M.Sc., Environmental Sciences, 2015-16

Semester IV

(CORE COURSE- XI)

M4 ENV01-CT 11 **CREDITS : 04**

ENVIRONMENTAL AND OCCUPATIONAL HEALTH

Unit I

Basic principle of environmental health; Environmental factors and human health; Physiological responses of man to relevant stresses in the environment; Disease causing infectious organisms (Virus, bacteria, and parasites); teratogens and mutagens; Detailed account of AIDS and sexually transmitted diseases (STD); Environmental health management.

Unit II

Air pollution and human health; causes of air pollution and air borne diseases, Soil pollution- Sources and effect on human health; Water pollution- sources and effects on human health; water borne diseases; Risk assessment and preventive measures; Toxico genomics- interaction of pollutants with biological systems at different levels-organism ,organ and organelles.

Unit III

Environmental health management in India; Occupational health safety and health administration; Environmental health in indigenous tribal communities- problems and remedies; Environmental health protection - Issues and problems ;Industrial safety management techniques and standards.

Unit IV

Definition of occupational health, Occupational hazards and associated diseases- silicosis, anthrax and other lung diseases; WHO standards of working conditions; factors affecting occupational health (physical, chemical and biological); prevention of occupational diseases; Various international organizations (WHO, ILO, UNICEF) on human health, Lead poisoning, occupational cancers, Dermatitis.

Unit V

Nuclear pollution and human health- case studies; Agriculture chemicals and human health; Hazardous wastes- human health and management; Noise pollution and human health hazards; Human health education and awareness. Hazard evaluation in polluted environment with specific emphasis on radiological health; causes and consequences of hazardous wastes in soil, water and air with respect to human health; Industrial hygiene application and statistical methods through medical records, in study of health problems of human population in green environment

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Semester IV

(CORE COURSE- XII)

M4 ENV02-CT 12 **CREDITS : 04**

ENVIRONMENTAL PLANNING AND BIOSTATISTICS

Unit I

Basic concepts of Environmental planning; Environmental problems of urban planning; Environmental policies**.**
Environmental priorities in India; urban planning; rural environmental planning; national and state

Unit II

Land use and degradation; land use planning; waste land and their reclamation; water logging; Salinization of lands; strategies forsustainable land management**.**

Unit III

Watershed management and planning in India; Structure and functioning of MOEF, CPCB, SPCB; wetlands planningand management;eco friendly technologies fornatural resources.

Unit IV

Fundamentals of bios statistics -basic concept & introduction to sampling methodology; measures of central tendency and graphical representation of data: Mean (arithmetic, harmonic and geometric), Median and Mode; Measures of central tendency & dispersion; skewness and kurtosis, Poisson and binomial distribution; Standard deviation; Standard errorof mean.

Unit V

Null hypothesis, t test and pair T test; Chi square test, Coefficient of association (measure of association); Analysis of variance; Probability –definition, addition and multiplication laws; concept of random variable; Correlation coefficient- testing of significance of correlation coefficient; Regression coefficient and the line of best fit; relationship between correlation

and regression; introduction to multivariate methods for environmental sciences – ANOVA (one way & two way), PCA, factor analysis and clusteranalysis.

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Semester IV

(DISCIPLINE SPECIFIC COURSE- III)

M4 ENV03-DT O3 **CREDITS : 04**

ENVIROMENTAL IMPACT ASSESSMENT

Unit-I

Introduction to environmental impact assessment; origin and development of environmental impact assessment; relationship of environmental impact assessment to sustainable development; basic concepts, objectives and its significance of EIA; EIA guidelines -1994 and modified in 2006; Generalized approach to impact analysis.

Unit II

Environmental Impact statement process; environmental impact assessment methodologies- Adhoc method; Check list methodologies-Matrix method, LCA method

Unit III

Introduction to environmental planning, Baseline Information and predictions- land, water, atmosphere, energy and socio-economic status and demographic profile; environmental audit- guidelines concept and process; concept of public participation- public hearing; ISO 9000,14000 & 18001.

Unit IV

Prediction and assessment of impact on water, air, Noise, soil and biological systems; cost benefit analysis.

Unit V

R & R plan(Act).2007; Green belt development; National environmental policies and guidelines in India; condition and approach for EIS review; Case–studies-River valley projects, Thermal power plants, Mining projects, Dams and reservoirs, Oil refineries,

Petro chemicals, national Highway Projects; Identification and prediction of Impact mitigation measures.

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Semester IV

(DISCIPLINE SPECIFIC COURSE- IV A)

CREDITS : 04

M4 ENV04-DT O4

ENVIRONMENTAL MICROBIOLOGY AND BIOTECHNOLOGY

Unit-I

Classification, characteristics, occurrence, distribution and ecological importance of microorganisms; Photo autorophs, chemo lithotrophs, organotrophs, parasites and their environmental importance; Soil microorganisms and theirinteractions relative to soil fertility; Detection of microbialtoxins.

Unit-II

Fermentation technology; wastes as a source of microorganism; compost and processes of composting; factors effecting the process of composting; microbes in biogas production, microbes in hydrogen and hydrocarbon production; application of immunofilteration; immunoprecipitation and DNA probing methods fordetection of microbial pathogens in aquaticenvironment.

Unit III

Environmental biotechnology- scope and application, scope of cleaner technology, tools and techniques of biotechnology; Application of plants tissues culture technology for micro propogation of stress tolerant plants.

Unit IV

Microbes and their genetic engineering for degradation of pollutants; Application of microbes as biofertilizers and biopesticides; Microbes in bio mining, bio hydrometallurgy and bio mineralization; Application of recombinant DNA technology for improvement of

bacterial strains; Microbial degradation of Xenobiotics, Microorganism in abatement of heavy metal pollution; Bioremediation

Unit V

Principle and application of biosensors for detection of pollutants; Risk assessment for recombinant biosensors; Anaerobic biotechnology for sustainable waste treatment; oil spills-causes and recovery; Biodegradation of petroleum (hydrocarbon); use of super bugs for removal of oil spills; Aero microbiology, Aeroallergens and microbial pathology in human health.

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Semester IV

(DISCIPLINE SPECIFIC COURSE- IV B)

M4 ENV04-DT O4 **CREDITS : 04**

Restoration Ecology

Unit I

Contaminated lands: Types of contaminated lands and contaminants; effects of contaminants on biota; Ecology of Disturbed Ecosystems: disturbance and its impact on the structure and functioning of terrestrial and aquaticecosystems; Types of waste and its characteristics.

Unit II

Aims and strategies of restoration: Concepts of restoration, single vs. multiple end-points; ecosystem reconstructions; physical, chemical, biological and biotechnological tools of restoration; Restoration of biological diversity: Acceleration of ecological succession, reintroduction of biota.

Unit III

Degradation and restoration of natural ecosystems: Forests, Grasslands, Savanna, Aquatic; Selection of plant species forrestoration

Unit IV

Restoration of degraded soils: Restoration of contaminated soils and soil fertility; mine spoil restoration. Phytoremediation, phytostabilization, rhizofilteration, phytodegradation, Conditioningstrategies

Unit V

Advances and possibilities in phytoremediation: Plant biochemistry, genetic engineering, transgenic plants, use of bacteria. Application and performances; Case studies: In Indiaand abroad

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Semester IV

(PRACTICAL COURSE – CCPR-VI)

M4 ENV05-EP03 **CREDITS-O4**

1.To determine the LAI, chlorophyll content, soluble leaf protein, ascorbic acid, phenol, carbohydrate and air pollution tolerance index (APTI) of selected plants species and comparison of plants fortheirrelative susceptibility to pollution

2.Permanent Preparation of slides- xerophytes, hydrophytes, zooplankton and phytoplankton in polluted and non polluted areas.

3.Assessment of respiratory activity with increasingbranch diameter

4.Qualitative and Quantitative analysis of plant enzymes

5.Estimation of chlorophyll a, b and total chlorophyll from commercial, roadside and industrial areas.

6.Estimation of crude proteins

7.To evaluate bryophytes and lichens fortheirsensitivity to different pollutants

(a)Numberof species

(b)Degree of cover

(c)Frequency of each species

(d)Growth and development

(e)Biomass

(f)Chlorophyll content

8.Use of animals in terrestrial amd aquatic ecosystem as bio indicators/ bio monitors (mammals/micro arthropods/earthworms/wood lice/molluscs)

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Semester IV

(PRACTICAL COURSE – DSE PR-II A)

M4 ENV06-EP04 **CREDITS-O4**

1.Test the difference between means of two samples using‘t’ test and paired t test.

2.To determine the correlation between two variables.

3.Test of null hypothesis by computingSEof differencebetween two means.

4.To determine the association between two species by usingchi- square test.

5.To determine mean, median and mode between various samples.

6.Introduction of biotechnological tools and techniques: principles and applications.

7.Isolation and culture of excised plant parts formicropropagation studies.

8.Isolation, purification and identification of aerobic bacteria from different soil and water sources.

9.Application of stage and ocularmicrometerformeasurements of microbes.

10.Preparation of different type’s mediaforculture of bacteria, algae and plant tissues.

11.Isolation, purification and identification of mycorrhizalfungi.

12.Demonstration of biogas production by methanogen bacteria.

13.Study of the following:

*a)*Organisms as bio fertilizer- *Azolla, Anabena, Nostoc, Aulosira, Plectonema. Oscillaloria, Tolypothrix, Glomus, Gigaspora, Sclerocystis, Rhizobium*

b)Different stages of micropropagation -shoot multiplication, rooting, in vitro hardening

➢ **Spotting :**

- LaminarFlow
- Auto Clave
- Hot Air oven
- Sterlizer
- Sprit lamp
- Instruments forinoculation
- Plant growth chamber

- Micro Pipette
- Stage & ocularMicro meter
- Compound Micro scope