on unit I –IV: 01 Credit	

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - I)
PAPER - III
BIOTIC RESPONSES – I: 05 Credits
(w.e.f. July 2018)

Total: 40 Hours

Unit - I: 01 Credit	Hrs
Habitat: Definition, classification and types lentic and lotic fresh water and marine habitats including division of sea (Intertidal, pelagic, abyssal, benthic)	4
Physico-chemical characteristics of fresh water and marine habitats	3
Disturbances and its impact on aquatic habitats	3
Unit - II: 02 Credit	
Ecological adaptations in plants: xerophytes, mesophytes, halophytes, psammophytes, oxalophytes	4
Morphological, physiological and anatomical features of aquatic and ecologically modified plants	5
Phytoplanktons of fresh and marine water environment	1
Unit - III: 01 Credit	
Wetlands, major wetlands of India and abroad, flora of wetlands, Ramsar sites	4
Degradation and restoration of wetland Ecosystems	3
Ecological engineering, Biological remediation practices for pollution abatement of wetlands using constructed wetlands.	3
Unit - IV: 01 Credit	
Faunal composition and aquatic habitats (Freshwater, marine and natural wetlands)	5
Nektons, Benthos & Zoo planktons	5
Practical based on unit I –IV: 01 Credit	

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - I)
PAPER - IV
BIOTIC RESPONSES – II: 05 Credits
(w.e.f. July 2018)

Total: 40 Hours

Unit – I: 01 Credit	Hrs
Terrestrial habitat and its Characteristics	3
Biogeographical realms.	3
Biomes (Tundra and Antarctica, high altitude and alpine, forests, tropical savana, grasslands and desert).	4
Unit - II: 01 Credit	
Biogeographical distribution of animals : Principles and concepts	4
Wallace line, Allen’s rule, Bergmann’s rule, Modern application of biogeography	4
Paleobiogeography	2
Unit - III: 01 Credit	
Phytogeography and vegetational zones	4
Interpretive Phytogeography , principals of plant distribution	4
Important forest types of India	2
Unit - IV: 01 Credit	
Biotic responses to Environmental stress (Drought, salinity, heat, UV, cold, nutrients and pathogens stress)	4
Concept of signaling molecules and mechanism of signal transduction, stress induced heat shock proteins	4
Cellular responses to Heat, Drought & salinity stress responses.	2
Practical based on unit I –IV: 01 Credit	

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - II)
PAPER - V
ABIOTIC NATURAL RESOURCES : 04 Credits
(w.e.f. July 2018)
Total: 40 Hours

Unit - I: 01 Credit	Hrs
Abiotic Natural Resources, status , classification and strategies for sustainable exploitation and development, management of water and land resources	4
Geological and geographical distribution of natural resources	3
Management of water and land resources	3
Unit - II: 01 Credit	
Geological and geographical distribution of mineral resources	2
Mineral types and their importance, major Environmental issues, classification properties of rocks	4
Metallic and nonmetallic mineral deposits	1
Mine waste disposal and related problems, impact of mining activities on health, Restoration of mined area	3
Unit - III: 01 Credit	
Water management strategies	2
Rain water harvesting	2
Artificial recharge of ground waste water	2
Biological treatment of waste water	2
Recycling of domestic and industrial waste waters	1
Water conservation	1
Unit - IV: 01 Credit	
Land Management : Law use classification, degraded lands	4
Soil erosion and factors affecting soil erosion	3
Principles and methodologies for soil conservation and restoration of degraded land	3

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - II)
PAPER - VI
BIOTECHNOLOGY AND AGRICULTURE: 04 Credits
(w.e.f. July 2018)

Total: 40 Hours

Unit - I: 01 Credit	Hrs
Agriculture practices in India, kinds of farm produce, cereal and cash crops of India	3
Constraints in agriculture and their suggested remedies, Main threats to sustainable agriculture	3
Bioconversion of agriculture waste into useful substances: Vermicomposting, Paper making, Biogas generation	4
Unit - II: 01 Credit	
GM crops in India	3
Environmental concerns about GM crops.	3
The regulation of GM crops and products	2
Greener genetic engineering	2
Unit - III: 01 Credit	
Organic farming	4
Bio fertilizers	4
Biopesticides; Slow release fertilizers and pesticides	2
Unit - IV: 01 Credit	
Role of tissue culture in agriculture	2
Floriculture	1
Intellectual property rights and Patent	4
Gene pool protection to conserve indigenous species	3

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - II)

PAPER - VII

BIOTIC RESOURCES : 04 Credits

(w.e.f. July 2018)

Total: 40Hours

Unit - I: 01 Credit	Hrs
Global & National forest cover, their importance , role in maintaining Environment	3
Reasons for Depletion of forest cover, conservation of forests, Afforestation of degraded waste lands and green designing	4
Forests resources management, National Forest policy and forest protection act	3
Unit - II: 01 Credit	
Sustainable and eco -friendly development and exploitation of forest resources, Social & Agro forestry	3
Aquaculture, Fish farming Types, problems	3
Silviculture	2
Bee farming	2
Unit - III: 01 Credit	
Wildlife and its importance, diversity trends and gradients management, Biodiversity bioinformatics and biodiversity prospecting , Role of NGOs in wild life management	3
Mega diversity zones and hot spots , threats to wild life diversity, major causes, extinctions	3
Social factors affecting wild life depletion , vulnerability of species to extinction, IUCN threat categories, red data list, biodiversity data bases, conservational efforts, wild life protection act	2
Cost valuation of biodiversity in Environmental terms, Earth summit and follow up action and convention on biodiversity Basic concept of sustainable development & Social Environmental issues related to wild life	2
Unit - IV : 01 Credit	
Biosphere reserves , National Parks, wild life sanctuaries in India	3
Ecotourism, concept of eco planning for eco friendly development	3
Tribals and their role in the wild life conservation, Role of sacred grooves in biodiversity conservation, Community Participation and capacity building programmes for sustainable exploitation of wild life resources and for socio- economic development of tribals.	2

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - II)
PAPER - VIII
AIR POLLUTION : 05 Credits
(w.e.f. July 2018)

Total: 40 Hours

Unit - I: 01 Credit	Hrs
Environmental pollution, basis and challenges of Environmental pollution and control measures	5
Types of Environmental pollutant including new emerging pollutants (Nano materials, antimicrobial agents)	5
Unit - II: 01 Credit	
Air pollution, types and sources,	2
Particulate air pollutants, Pollution due to Dust, Carbon, Flyash, Asbestos, smog – sources and effects,	4
Non particulate air pollutants, environmental levels and effects of common non-particulate air pollutants viz, Gases – SO ₂ , CO ₂ , CO, CH ₄ Nitrogen oxides etc., Management of particulate nonparticulate air pollutants	4
Unit - III: 01 Credit	
Global warming, climate change, acid rain	3
Green house gases and impact of enhanced green house effect on Environment	3
Ozone layer depletion	2
Vehicular pollutants and their impact on environment	2
Unit - IV : 01 Credit	
Dust and pollen allergies, protection and control measures.	5
Air borne microbes and their health hazards	5
Practical based on Unit 1-IV : 01 Credit	

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - III)
PAPER - I
WATER & SOIL POLLUTION: 05 Credits
(w.e.f. July 2018)

Total: 40 Hours

Unit - I: 01 Credit	Hrs
Water Pollution: Types (biodegradable and nondegradable), Major Sources, environmental levels, effects on plants and animals.	4
Physico-chemical properties of freshwater and marine water resources	4
Microbial water quality assessment for identifying water borne diseases and their health hazards.	2
Unit - II: 01 Credit	
Water quality standards, water sampling techniques	4
Management of water pollutants: Industrial, domestic, agricultural run off I: Industrial and domestic waste water treatment methods, ETP design and function	4
II: Bioremediation techniques: Phytoremediation, constructed wetlands for management of polluted areas, bacterial degradation of pollutants	2
Unit - III: 01 Credit	
Ground water pollution, major sources its impact on plants and human life.	3
Physico-chemical and microbiological properties of ground water	3
Flouride pollution of ground water and its management.	2
Ground water Salinity: Sources, spread and impacts of ground water salinity on humans and agricultural crops.	2
Unit - IV: 01 Credit	
Soil Pollution, Definition and Types of soil pollutants.	5
Bioremediation of soil pollutants.	5
Practical based on Unit I to IV: 01 Credit	

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - III)
PAPER - II
RADIATION, NOISE, INDUSTRIAL AND THERMAL POLLUTION : 05 Credits
(w.e.f. July 2018)

Total: 40Hours

Unit - I: 01 Credit	Hrs
Radiation Pollution: Sources, environmental levels and effects of radiation pollution on environment and organisms.	4
Radioactive fall outs. Protective measures.	4
Bio indicators of radio nucleotides and radiation hazards	2
Unit - II: 01 Credit	
Noise pollution: Definition and units of noise, tolerable and hazardous limits of noise.	4
Effects of noise pollution on human health, Control measures.	4
Role of plants in management of noise pollution	2
Unit - III: 01 Credit	
Industrial Pollution, Definition and Types of Industrial Pollutants.	4
Sources and effects of Industrial wastes and its impact on environment.	4
Management of Industrial Pollutions	2
Unit - IV: 01 Credit	
Thermal pollution: Its source simpacts on flora, fauna and human beings, its control measures.	5
Solid waste: types, sources, solid waste disposal, solid waste treatment plant and Management of landfill sites through plantation	5
Practical based on Unit I to IV: 01 Credit	

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - III)
PAPER – III
ENVIRONMENTAL TOXICOLOGY: 05 Credits
(w.e.f. July 2018)

Total: 40Hours

Unit - I: 01 Credit	Hrs
Common hazardous chemicals in the environment and their classification	3
Mutagenic and carcinogenic agents (Polynuclear aromatic hydrocarbons and nitrosamines, organic solvents, alcohol, carbon tetra chloride,	3
Anaesthetics (chloroform, ether, xylocaine). Tobacco chewing and smoking.	1
Toxicity tests: Acute, subacute, subchronic and chronic toxicity tests. Skin and eye tests; behavioural, neurotoxic, reproductive, mutagenic and carcinogenic tests.	3
Unit - II: 01 Credit	
Principles of biotransformation, Sites of biotransformation.	3
Biotransformation enzymes and biotransformation reactions for gaseous toxicants (CO ₂ , CO SO ₂ and nitrogen oxides), chemical contaminants (Dioxins and dibenzofurans).	3
Xenobiotics , routes of exposures,	1
Biotic and environmental factors effecting toxicity and absorption, their transport across bio-membranes, biotransformation and excretion	2
Principle of antidotal therapy	1
Unit - III: 01 Credit	
Systemic toxicity : Neurotoxicity, hepatotoxicity, and immunotoxicity, Cardiovascular toxicity, respiratory dysfunction and hypersensitivity.	4
Toxicity of chemical pesticides: Their types, uses and harmful effects to plants and humans	2
Heavy metals and metalloids (Arsenic, Cadmium, Lead, Fluoride & Mercury), their sources, toxic effects on plants, animals and humans and control measures.	2
Microbes as contaminant of food , microbial toxins and their toxicity to humans, biosensors for microbial contamination detection in food.	2
Unit - IV: 01 Credit	
Biostatistics and its application in toxicological studies, statistical terms and symbols, samples and sampling, data and data presentation (tabular, graphical and diagrammatic)	3
Measures of Central tendency (mean, mode, median)	2
Measures of dispersion: range, mean deviation, standard deviation, variance	2.5
Correlation and regression analysis	1
t- test, chi square test, one way and two way Analysis of variance	1.5
Practical based on Units I-IV: 01 Credit	

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - III)
PAPER – IV
ENVIRONMENTAL POLICY & MANAGEMENT : 05 Credits
(w.e.f. July 2018)

Total: 40Hours

Unit - I: 01 Credit	Hrs
Environmental priorities in India, natural, accidental and manmade environmental disasters and their effects, management of environmental disasters, solid waste, biomedical and e- waste management, Treatment of domestic and industrial wastewater,	4
National efforts for environmental management, Environmental planning for sustainable development	1
Objective and guiding principles of environmental education. Public awareness programmes for Environmental quality maintenance	2
National movements for conservation and protection of environment	3
Unit - II: 01 Credit	
Remote Sensing: Sensors and plate forms, image geometry, scale and resolution, visual interpretation, principles of digital image processing	3
Application of remote sensing in environmental pollutant identification and environmental quality management	3
Concepts of geographical information system	2
Application of remote sensing in hazards identification for extreme metrological events: wave and tsunami effects, tropical cyclones, landslides and avalanches, forecasting of earthquakes, precipitation, el-nino, melting of ice sheets	2
Unit - III: 01 Credit	
Emergence of international environmental laws, fundamental principles and application of international environmental law and understanding climate change and process.	4
International Environmental protection laws (right to environment and human right, international humanitarian law and environment conflict management, international conventions and treaties)	4
Environmental protection laws in India for pollution control, natural resources conservation and management and their enforcement by key national governmental and nongovernmental organizations and agencies.	2
Unit - IV: 01 Credit	
Environment impact assessment :State environmental appraisal committee and state environmental Assessment authority and their role in environmental clearance of projects	4
Environmental Impact Statement and Environmental Management Plan. EIA guidelines 1994	4
Eco audit	2
Practical based on Units I-IV: 01 Credit	

M.Sc. ENVIRONMENTAL SCIENCE (SEMESTER - IV)
(w.e.f. July 2018)

EXTERNAL PROJECT

Duration: 3-4 months

No. of Credits: 20

Project work for Semester IV will be carried out by the students in various recognized/established labs of other Universities, of Institutes under CSIR, ICAR, DST, EIA Labs and of Industry etc. (to be arranged by the students themselves, including whatever expenses become due in this regard).