DEPARTMENT OF ENVIRONMENTAL SCIENCES

FACULTY OF EARTH SCIENCE

M. L. SUKHADIA UNIVERSITY

UDAIPUR

M.SC (CBCS) SYLLABUS

2018-19

M.Sc., Environmental Sciences

Semester I (CORE COURSE -I)

MI ENV01-CC01 **CREDITS: 04**

BASIC CONCEPTS OF ECOLOGY AND ENVIRONMENT

Unit I

Basic concept of ecology and Environment: components- Topographic, climatic, edaphic factors; Scope of ecology and its relations with other disciplines; Principles pertaining to ecosystem; ecosystem components: food chains, food web, ecological pyramids; Ecosystem energetics; energy budget and ecological efficiency; Processes of primary productivity, gross and net productivity; Homeostasis; Principles of limiting factors.

Unit II

Biogeochemical cycles in Environment- concepts and significance, Carbon , Nitrogen, Phosphorus, oxygen ,hydrological, Sulphur cycle; Autecology and synecology- Basic principles; Concept of population growth and survivorship; population characteristics and dynamics; population growth forms and concept of carrying capacity; Population regulation K and R selection ,population changes.

Unit III

Biotic community: concept and classification; community characteristics- Qualitative, Quantitative, phyto sociological methods: quadrats, Transects & IVI; Ecotone and continuum concept, Life forms and biological spectrum; Community coefficients; Ecological dominance and ecological niche; ecological succession, concept of climax and community stability; Biotic interactions, ecads; Ecological succession- types, causes and effects, climax community, succession models of ecosystem developments; Micro versus macro evolution.

Unit IV

Aquatic ecosystems: Lantic and lotic- Physicochemical characteristics of fresh water environment, Biotic communities of pond and lakes, thermal stratification of lakes, conservation and management of fresh water habitats; Physicochemical characteristics of Marine ecosystem, biotic communities of oceanic regions, coral reefs and mangroves; estuarine ecology; Concepts of wetland ecosystem, Ramser wetlands, wetlands with special reference to Rajasthan.

Unit V

Terrestrial Environment: Physicochemical characteristics; Biomes of the world- Forest, Grassland, Desert and Tundra; Flora and Vegetation of India with special reference to Rajasthan; Endemism, Age and Area hypothesis, Dispersal dynamics; Role of ecotone in conservation and management of Biomes .

M.Sc., Environmental Sciences

Semester I (CORE COURSE- II)

M1 ENV02-CC02 **CREDITS : 04**

EARTH PROCESSES AND NATURAL CYCLES

Unit I

Evolution of atmosphere; Chemical composition and thermal stratification of present day atmosphere; Atmosphere and earth radiation balance, Latitudinal and seasonal variation of Insolation, temperature, pressure, wind belts , Humidity, cloud types & formation, precipitation; Circulation of earth's atmosphere and world precipitation pattern, precipitation to evaporation ratio; Hydrological cycle.

Unit II

Elements of climate: temperature, pressure, wind, Altitude, latitude, longitude, Horizontal and vertical distribution of air masses, Interrelationship between various elements of climate, properties of air masses, air circulation system in the tropic; Climate classification, World climate regimes; Climate types of India, Indian Monsoon; El Nino & La Nina; Climate control and distribution of plants and animals, Gaia hypothesis, Climate and biosphere-feedback mechanisms, Climate elements in crop production: temperature and crops, frost moisture, drought .

Unit III

Climate and habitable areas; climate and rural housing; climate and buildings; Micro climate and architectural design, modification of macro and micro climates with special reference to urban areas; Human body and heat balance; climate and human health, climate and race temperament, clothing insulation and clothing zones of the world.

Unit IV

Meteorology fundamentals- Pressure, temperature, wind, humidity, radiation, atmospheric stability adiabatic diagrams, turbulence and diffusion; Emission and absorption of terrestrial radiation, radiation windows, Net Radiation Budget- thermodynamic diagram; thermal inversion process ; entropy and enthalpy, thermodynamics of dry and moist air and adiabatic processes; Applications of micrometeorology to vegetated surfaces, urban areas, human beings, animals; Applicatio n of meteorological principles to transport and diffusion of pollutants.

Unit V

Scavenging processes; Effects of meteorological parameters on pollutants and vice versa; Wind roses; Topographic effects; Pollution climatology; theories of climate change: forecasting climate, climate trends and climatic cycles; Preliminary concepts of climate change - global warming , sea level rise, ozone depletion, green house gases, smog, fog formation and dispersal.

M.Sc., Environmental Sciences

Semester I (CORE COURSE- III)

M1 ENV03-CC03 **CREDITS : 04**

NATURAL RESOURCES AND THEIR CONSERVATION

Unit-I

Natural Resources : Definition, Types & Classification, Concepts of Reserves & Resource availability, Environmental impacts of resource exploitation, Understanding Resource Ecology & life supporting capacity of Natural Resources- Economic models: Green Building concept & Green technology concept, Natural Resource Management.

Unit-II

Definition of Energy-Types & units; Energy production and consumption pattern of world & India; Renewable and Non renewable Energy Resources, Principles of generation of Hydro electric power, Tidal power, Thermal energy conversion, wind and geothermal energy, Solar energy- Solar collectors, Photovoltaics, Solar ponds & Solar equipments- Heaters, driers, cookers; Harnessing Solar energy, solar electricity generation; Impact of large scale exploitation of solar, wind, hydro and ocean energy, Energy conservation policies.

Unit-III

Non-renewable energy resources: Fossil fuel classification, composition and physico-chemical characteristics; energy content of petroleum and natural gas -formation, reserves, exploration/ Mining and uses of Coal; Environmental problems associated with mining, processing & transportation ; uses of Fossil fuels.

Unit-IV

Bio energy: Biomass, Biogas, Refuse, Organic residues; Biomass fuel types- Solid, liquid and gaseous fuels, Availability of Biomass fuels in India; Biogas production and uses; Conversion processes- pyrolysis, charcoal production, compression, gasification and liquefaction; Anaerobic digestion; Energy from solid wastes- sources , types and energy production; Energy plantations- Carbohydrate crops, petro crops and Energy weeds.

Unit-V

Mineral resources- origin, distribution and uses of economic minerals; Impact of mineral exploitation on environment, conservation of mineral resources; Mineral resources with special reference to Rajasthan; Forest Resource Management: distribution, wood Production , forest land -use changes in India, future demand of forests -carbon sequestrations; Nuclear energy resources-fission and fusion, nuclear fuel types, sustainable use.

M.Sc., Environmental Sciences

Semester I (CORE COURSE- IV)

M1 ENV04-CC04 **CREDITS : 04**

ENVIRONMENTAL POLLUTION AND MONITORING

Unit I

Environmental Pollution - concepts & Introduction, Global, regional and local prospective of environmental Pollution; Natural and anthropogenic sources of pollution; primary and secondary pollutants; Transport and diffusion of pollutants; Air pollution: source, effect of gaseous air pollutants on plants and animals, TSP and their effect on plants and animals; Principles of air monitoring; Air Pollution Tolerance Index, effect of metereological & topographical factors on transport and dispersion of pollutants ; Lotka-voltera, prey-predator model, Gaussian plume model; Air Quality Standards, control of air pollution, Euro standards, Indoor and vehicular air pollution.

Unit II

Water pollution: types, Sources and consequences of water pollution; Principles of wa ter quality monitoring, ecological and biochemical aspects of water pollution ,effects of domestic industrial and agricultural wastes on water bodies, physicochemical and bacteriological sampling and analysis of water quality; water quality standards; water pollutants and their control; Ganga Action Plan; Marine pollution; Thermal pollution.

Unit III

Radiation sources in environment- natural and man made; Sources and classification of Radioactive pollution, effect of radioactive pollution on biological system; Basic properties of noise, sound pressure, loudness and intensity levels, Sources and measurement of noise pollution, noise exposure levels and standards; noise pollution control and abatement measures; Noise survey - equipments and sampling.

Unit IV

Physicochemical and bacteriological sampling and analysis of soil; Sources of Soil pollution, Heavy metals sources and effects on biological systems; Pesticides sources and effect on biological systems, Detrimental effects of soil pollutants on soil micro biota, Ecological consequences and soil pollution control

Unit V

Sources and characteristics of solid wastes, Environmental Problems associated with solid wastes disposal practices; Solid waste disposal and management, Biomonitoring of air, water and soil environment, concept of indicator species and their environmental significance, Introduction to pollutant-sensitive and resistant plants; environmental impacts of biomedical wastes: sources and waste minimization.

M. Sc. Environmental Sciences

Semester I (PRACTICAL COURSE - CPR-I)

MI ENV05-CP01 **CREDITS-04**

1. To determine minimum size of quadrate by species area curve method.
2. To study the vegetation by line transect method
3. To determine frequency, Density and Abundance of the given area
4. Find out the IVI of specified vegetational area
5. Find out the similarity and dissimilarity indices between disturbed and undisturbed grassland.
6. Determination of pattern (non randomness) in vegetation.
7. Estimation of total chlorophyll content of herbaceous vegetation on per square meter of land area basis
8. Study of biotic interactions and their ecological significance
9. Representation of climate data by
    (1) Simple graph
    (2) Hytherograph
    (3) Rainfall variability graph
    (4) Wind rose
    (5) Combine bar and line graph
    (6) Climograph
10. Observation of India weather maps.
11. Preparation of wind rose.
12. Construction, principle and working of weather instruments : Thermometer, Rain gauze,

    Anemometer, Barometer, Pedometer, Compass, lux meter ,hygrometer
13. To find out Index of Dominance in given area

> **Spotting:**

- Thermometer,
- Rain gauze,
- Anemometer,
- Barometer,
- Pedometer,
- Compass,
- lux meter,
- hygrometer,
- weather graph,
- temperature,
- wind rose
- WEATHER GRAPHS
- Biotic interactions: proto cooperation, mutualism, parasitism, amensalism, symbiosis
- Plant interactions : lichens ,root nodules, epiphytes, macrophytes, insectivorous plants

M. Sc. Environmental Sciences

Semester I (PRACTICAL COURSE - CPR-II)

MI ENV06-CP02 **CREDITS-04**

1. Analysis of water samples:
   a) PHYSICAL ANALYSIS :Temperature, Turbidity, Conductivity, PH
   b) CHEMICAL ANALYSIS :bicarbonates and Carbonates ,Total dissolved solids, Total suspended particulates, Salinity, Free CO2, Alkalinity, Dissolved oxygen, COD, BOD, Primary productivity, Phosphate, Silicate, DOC & DOM , Total hardness, Nitrates, Chlorides
2. To study faecal coli forms in water sample by M.P.N. method
3. Qualitative and quantitative analysis of water samples for zooplanktons and phytoplanktons.
4. Preparation of field report of any case study carried out in any areas to assess the pollution status.
5. Temporary slide preparation of phyto and zooplanktons

SPOTTING :

- Sampling equipments : BOD Bottle, Sechhi disc, Plankton net, components of simple and compound microscope
- Phytoplanktons : microcystis, anabena, volvox, nostoc, occillatoria,
- Zooplanktons: moina, Cyclops, Daphnia, zoea larva, chyronomus larva, nauplius larva, ticks, mites