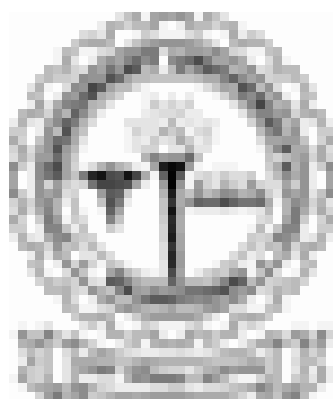# BHAGWANT UNIVERSITY

Sikar Road, Ajmer

Rajasthan

Syllabus

Institute of Life Science & Applied Sciences

M. Phil I Semester

Environmental Science

Course Category

MEVS : M.Phil in Environmental Science
CCC: Compulsory Core Course
ECC: Elective Core Course
Contact Hours:
L: Lecture
T: Tutorial
P: Practical or Other
Marks Distribution :
IA: Internal Assessment (Test/Classroom
Participation/Quiz/Presentation/Assignment etc.)
EoSE: End of Semester Examination

M. Phil (Environmental Science)

(Course Structure)

Subject code	Subject Name	Teaching hours			Marks		
		L	T	P	External	Internal	Total
01MEVS101	**Research Methodology:Theory & Techniques**	3	0	0	70	30	100
01MEVS102	**Current Issues In The Environment & Pollution Control**	**3**	**0**	**0**	**70**	**30**	**100**
01MEVS103	**Solid Waste Management**	3	0	0	70	30	100

01MEVS104	ECOTOXICOLOGY	3	0	0	100		100
	Total	**12**	**0**	**0**	**280**	**120**	**400**

SEMESTER II

Subject code	Subject Name	Teaching hours			Marks		
		L	**T**	**P**	**External**	**Internal**	**Total**
02MEVS101	**Advanced Research Methodology:Theory & Techniques**	3	0	0	70	30	100
02MEVS102	**Disaster Management and Restoration Ecology**	**3**	**0**	**0**	**70**	**30**	**100**
02MEVS103	**Environment Impact Assessment and Environmental Auditing**	3	0	0	70	30	100
02MEVS201	**Dissertation**	**3**	**0**	**0**	**50**	**50**	**100**
	Total	**12**	**0**	**0**	**260**	**140**	**400**

Research Methodology Theory And Techniques

UNIT - I

Research – Definition – Importance and Meaning of research – Characteristics of research – Types of Research – Steps in research – Identification, Selection and formulation of research problem – Research questions – Research design – Formulation of Hypothesis – Review of Literature.

UNIT – II

Sampling techniques: Sampling theory – types of sampling – Steps in sampling – Sampling and Non-sampling error – Sample size – Advantages and limitations of sampling.

Collection of Data: Primary Data – Meaning – Data Collection methods – Secondary data – Meaning – Relevances, limitations and cautions.

UNIT – III

Statistics in Research – Measure of Central tendency – Dispersion – Skewness and Kurtosis in research. Hypothesis – Fundamentals of Hypothesis testing – Standard Error – Point and Interval estimates – Important Non-Parametric tests : Sign, Run, Kruskal – Wallis tests and Mann-Whitney test.

UNIT – IV

Para metric tests: Testing of significance – mean, Proportion, Variance and Correlation – testing for Significance of difference between means, proportions, variances and correlation co-efficient. Chi-square tests – ANOVA – One-way and Two-way.

UNIT – V

Research Report: Types of reports – contents – styles of reporting – Steps in drafting reports – Editing the final draft – Evaluating the final draft.

Reference Books

1. Statistical Methods   - S.P. Gupta

2. Research Methodology Methods and Techniques - C.R. Kothari

3. Statistics (Theory and Practice)   -   B.N. Gupta

4. Research Methodology Methods and Statistical Techniques - Santosh Gupta

Current Issues In The Environment & Pollution Control

UNIT – I   FUNDAMENTALS OF ENVIRONMENTAL SCIENCE

Definition – Principles & Scope of Environmental Science. Earth – Man & Environment – Ecosystems – pathways in Ecosystems. Physico – Chemical & Biological factors in the environment. Structure & composition of atmosphere – hydrosphere, lithosphere & biosphere. Natural resources – conservation – sustainable development.

UNIT – II   ENVIRONMENTAL CHEMISTRY

Chemical composition of air: Classification of elements, chemical speciation. Chemical processes for formation of inorganic and organic particulate matter. Thermochemical & photochemical reactions in the atmosphere. Oxygen & ozone depletion , photochemical smog. Water chemistry: chemistry of water, concept of DO, BOD, COD, Sedimentation, coagulation, filtration, Redex

potential. Toxic chemicals in the environment air & H_2O : Pesticides in H_2O. Biochemical aspects of Arsenic, cadmium, Mercury, carbonmonoxide, O_3, carcinogens in the air.

UNIT – III ENVIRONMENTAL BIOLOGY

Definition, Principles & Scope of ecology. Evolution, origin of life & Speciation. Ecosystems: Structure & functions, abiotic & Biotic components, Energy flow, food chains, food web & Ecological pyramid. Common flora & fauna in India: (i) Aquatic:

Phytoplankton, Zooplankton & Macxophytes. (ii) Terrestrial: Forests. Endangered & Threatened species.

UNIT – IV ENVIRONMENTAL POLLUTION & CONTROL

Air: Natural & anthropogenic sources of pollution, primary & Secondary ppllutants. Effects of pollutants on human beings, plants, animals, materials & on climate. Methods of monitoring & control of air pollution. Water: Types, sources of H_2O pollution, physico-chemical & bacteriological sampling & analysis of H_2O quality, water borne diseases. Waste water treatment & recycling. Noise: Sources of noise pollution, Measurment of noise & indices. Noise exposure levels & standards. Noise control & abatement measures. Impact of noise on human health. Maxine: Sources of marine pollution & control. Radioactive & Thermal Pollution.

UNIT – V   ENVIRONMENTAL MANAGEMENT, LAWS & POLICIES

Sources & generation of solid wastes. Different methods of disposal & management of solid wastes (Hospital wastes & Hazardous wastes). Environmental Policy Resolution, Legislation, Wildlife prediction Act, 1972 amended in 1991, Forest conservation Ac6t, 1980. Air (Prevention & control of pollution) Act, 1981. The water (Prevention & control of pollution) Act 1974. Environmental education & Awareness. Global Environmental Problems – Ozone depletion, global warming & climatic change. Rain water Harvesting. Waste Lands & their reclamation. Epidemiological issues (Goitre, Fluorosis, Arsenic). Bio-diversity conservation & Agenda-21.

Reference:

1. Sharma, P.D. Ecology & Environment – Meerut: Rastogi Publications, Meerut, 1990.
2. Manivasakam, "Environmental Pollution", New Delhi, Natural Book Trust of India, 1984.
3. Dara. S.S. - Text Book of Environmental chemistry & Pollution control. S.Chand & Company.
4. Sharma. B.K. – Environmental Chemistry, Goel Publishing House.
5. Biswarup Mukerjee. Environmental Biology.
6. Dr. Ifthikarudeen et al., Principles of Environmental Science & Engineering, Sooraj Publcations, May 2005.

Solid Waste Management

UNIT1: INTRODUCTION

Sewage and sewer, Sewage characteristics – physical, chemical and bacteriological.

UNIT II: SEWAGE

Classification of sewage – treatment – preliminary, primary and final – Sewage treatment methods – and disposal and dilution techniques – Construction and working of oxidation pond and ditches.

UNIT – III: SEWAGE TREATMENT PLANT

Physical, chemical and biological methods for treating solid waste. Treatment of municipal solid waste

UNIT-IV SLUDGE TREATMENT

Type of sludge – sludge digestion – Thickening and drying – Collection- Transportation. Disposal of solid wastes – Choice of disposal methods – Disposal without water carriage system – Integrated solid waste management

UNIT – V BIOMEDICAL WASTES

Sources, effects and control measures of biomedical wastes,. Colour coding of biomedical wastes. Disposal of biomedical waste-Collection – Labeling – Storage – Transportation and disposal of biomedical wastes.

REFERENCES:-

1. Gilbert M. Masters, "Introduction to Environmental Engineering and Science", Peason Education, New Delhi.

2. S. K. Garg, "Sewage Disposal and Air Pollution Engineering", Khanna Publishers, New Delhi.

3. A. K. Chatterjee. "Water Supply, Water Disposal, Environmental Pollution Engineering", Khanna Publishers, New Delhi.

Paper IV :ECOTOXICOLOGY

UNIT I

Models in Ecotoxicology ,Physical and biological scales, aggregation, simplification, and the problem of dimensionality, equilibrium and variability. Physical and biological scales, aggregation, simplification, and the problem of dimensionality, equilibrium and variability.

UNIT II

Mathematical models : Components of models, transport,salinity and solids analyses, organic chemicals in the water column, case study of Thames river (In due course a data bank should be built for Ganga / Krishna river and later may replace the case study of Thames River).

UNIT III

Deterministic and statistical models of chemical fate in aquatic systems : Theory, steady state simplification, deterministic time variable models, statistical variation in fish.

UNIT IV

Bioaccumulation of hydrophobic organic pollutants : Physical and chemical considerations and bioavailability, Biological uptake, retention, metabolism and release, bivalve molluscs, fish, crustaceans and polychaetes, dietary source of organic pollutants.

UNIT V

Environmental chemical stress effects associated with C and P : Biogeochemical cycles : Carbon and phosphorus cycles, simple cycles models, analysis of environmental stresses in C and P cycles.

SEMESTER II
02MEVS101 Paper- I Advance Research Methodology
UNIT I

Basic concepts: Research process, problem identification, research designs, informal experimental designs. Completing randomised design, randomized block design, latinsquare design, factorial designs

UNIT II

Sampling and testing of hypothesis: Concept of probability, probability distribution, Normal, Poisson, χ-square, t-test. Sampling distribution, central limit theorem, Sandler's A-test, standard error, population mean, population proportion, sample size, confidence intervals, null hypothesis and alternative hypothesis, level of significance, two tailed and one tailed tests, Z-test, t-test, x2-test, F-test, testing of correlation coefficients, ANOVA one way ANOVA, two way ANOVA Tukey's HSD.

UNIT III

Non-parametric tests: Sign test, Fisher-Irwin test, Mc Nemer test, Wilcoxon Mali test, Wilcoxon, Mann-Whitnery test, Kruskal-Wallis test, one sample runs test. Spearman's rank correlation, Kendall's coefficient of concordance.

UNIT IV

Multivariate analysis: Multiple regression, multiple discriminant analysis, multiple analysis of variance, canonical correlation analysis, Factor analysis cluster analysis, path analysis. Computational techniques.

UNIT V

Computer Application, Basic of computer, System Software & application Software. Computer as a tool of Research: Application in Data Analysis, related software. MS Office, SPSS, Data Communication, LAN & WAN Data Exploration using internet tools, e-journal, e-books, basic concept of tele-conferencing & related configuration.

References:

1. Kothari, C.R.(2004). Research Methodology: Methods and Techniques, New Age
International Publishers, New Delhi.

2. Arya., P.P. and Pal, Y.(2001) Research Methodology in Management: Theory and
Case Studies. Deep and Deep Publishers Pvt. Ltd. New Delhi.

02MEVS102 Environmental Impact Assessment and Environmental Auditing

UNIT 1

Environmental Impact Assessment (EIA): Definition of EIA and its purpose; Sustainable Development with reference to EIA; Aims and objectives of EIA; Originand development of EIA; Major Trends in EIA; Key Principles of EIA; Costs and benefits of using an EIA process; Indian directive on EIA: EIA guidelines 2006 i.e.Notification of Government of India on EIA; EIA 'best practice' including EIAqualities and expectations from the EIA process.

UNIT 2

EIA Methods and Techniques: Main features of the EIA system, Generalised EIA Process flowchart; checklists, matrices, networks, overlays and geographic information system (GIS), etc.; Main advantages and disadvantages of Impact Identification methods; and Future directions

UNIT3

Environmental Auditing: Definition, aims and objectives of the Environmental Audit; Incentives to undertake the audit; Audit principles; Partial Environmental Audits; Implementing the audit- stages of an environmental audit;

UNIT 4

Need of Environmental Auditing: The scope of the audit; Need for objectivity andindependence in audit procedure; using questionnaires for environmental reviews and audits; Audit reports; Frameworks for environmental auditing.
Unit 5
EIA Report: Knowledge of EIA software; Screening, Scoping; Impact analysis; Mitigation and impact management; Reporting; Review of EIA quality; Decision making; implementation and follow up; EIA project management; Social Impact Assessment; Strategic Environmental Assessment.
02MEVS103 Disaster Management and Restoration Ecology.
UNIT 1
Disaster Management: Introduction, Concepts in Disaster management- with emphasis on disaster preparedness; Natural and Man Made disasters; Importance of
disaster management and introduction to mitigation methods;
UNIT 2
Manmade Disasters and Contingency plan: Concept of Community Contingency plan; Manmade Disasters- Types of manmade disasters (accidents, nuclear, chemical,and biological), concept of WMD (Weapons of Mass destruction).
UNIT 3
Natural Disasters I: Earthquakes- Causes and effects, relative disaster vulnerabilities among people; Earthquakes in India, introduction to seismic zones and related damage, scales for measurement; Preparing for earthquakes; Cyclones-Causes and effects, cyclone prone areas in India, preparing for cyclones;
UNIT 4
Natural Disasters II: Floods- Causes and effects, flood-prone areas in India, preparing for floods; Drought- Concept of slow-onset disaster, causes and effects, drought-prone areas in India and relative vulnerabilities of people, mitigating drought and preparedness;
UNIT 5
Restoration ecology: Land degradation, causes and impacts, Mining lands, remediation of degraded lands of Aravallis, Integrated ecological management and assisted natural regeneration. Eco-restoration through watershed development. Bioinvasions, Ecosystem degradation and management strategies with reference to weeds and other invasive species.
02MEVS201 Dissertation Max Marks: 100
> This is a compulsory paper and in this semester the candidate shall submit the dissertation.