

M.Phil. ENVIRONMENT MANAGEMENT 2014

CREDIT AND SEMESTER SYSTEM

COURSES OF THE PROGRAMME

Semester	Course	Course Code	Name of the course	Credits	Total Credits
1	Core	SES 601	Ecology and Environment Management	4	16
		SES 602	Research and Analytical Methods in Environment management	4	
		SES 603	Lab Course- Practicals	2	
		SES 604	Project Course	2	
		SES 605	Resource Management		
	Elective	SES606	Biodiversity Conservation and Utilization		
		SES607	Environmental Toxicology and Health hazards		
		SES608	Environmental Microbiology		
		SES609	Environment Pollution Management		
		SES610	Environmental Engineering and Biotechnology	4	
		SES611	Waste Management		

2	Project	SES 612	Project Work (Thesis-16 Credits; Viva-voice- 4 Credits)	20	20
					36

**SCHOOL OF ENVIRONMENTAL SCIENCES
MAHATMA GANDHI UNIVERSITY
M.Phil. Environment Management
First Semester**

SES 601 Ecology and Environment Management

Unit 1 : Ecology & Environment: Earth – structure and interactions; Soil formation, hydrological systems; Human impact on earth systems; Ecological principles and variables, Energy flow, Ecosystems- structure and dynamics, Temporal and spatial dimensions, Biogeochemical cycles, Biodiversity – significance, Global and National biodiversity status, Critical eco-systems and landscape-level conservation, Tools for the management of Natural resources, Biogeographical regions in India, Ecosystems of India - status & conservation strategies by Govt. of India, Acts & treaties relating to biodiversity conservation, bioprospecting, biopiracy, WTO regime and commercialization of biodiversity. Convention on Biological Diversity, 1992.

Case studies: *Western Ghats- Biodiversity, Ecological significance, major threats and conservation strategies, Ethnic communities of Western Ghats; Value of traditional science and technology for sustainable management of natural resources, Participatory forest management.*

Unit 2 : Population and Community Ecology : Population ecology – characteristics, Growth curves and modeling approaches, Carrying capacity, Population genetics. Community ecology – Concept and classification, community analysis, niche concept, adaptations and interactions, Evolutionary ecology, Ecological invasions, Restoration of Degraded Ecosystems, Mathematical ecology- Fundamentals and applications.

Case studies: *Climate change and biological invasion, Eco-restoration programmes- International and national level studies, Human-Animal Conflicts, Development and Ecology- selected National and International issues.*

Unit 3 : Environmental chemistry & pollution : Green chemistry-fundamentals

Instrumentation - Chromatographic techniques, Microscopy, Spectroscopy- Basics and applications of spectroscopy

Atmospheric chemistry, Air, water and soil pollution, Ecotoxicology, Toxicity of metals, pesticides, radioactive minerals, flourides etc, Interaction of toxicants with environment, bioaccumulation and magnification, Biomonitoring – bioindicators, biomarkers

Water treatment, recent advances in water purification , Case studies – air pollution, water pollution, soil pollution. Water, sanitation and human health

Case studies : *Water and air pollution*

Unit 4 : Environment Management : Principles, tools- EIA, LCA, Environment audit, Environment Management Systems, environment management techniques, Environmental Planning and Management-principles, concepts, Regional planning and management, Watershed management, wetland management.

Human activities and impacts: local, regional and global; short-term and long-term impacts on Environment. Origin and development of EIA, National environmental policy and statutory requirements of EIA; objectives of EIA, Methodology of EIA; scoping, categorization and evaluation criteria; prediction and assessment of impact, interactions between environmental components and impacts. Alternate strategies and mitigation measures, environmental monitoring and audit. SWOT analysis in environment management

Case studies : EIA; Environment movements

Unit 5 : Environmental Biotechnology : an overview, Biotechnological solutions to Environmental Pollution: Air, Water and Soil; Emerging trends in wastewater treatment; Agrobiotechnology; Ecological Engineering; Biodegradable plastics; Biotechnological methods in solid waste management; Processing /treatment of hazardous wastes; Bioremediation technology.

Case studies : GM Crops – Bt Cotton , Bt Brinjal ; Hazardous waste dumping – Love canal , Exxon-Valdez oil spill

References

1. Stanley E. Manahan, Environmental Chemistry, CRC press, 2005
2. Gary W.V. & Stephan J.D (2000), Environmental Chemistry a Global Perspective, Oxford University Press, New York
3. Skoog, D.A and Leary, J.J. (1992), Principles of Instrumental Analysis, 4th ed., Saunder's College Publishing, Fortworth
4. Wathern Peter. Environmental impact assessment: theory and practice. Routledge London
5. Anjaneyulu Y . Environmental Impact Assessment Methodologies. B S Publications Delhi
6. Abbasi S A Arya D S. Environmental Impact Assessment. Discovery New Delhi
7. Rao Sasi Bhushana. Environment Management. Regal Publications New Delhi
8. Kluge Heiner. Environment Management. Univeirsity of Technology and the institute of Scientific Co-Operation Dresden.
9. Sheldon Christopher Yoxon Mark. Environmental management systems. Earth Scan London
10. Kulkarni Vijay Ramachandra T V. Environmental Management. Capital Publishing Co Newdelhi

11. Newman Michael C Clements William H. *Ecotoxicology a Comprehensive treatment*. CRC Press Florida
12. Scragg Alan. *Environmental biotechnology*. *Pearson Education Ltd England*
13. Abbasi S.A., Ramasamy E.V. (1999) *Biotechnological Methods of Pollution Control* , *Universities Press (Orient Longman) India Ltd*. Hyderabad 168 p.
14. Bhattacharrya B.C., Banerjee R (2007). *Environmental Biotechnology*. *Oxford University Press*, New Delhi, 338 p.
15. Kluge Heiner Bittner Alfred Hohnholz Jurgen. *Waste management*, University of Technology and the Institute for Scientific Co-Operation Dresden
16. Odum E.P., Barrett W.G. (2005). *Fundamentals of Ecology*, Thomson/Brook/Cole India Edn.598p
17. Schneid Thomas D Collins Larry. *Disaster management and preparedness*, Lewis Publishers London
18. Singh Tej. *Disaster management approaches and strategies*, Akansha Publishing New Delhi
19. Mckinney Michael L Schoch Robert M. *Environmental science, Systems and solutions*, Jones and Bartlett Publishers London
20. Morgan Michael D Moran Joseph M Wiersma James H. *Environmental Science, Managing Biological and physical Resources*, W M C Brown Publishers New York.

**SCHOOL OF ENVIRONMENTAL SCIENCES
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M.Phil. Environment Management
First Semester**

SES 602 Research and Analytical methods in Environment Management

Unit 1: Methods of Research

Definition; Types of research – basic research, applied research and policy research

Essential qualities of a researcher – Scientific temperament and attitude

Identifying the problem; Literature survey; Formulating hypothesis; Objectives, designing and carrying out experiments/survey; Observation and collection of data; Analysis of data - qualitative and quantitative; Drawing inferences, arriving at conclusions and suggestions.

Environmental sampling : Water, air, soil and biological samples

Unit 2: Statistical tools in Research

Measures of central tendency – Mean, Median, Mode, Standard deviation, Coefficient of variation, Standard error

Fundamentals of testing hypothesis – Chi-square, Student ‘t’ test; Analysis of variance (ANOVA – one way and two way), Regression and Correlation

Design of experiments – CRD, RBD and Factorial analysis

Software in statistical analysis; Modelling

Unit 3: Scientific writing – Structure of a research paper/thesis

Research Paper: Title, Abstract, Key words, Introduction, Review of literature, Methods, Results and Discussion, Conclusions, References; Submission of research papers to journals

Review paper : Scheme and structure of a review paper ; significance of review papers

Thesis : Review of literature; Presentation of results - tables, figures, and plates; References - citations pattern; Acknowledgements, Appendix; Thesis preparation-Standard model

Unit 4: Seminars and Conferences

Preparation and submission of abstracts and full papers- online submission

Presentation (Oral/Poster): standard methods; Conference proceedings, editing

Unit 5: Project proposals

Title, Abstract, Introduction-Rationale, Objectives, Methodology

Time frame and Work plan; Budget and justification; References

Unit 6 Remote sensing and GIS

Basics of remote sensing and GIS

Mapping concepts; Satellite remote sensing - EMR, platforms, sensors, visual interpretation and elements, digital image processing; Aerial photography; Global positioning system; Geographic Information System - components, data structures, data capture, spatial analysis and modelling; applications in environment science and management.

Unit 7 : Analytical Techniques and Instrumentation

Chromatographic techniques, TLC, GC, HPLC, GC-MS, LC-MS, Electrophoresis, Microscopy, Fluorescence microscopy, SEM, AFM, TEM, Basics and applications of spectroscopy, UV, IR, Raman, NMR, AAS, ICP, IRMS, CVAFS.

References

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2. Daniel W.W. (2008). Biostatistics: a foundation for analysis in the health sciences. 7th Edn. Wiley India (Pvt.) Ltd. New Delhi. 755p.
3. Gupta S.P. (2008). Statistical methods 37th Edn. (Rev.) Sultan Chand and Sons. New Delhi. 1470p.
4. Gurumani N. (2006). Research methodology for biological sciences. M.J.P. Publications, Chennai. 754p.
5. Kothari C.R. (2008). Research Methodology: Methods and Techniques 2nd Edn. New Age International Publishers, New Delhi.
6. Kozak A., Kozak R.A., Staudhammer C.L., and Watts S.B. (2008). Introductory probability and statistics: Applications for forestry and natural sciences. CAB International, UK. 408p.
7. Levin R.I. and Rubin D.S. (1997). Statistics for management, 7th Edn. Printice Hall of India (Pvt.) Ltd. New Delhi. 1026p.
8. Sundar Rao P.S.S. and Richard J. (2008). Introduction to biostatistics and research mehods, 4th Edn. Prentice Hall of India (Pvt.) Ltd. New Delhi. 262p.
9. Thakur D. (1998). Research methodology in social sciences. Deep and Deep Publications, New Delhi. 490p.
10. George Joseph. 2001. Fundamentals of Remote Sensing. Universities Press (India).
11. Lilliesand T. M., Keifer R. W. and Chipman J. W. 2008. Remote Sensing and Image Interpretation. John Wiley and Sons.
12. Peter A. Burrough. 2006. Principles of GIS for land resource assessment. Oxford University Press
13. Bhatta B. Remote sensing and GIS, Oxford NewDelhi
14. Wise Stephen. GIS Basics, Taylor and Francis London.
15. Burrough PA. 1999. Principles of Geographical Information System for land resource assessment. Oxford University Press, New York

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M.Phil. Environment Management

CREDIT AND SEMESTER SYSTEM

Course: SES 603 – Lab Course

1. Water quality studies

pH, EC- Electrical conductivity, Colour, odour, turbidity, Solids- Total Dissolved Solids, Total Suspended Solids, Total Solids, hardness- total and Calcium hardness, Nitrogen- Kjeldhal N, NO₃-N, NO₂-N, Phosphate- Total P, potassium acidity, alkalinity, chloride, salinity, DO, biological oxygen demand- BOD, chemical oxygen demand- COD

NOTE: all cited parameters are to be carried out in accordance with the type of water samples, for example, in the case of surface / ground water samples, the COD/ BOD doesn't play a significant role while N and P are essential. Similarly for sewage or any industrial waste water COD and bod become very important parameters.

2. In general, in water quality studies the following pattern need to be followed:

- A) Take at least three samples on the same day and time from three sources- 1. River water, 2. Pond water 3. Dug well/ bore well water. Do analyse for the applicable parameters and compare the results.
- B) Do periodical sampling of a river or lake on every month or every fortnight and do the analysis, also compare the results at the end of your course (you must have at least 6 month data at the end)
- C) Take some industrial waste water (if possible 2 or 3 kinds of industrial waste water) and do the analysis and compare the results.
- D) Take the drinking water samples from 2-3 locations and does the analysis- give a thrust on microbial analysis for these samples.

2. Ambient air quality studies

Using the high volume air sampler take air samples from various places and determine the following:

- A) Suspended particulate matter (SPM)
- B) Respirable particulate matter (RPM)
- C) SO_x

- D) NO_x
- E) CO_x

3. Soil and Phyto mass analysis

Parameters to be studied

1. For soil
 - a. Carbon
 - b. Nitrogen
 - c. C/N ratio
 - d. Soil pH
 - e. N,P,K
2. For Phyto mass:
 - a. Dry weight and moisture percentage
 - b. C/N ratio
 - c. N,P,K

4. Microbiology

1. Isolation of bacteria from environmental samples- pour plate and spread plate methods.
2. MPN method for estimation of coliform bacteria in water and waste water
3. gram staining, spore staining, motility, oxidase, catalase and O/F test.

5. Noise

Use noise level meter and record the noise level at various places. Repeat this recording periodically at least for six months and compile the data.

REFERENCES

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overburden, solid waste and ecology. ABD Publishers, Japur.
- Marc Pansu, Jacques Gautheryrou, Hand book of soil analysis- Minerological, organic and
inorganic methods, Springer, New York
- Maria Csuros and Csaba Csuros, Environmental Sampling and Analysis for Metals, Lewis
Publishers
- Miroslav Radojevic and Vladimir N Bashkin, Practical Environmental Analysis, RSC Publishing
- Conklin Alfred R. Introduction to Soil chemistry, analysis and Instrumentation, Jhonwiley&Sons
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- NEERI , Air quality monitoring, A course manual (Photostat), NEERI Nagpur

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