

M.Sc. ENVIRONMENTAL SCIENCE
Semester- FIRST **Course – I 2020-21**
COURSE TITLE- Community & Ecosystem Concept

Unit – I

Ecology: Aut & Syn – ecology, environment, ecosystem, environmental science, history & scope.
Community concept, continuum & community type hypothesis.
Analytical and synthetic characters of community,
Ecotone and edge effect,
Method of studying a community,

Unit – II

Niche concept: Types, difference between niche and habitat, growth of niche concept
Overlapping niche and niche segregation, ecological equivalents
Species diversity, measurement of species diversity,
Simpson's and Shanon – Wever Index., Similarity Index

Unit – III

Development and evolution of ecosystem.
Strategy of ecosystem, development in terrestrial and aquatic habitat.
Mechanism of succession, facilitation, tolerance and inhibition.
Types of Succession, effect of climatic condition on rate of succession

Unit – IV

Changes in ecosystem properties during succession,
Concept of climax, monocl原因, polyclimax, and information theories,
Ecological disturbance, natural and anthropogenic causes, resilience & resistance stability

Unit - V

Concept of energy and thermodynamics laws,
Ecosystem energetics, trophic structure, energy flow pathways and models,
Ecological pyramids food chain and food web, types of ecological pyramids
Relationship between energy flow and mineral cycling,
Concept of productivity, primary and secondary productivity,
Methods of measuring primary and secondary productivity.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- FIRST Course – II 2020-21
COURSE TITLE- Ecological factors and biomes

Unit – I

Ecological factors, Liebig's law of limiting factors and Shelford's law of tolerance.
Blackman's law of limiting factors,
Light as an ecological factor,
Temperature as an ecological factor,
Precipitation as an ecological factor,
Humidity as an ecological factor.

Unit – II

Wind as an ecological factor.
Fire as an ecological factor.
Biotic factor.
Man as an ecological factor.

Unit – III

Process of origin of soil ,Weathering of rocks,
Physical, chemical and biological agencies involved in weathering of rocks,
Pedogenesis factors and process.

Unit – IV

Components of soil, mineral matter, organic matter, soil water, soil air, soil organisms (macro and micro).
Soil types of world & Madhya Pradesh,
Soil erosion, types and causes of erosion,
Conservation of soil, Reclamation of soil. Soil solarization

Unit – V

Biogeographical realms.
Biomes of the world – Tundra Biome, Temperate Evergreen forest, Temperate forest, tropical evergreen and biome, desert biome.
Floristic regions of M.P. and India.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- FIRST Course – III 2020-21
COURSE TITLE- Environmental pollution-I

Unit – I

Concept of pollution, types of pollutants,
Sources of pollutants: Point, non point,
Air pollution, sources and types of air pollutants,
Harmful effects of air pollutants, CO, CO₂, SO₂, Nox and particulate matter,
Control of gaseous and particulate pollutants.

Unit – II

Environmental monitoring, objective, benefits and classification,
Air quality monitoring, devices for air quality monitoring,
Air quality standards,
Global air pollution problems, Green house effect, Acid rain and Ozone layer depletion.

Unit – III

Water pollution and water pollutants,
Types of water pollutants,
Harmful effects of water pollution,
Control of water pollution,
Typical industrial effluent treatment and sewage treatment plants.

Unit – IV

Water quality standards – needs,
Drinking water quality by different agencies and industrial effluent discharge standards,
Water quality index, sequential comparison index,
Biological monitoring general idea,
Bioaccumulation,
Biological magnification of persistent pollutant.

Unit – V

Soil pollution sources,
Types of soil pollutants, effects and control of soil pollution,
Solid wastes, classification,
Sources and types of solid wastes,
Methods of disposal of solid wastes.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- FIRST **Course – IV 2020-21**
COURSE TITLE- Environmental microbiology

Unit – I

Classification of microorganism- Introduction, Haeckel's three kingdom concept, Whittakar's five kingdom concept, current six kingdoms, Classification & salient features of bacteria according to Bergey's manual of determinative & systemic bacteriology.

Unit – II

Air microbiology:-
Sources and types of microorganism in air,
Allergic disorder by air micro flora,
Collection & enumeration of air micro flora.

Unit – III

Soil microorganism, Biogeochemical cycles with reference to micro-organisms
Rhizosphere, Rhizoplane, phyllosphere, phylloplane,
Mycorrhiza- Ecto, Endo, Ectendomycorrhiza, VAM
Cyanobacteria,

Unit – IV

Interaction among soil organisms Neutral, positive interactions,
Biological nitrogen fixation- symbiotic and non symbiotic,
Mechanism of N₂ fixation.

Unit – V

Water microorganisms, pathogenic & non pathogenic
Microbial analysis of water
Water purification
Brief account of water borne diseases & preventive measures.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- SECOND **Course – V**
COURSE TITLE- Habitat ecology 2020-21

Unit – I

Fate of matter in the ecosystem, nutrient exchange and nutrient cycling,
Biogeographical cycles (sedimentary and gaseous).
Carbon, Nitrogen, Sulphur and Phosphorus cycle,
Recycling pathways, decomposition

Unit – II

Fresh water environments, types and limiting factors,
Ecological classification of fresh water organisms,
Lentic and lotic communities and longitudinal zonation in system,
Aquatic adaptation in freshwater plants and animals,

Unit – III

Marine ecology
Physiochemical characteristics of marine habitat,
Zonation in marine system,
Marine communities and estuaries,
Thermal stratification & oxygen distribution curves,
Aquatic adaptations in marine plants and animals.

Unit – IV

Terrestrial ecosystems
Physicochemical nature of terrestrial ecosystems and their comparison with aquatic ecosystem,
Forest ecosystem, grassland and agro ecosystem.

Unit –V

Xeric adaptations in plants and animals,
Cursoreal, fussoreal and arboreal; adaptations of animals,
Volant and air adaptation in animals.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- SECOND Course – VI
COURSE TITLE- Population ecology 2020-21

Unit – I

Characteristic of population- distribution, density, natality, mortality, survivorship curves, age distribution and age pyramids.

Population growth, carrying capacity, 'r' & 'k' selection, Energy partitioning, Population fluctuations and self regulation of population, density dependent & density independent population regulation.

Unit – II

Population interaction– intra specific competitions, characteristic and outcomes,
Inter specific interactions- positive interaction, commensalism, mutualism and protocooperation.
Negative interaction- amensalism, parasitisms, competition, predation.

Unit – III

Ecological genetics – Hardy Weinberg law, factors affecting gene frequencies, genetic drift and founder's effect.
Population variation, environmental and genetic variation, external influence on genetic variation,
Speciation- isolation mechanisms.

Unit – IV

Allopatric and sympatric speciation,
Ecology of mimicry- types and evolutionary aspects,
Co-evolution of plants and animals, pair wise and diffuse co-evolution.

Unit – V

Systems ecology – general idea,
Elementary idea about ecological modeling,
Concept of homeostasis,
Cybernetics and feedback.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- SECOND Course – VII 2020-21
COURSE TITLE- Environmental Pollution- II

Unit – I

Noise pollution sources and noise level standards.
Noise levels of some cities of India.
Health effects of noise pollution.
Noise control in industrial establishment,
Thermal pollution, Marine pollution.

Unit – II

Biomedical waste- characterization and quantification, general idea, Health hazard,
Biomedical waste management and handling rules 1998,
Pesticides- classification and types, properties, half life period of pesticides,
Mode of action of organochlorine, carbamate and organophosphate pesticides,
Alternative to pesticides: chemical and biological.

Unit – III

Toxicology, toxicants and toxicity,
Dose response relationship,
Factors affecting toxicity,
Carcinogens- mechanisms of carcinogenesis,
Types of cancers,
Basic idea of mutagens.

Unit – IV

Plastics and polymers, classification,
Addition polymers-types,
Condensation polymers,
Utilization of wastes, utilization of fly ash,
Pollutants removal from waste water by utilization of low costs adsorbents

Unit – V

Principles of spectrophotometry and colorimetry, turbidimetry, conductivity meter,
Flame photometer, High volume air sampler, AAS,
Chromatography general idea, GC, HPLC, HPTLC general idea
Paper Chromatography,
Thin layer Chromatography.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- SECOND **Course – VIII 2020-21**
COURSE TITLE- Environmental Microbiology Part-II and Biotechnology

Unit – I

Foods and Microbes- spoilage and preservation of foods, single cell protein, microbiology of milk and milk products, causation of food toxicity, infections.
Edible mushrooms and their cultivation,
Spirulina cultivation.

Unit – II

Cell structures and their functions. DNA & RNA structure,
DNA Replication,
Transcription and Translation (Protein synthesis),
Genetic code, gene mutation.

Unit – III

Scope and importance of biotechnology,
Basic principles of recombinant DNA technology, gene cloning (plasmids),
Gene probing, molecular fingerprinting., Bioremediation, Phytoremediation, Xenobiotics

Unit – IV

Basic idea of animal cell culture and their applications,
Basic idea of plant cell culture and their applications,
Basic idea of microbial culture and their applications.

Unit – V

Biotechnology and its applications in pollution control, energy, restoration of degraded land.
Fermentation technology.
Biofertilizer technology.
Biodegradation of xenobiotics.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- THIRD **Course – IX 2020-21**
COURSE TITLE- Biostatistics-I

Unit – I

Introduction, origin and growth of statistics, scope of statistics.
Sampling- introduction, census and sampling, theory of sampling,
Methods of sampling- random sampling method, non random sampling method,
Merits and limitation of sampling,
Sampling and non sampling errors.

Unit – II

Organizing a statistical survey,
Planning and execution of survey,
Collection of data, primary and secondary data,
Methods of collection of primary data,
Sources of secondary data.

Unit – III

Classification and Tabulation of data,
Objects of classification, Types of classification,
Formation of discrete and continuous frequency distribution,
Tabulation of data,
Types of diagrams-one dimensional and two dimensional,
Graphs of frequency distribution, Histogram, frequency polygon, smooth frequency curve,
cumulative frequency curve (OGIVE).

Unit – IV

Measures of central tendency,
Requisites of good average,
Computation of Mean,
Computation of Median,
Computation of Mode.

Unit – V

Measures of dispersion, Introduction,
Objects of measuring variation,
Methods of studying variation,
Computation of range, mean deviation and standard deviation,
Coefficient of variation.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- THIRD **Course – X 2020-21**
COURSE TITLE- Environment Resources and Agriculture Development

Unit – I

Environment and Resources

Resources defined, types of resources and detailed account of resources,

Conservation defined, fundamental principles of conservation,

Major resources- Water, the hydrological cycles, water problems, factors influencing surface water, human use and problems of ground water, Effect of increasing population on water resources. Need and techniques of water harvesting, water conflict.

Unit – II

Energy resources, types of energy resources,

Conventional energy and exhaustible resources of energy, firewood and fuel,

Non conventional energy resources and exhaustible energy resources,

Types of non conventional energy resources i.e. - solar energy, hydroelectric energy, biogas, biomass, geothermal and nuclear energy, Conservation of energy resources,

Energy use pattern in world.

Unit – III

Mineral resources of earth,

Ocean as new areas for exploration of mineral resources,

Recycling of resources of important mineral,

Conservation of mineral resources,

Environment impact of mining.

Unit – IV

Forest resources,

Types of forest resources, wood and non wood resources,

Human demand and multiple use of forest,

Forest management and efficient utilization.

Unit – V

Agriculture development, Agriculture & food management,

Geographical factors influencing agriculture,

Agriculture and climate change, agriculture sustainability in India,

Agro-forestry for sustainable land management.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- THIRD **Course – XI 2020-21**
COURSE TITLE- Environment Impact Assessment and Community Health

Unit – I

Meaning and concept of Environment Impact Assessment,
Purpose and scope of E.I.A.
Frame work of E.I.A.
Component of E.I.A.
Environment management & guidelines of environmental planning.

Unit – II

Writing of Environment Impact Assessment,
Description of environmental setting,
Methods of impact assessment i.e. Adhoc method, overlay method, checklist method and matrices method.

Unit – III

Prediction and assessment impact of developmental activities on biodiversity,
Case study dealing with E.I.A. projects i.e. Dams, Highways, and Paper industry.

Unit – IV

Concept of health and disease,
Dimension and ecology of health,
Indicators of health,
Health situation in India.

Unit – V

Occupational health and occupational environment,
Occupational hazards, types of occupational hazards,
Hazards of agricultural,
Occupational disease, types and prevention.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- THIRD **Course – XII 2020-21**
COURSE TITLE- Environment Management

Unit – I

Introduction and general idea of remote sensing,
Types of remote sensing,
Techniques of remote sensing,
General remote sensing applications.

Unit – II

Remote sensing for environmental management,
Role of remote sensing in environmental impact analysis,
Wild life census,
Remote sensing in forest ecosystem analysis,
Introduction and application of geographical information system.

Unit – III

Concept of biodiversity, Species, genetic & ecosystem diversity,
Threats to biodiversity,
Major cause of reduction in biodiversity,
Effect of loss of biodiversity.

Unit – IV

Need for conservation of biodiversity,
Social and ecological benefits of biodiversity,
Measures for maintaining biodiversity,
Hot spots of biodiversity,
Biodiversity conservation and international efforts- The Earth Summit, Rio declaration.

Unit – V

Environmental Education- Guiding principles, aims, and objectives,
Environmental education programme in formal and informal education,
Recommendation in the development of environmental education programme,
Status and policy of environmental education,

M.Sc. ENVIRONMENTAL SCIENCE
Semester- FOURTH **Course – XIII** **2020-21**
COURSE TITLE- Biostatistics-II

Unit – I

Probability, definition and types of events in probability,
Classical probability, relative frequency theory of probability,
Theorems on probability, Addition theorem on probability,
Multiplication theorem on probability,
Conditional probability.

Unit – II

Test of Hypothesis- introduction,
Procedure for testing the hypothesis,
Types of error during testing a hypothesis,
Standard errors, confidence limit of population mean,
Test of significance, student 't' test, properties and application of 't' test.

Unit – III

Correlation,
Types of correlation, positive and negative, simple, partial and multiple correlations,
Linear and non linear correlation,
Method to study correlation: Karl Pearson's correlation coefficient method, scatter diagram
method. Standard error of correlation coefficient and its significance test.
Regression analysis, difference between correlation and regression, regression lines, regression
equation. Use of regression analysis.

Unit – IV

Chi Square Test, introduction,
Computation and use of Chi Square Test,
Misuse and limitation of Chi Square Test,
Analysis of variance, Assumption in analysis of variances,
One way and two way classification, general idea.

Unit – V

Vital statistics,
Methods of obtaining vital statistics, Registration method, census enumeration method, analytical
method,
Measurement of fertility,
Measurement of mortality,
Life table, construction and its uses.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- FOURTH **Course – XIV 2020-21**
COURSE TITLE- Environmental Resources and Human Population

Unit – I

Population as resources, population resource relationship,
Population explosion, effect of increasing human population,
Demographic trend in India,
Control measures of population, integrated reproductive and child health programme.

Unit – II

Wild life of India, importance of wild life, causes for depletion of wild life,
Objective and measures of wild life management,
Habitat improvement,
National parks, Sanctuaries Biosphere reserves (with regard to MP) and their role in wild life conservation.

Unit – III

Factors threatening natural communities,
IUCN classification of status of species,
Measure for conservation of species and natural communities.

Unit – IV

Importance of rangeland and fodder, Depletion, causes of degradation and management of Rangeland,
Urbanization- factors promoting urbanization effect of urbanization on environment,
Industrial development and environmental degradation.

Unit – V

Environmental hazards and disaster, meaning and concept,
Natural disasters, types, reduction and management,
Environmental hazards- types, causes and effects of environmental hazards i.e. earthquake, floods, drought, and landside.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- FOURTH **Course – XV 2020-21**
COURSE TITLE- Environmental Management

Unit – I

Environmental legislation- objective, importance and needs,
Some existing legislation- general idea and salient features,
 (a) Air (Prevention and control of pollution act 1981), Kyoto protocol,
 (b) The water (Prevention and control of pollution act 1974).

Unit – II

Drawback in environmental legislation and enforcement problems,
Some existing legislation- general idea and salient features,
 (a) Wild life protection act 1972.
 (b) Forest conservation act 1980.
 (c) Environmental protection act 1986.
 (d) Biodiversity act 2002.

Unit – III

Concept of environmental management,
Aspect and approaches to environmental management,
Conservation of ecological resources,
Management of ecological resources.

Unit – IV

Current environment issues in India- Narmada Dam, Tehri Dam, formation and reclamation of Usar soil,
Concept of sustainable development,
Environmental priorities in India and sustainable development,
General idea and concept of environmental audit.

Unit – V

Economic implication of changed environment,
Waste generation, cost of waste disposal, recycling and power generation,
Utilization of agricultural waste and Fly ash.

M.Sc. ENVIRONMENTAL SCIENCE
Semester- FOURTH (Elective Paper-II) Course – XVI 2020-21
COURSE TITLE- Plants in Human Welfare, Ecotourism & Environmental Audit

Unit – I

History of plants & development of society,
Green revolution- benefits and adverse consequences,
Innovations for meeting world food demands,
Plants in Mythology.

Unit – II

Afforestation and impact of afforestation on global climate,
Methods of natural and artificial regeneration of forest,
Social forestry, farm forestry & waste land reclamation- general idea.

Unit – III

Plants and Human health,
Usage of plants in different system of medicine- Allopathic, Homeopathic, Ayurvedic, Herbal
Medicine & concept of herbal cosmetic,
Plants used by villagers & tribal people.

Unit – IV

Environmental audit- concept,
Setting up an audit programme,
Items to be addressed in Environmental audit,
Audit methodology,
Pre audit activities, activities at site & post audit activities,
Benefits of Environmental audit.

Unit – V

Tourism and Environment,
Fundamentals of tourism,
Positive effects of tourism on environment,
Negative effects of tourism on environment,
Ecotourism, planning for sustainable tourism,
Agenda- 21 for travel and tourism industry.