

SCHOOL OF ENVIRONMENTAL SCIENCES
MAHATMA GANDHI UNIVERSITY
PhD Course work syllabus - 2020

Sl No.	Course code	Course title	Core/Elective	Credit
1	SES DC 1C 16 01	Research Methodology	Core	4
2	SES DC 1C 16 02	Environmental Sciences	Core	4
3	SES DC 1C 16 04	Subject related to PhD	Elective	4
4	SES DC 1C 16 05	Research Ethics	Core	4

SES DC 1C 16 01 : Course I - Research Methodology

Unit 1: What is Research?

Definition

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

Essential qualities of a researcher – Scientific temperament and attitude

Unit 2: Methods of Research

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.

Unit 3: 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 4: Scientific writing – Structure of a research paper/thesis

Title, Abstract, Key words

Introduction, Methods, Results and Discussion, Conclusions, References

Review of literature

Presentation of results - tables, figures, and plates

References - citations pattern

Acknowledgements, Appendix

Submission of research papers to journals

Thesis preparation-Standard model

Unit 5: Seminars and Conferences

Preparation and submission of abstracts and full papers- online submission

Presentation (Oral/Poster): standard methods

Conference proceedings, editing

Unit 6: Project proposals

Title, Abstract, Introduction-Rationale, Objectives, Methodology

Time frame and Work plan

Budget and justification

References

References

1. Anderson J., Durston H. Berry and Poole M. (1992). Thesis and Assignment writing. Wiley Eastern Limited, New Delhi. 129p.
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.

SES DC 1C 16 02: Course II – Environmental Sciences

Unit I Earth and Environment:

Earth as a System of Interacting Components, Materials of the earth, Lithosphere, Atmosphere, Hydrosphere and Biosphere, Hydrologic cycle and groundwater, Hydrogeology and Geology and of Kerala

Introduction, Ecosystems, Biodiversity and its significance, Biogeography of India, Critical eco-systems and landscape-level conservation, Laws and Policies of Govt. of India for biodiversity conservation.

Case studies: Biodiversity of Western Ghats, Human-Animal Conflict and resource sharing, Participatory forest management.

Unit II: Environment Management

Environment Management: Principles, tools- EIA, LCA, Environment audit, Environment Management Systems, Environmental Planning and Management. Case studies - EIA

Resource Conservation - Renewable and non-renewable resources, Tools for the management of natural resources. Conservation strategies - policies and laws of GOI.

Disaster management – case studies

Unit III : Environmental Chemistry

Chemistry and environment (fundamentals), Thermodynamics (concepts of first and second laws in environment), fundamentals of green chemistry, Atmospheric chemistry, Air, water and soil pollution, Ecotoxicology, Toxicity of metals, pesticides, radioactive minerals, fluorides etc, Interaction of toxicants with environment, bioaccumulation and magnification, biomarkers, Role of microbes in biogeochemical cycles, Water treatment, recent advances in water purification, Case studies – air pollution, water pollution, soil pollution

Unit IV : 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

Remote sensing & 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, spatial analysis and modelling; applications in environment science and management.

Unit V: Environmental Biotechnology and Waste Management

Environmental Biotechnology : an overview, Biotechnological solutions to Environmental Pollution, Air, Water and Soil, Emerging trends in – Agrobiotechnology, Ecological Engineering, Biodegradable plastics, Biotechnological methods in solid waste management, processing /treatment of hazardous wastes.

Reference

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
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16. Mckinney Michael L Schoch Robert M. Environmental science, Systems and solutions, Jones and Bartlett Publishers London
17. Morgan Michael D Moran Joseph M Wiersma James H. Environmental Science, Managing Biological and physical Resourses, W M C Brown Publishers Newyork.
18. Bhatta B. Remote sensing and GIS, Oxford NewDelhi
19. Wise Stephen. GIS Basics, Taylor and Francis London.