

M. Phil. ENVIRONMENTAL SCIENCE

SYLLABUS

(2018-2019 ONWARDS)



**P. G. DEPARTMENT OF ENVIRONMENTAL SCIENCE,
FAKIR MOHAN UNIVERSITY, VYASA VIHAR
BALASORE-756020
ODISHA**

Dept. of Environmental Science
M.Phil. Environmental Science

COURSE STRUCTURE

Paper Code	Paper Name	Marks	Credit
<u>Semester I</u>			
Paper I (Compulsory)			
ENS-611	Research Methodology & Computer Application	80+20	8
Paper II (Elective: M. Phil Students to opt one from the following elective papers)			
ENS-612-A	Environmental Pollution Control and Management	80+20	8
ENS-612-B	Natural Resources and their Conservation	80+20	8
Paper III (Practical)			
ENS-613	Laboratory and Field Techniques/Practical; and Computer Application	100	8
<u>Semester II</u>			
ENS-621	Review work and Proposal Presentation	50	4
ENS-622	Presentation of Finding	50	4
ENS-623	Dissertation Submission, Presentation and Viva-voce	200	16
Total Marks		600	48

Semester I
Paper I (Compulsory)

ENS-611 RESEARCH METHODOLOGY & COMPUTER APPLICATION

Total Marks = 100 (End Term-80 + Internal-20)

Credit Hour =8

UNIT-I: Integrated Research Methodology and Writing of Research Report

Research as a creative and strategic thinking process, Developing research aptitude, Literature survey, Challenge of writing up, Preparing the Research Proposals and starting to write, Skills and Tips for successful projects from start to finish, Writing for Journals and Edited Books, Journal impact factor, Citation Index; Presenting papers at Conferences (Poster and Oral Presentations), Thesis writing, Honesty and Research ethics, Plagiarism, IPR, Patenting.

UNIT-II: Experimental Design, Data interpretation and Statistical analysis

Methodology design, Data collection/generation, Primary and secondary data, methods of collecting primary and secondary data, Sampling and Sampling Designs, Test of Significance for large and small samples (t-Test, χ^2 -test, F-test), Non parametric methods, Simple and multiple correlation & Regression Analysis, ANOVA and Multivariate Analysis, Concept of Modelling and Modelling Techniques.

UNIT-III: Instrumental techniques for Environmental Sample Analysis

Principles and Applications of Spectrophotometer; Principles and Applications of Atomic Absorption Spectrophotometer, Electrophoresis Techniques (Types and application); Chromatographic techniques (Types and application); Basic concepts and applications of NMR, FTIR, XRD, XRF, TGA, DTA, SEM, TEM, ICPMS, Bomb Calorimeter; Remote Sensing & GIS Techniques- Its application in Environmental Monitoring;

UNIT-IV: Computer Application in Research

Scope of computer and information technology in Research; Components of personal Computer - Input-Output Devices, CPU and other Hardware components; Software (Operating system software, application software); Use of scientific search engines and Databases; Use of power-point for preparation of a scientific presentation. Preparation of line-graph, pie diagram, and histograms using MS Excel and Sigma-plot, Statistical analysis using MS Excel and sigma plot (correlation and regression analysis, comparison of data using ANOVA, t test and f test).

Paper II (Elective)

ENS-612-A ENVIRONMENTAL POLLUTION CONTROL AND MANAGEMENT

Total Marks = 100 (End Term-80 + Internal-20)

Credit Hour =8

UNIT-I: Air and Water Pollution, their Prevention & Control

Air pollution survey, Air pollution from major industrial operations and other sources; Classification, atmospheric dispersion and spreading of air pollutants; Air pollution control measures for certain industries of Odisha; Development of air pollution monitoring network. Industrial Ventilation, Fumes and Dust control system in industries. Sources of Water pollution, Bio-monitoring of water pollution, Advanced methods of waste water treatment, Sewage treatment and disposal, Use of adsorbents in waste water treatment.

UNIT-II: Solid Waste and their Management

Solid wastes and their classification, Municipal Solid Waste disposal and management, Recycling of organic and inorganic wastes, Mining environment & Health hazards, Biomedical waste and their management

UNIT-III: Bio-resources Conservation and Management

Biodiversity hotspots, Mega-biodiversity countries; Species richness & diversity, measurement of diversity; Factors causing loss of biodiversity, Conservation of biodiversity (In-situ and Ex-situ conservation), IUCN categories, Red data book, Threatened, Vulnerable and Endangered species, Forest principles, CBD (Convention on Biological Diversity) and its goals, Man and Biosphere programme of UNESCO; Biosphere reserve, National Parks and Sanctuaries of India; Vegetation of Odisha with special reference to mangroves and their associates.

UNIT-IV: Biotechnological Approach in Pollution Control

Bioremediation Principles and applications, Use of biosensors in environmental monitoring and pollution detection, Bio-mining. bio-conversion options (Composting, Mushroom farming & Vermi-composting); Industrial hygiene

Paper II (Elective)

ENS-612-B NATURAL RESOURCES AND THEIR CONSERVATION

Total Marks = 100 (End Term-80 + Internal-20)

Credit Hour =8

UNIT-I: Resource Utilization & Management

Natural resources, renewable & non-renewable resources, Caring & sharing of natural resources, Life style & consumption pattern of resources, utilization of wastes as secondary resources, Public-Private Partnership & Role of NGOs in Resource Management.

UNIT-II: Natural Resource Management

Soil resource management, Reclamation of salt affected & alkaline soil, Mineral resource management, Sustainable mining, Beneficial use of mining wastes, Environmental impact of mineral extraction, National policy on mineral utilization; Fresh water resources, monitoring of drinking water quality, Ground water conservation, Rain water harvesting, Economic dimensions of water use, Marine Bio-resources.

UNIT-IV: GIS & Remote-Sensing in Resource Mapping

Concepts of GIS & Remote sensing A brief idea on role of GIS remote sensing in Forest resource management, watershed management, Water quality mapping & Urban planning management with special reference to Orissa.

UNIT-V: Energy Resources

Brief idea on Nuclear energy, Geothermal energy, Solar energy, Wind energy, Wave & tidal energy, Biomass Energy (Biogas, Bio-alcohol and Biodiesel) Hydro Energy, Energy Conservation, Status of non-renewable energy resources of Odisha and India

Paper III (Practical)

ENS-613 LABORATORY AND FIELD TECHNIQUES/PRACTICAL; AND COMPUTER APPLICATION

Total Marks = 100

[25 (Computer Application) +75 (Practical)]

Credit Hour =8

Based on the compulsory and elective papers, the students have to carry out a series of practical experiments. The examination of the paper will be done at the end of second semester which will be combinedly evaluated by an internal examiner and an external examiner.

Computer Application in Research (25 Marks)

Preparation of line-graph, pie diagram, and histograms using MS Excel and Sigma-plot, Statistical analysis using sigma plot (correlation and regression analysis, comparison of data using ANOVA, t test and f test)

List of Laboratory Experiments (75 Marks)

1. Enumeration of bacteria in ambient air using Petri-air sampler
2. Enumeration of bacteria in Industrial effluent by Viable Plate Count Method
3. Morphological characterization of bacterial colonies isolated from waste water sample on nutrient agar plates.
4. Isolation of pure strain and calculation of its generation time by spectrophotometric method
5. Separation of Amino acids from Mixtures using paper chromatographic techniques.
6. Estimation of reducing sugars.
7. Estimation of soluble proteins.
8. Estimation of amino acids.
9. Estimation of total chlorophyll in etiolated and green seedlings.
10. Estimation of peroxidase activity in leaf tissues of different ages/in seedlings exposed to abiotic stress.
11. Isolation of bacterial DNA and performance of agrose gel electrophoresis.
12. Analysis of water samples (DO, BOD, Alkalinity, hardness) following standard methods
13. Analysis of soil samples (pH, Conductivity, texture, organic carbon content, bulk density, particle density, porosity, moisture content and degree of saturation) following standard methods
14. Analysis of Air quality (SO_x, NO_x, SPM/RSPM) using high volume air sampler.
15. Identification of earthworms (degrading and exotic varieties).
16. Estimation of glucose from the liver of bird.
17. Identification of monocot and dicot plants with the help of flora book

GENERAL BOOKS RECOMMENDED:

1. Research Methodology By – Ranjit Kumar, Sage- Publications
2. Writing your Thesis By- Paul diver
3. Writing the winning Thesis or Dissertation, By- Allan Glathorn & R. Joyner.
4. Measurement Error & Research design , By- Madhu Viswanathan
5. Presentation skill, By- P. Maccarthy & C Hatcher
6. Presenting at Conferences Seminars & meetings, By – Kerry Shephard
7. Environmental Chemistry, By – I. Higin
8. Environmental Chemistry, By- B. K. Sharma
9. An Introduction to Air Pollution, By- R. K. Trivedy & P. K. Goel
10. Doing your Masters Dissertation, By-Chris Hart
11. Your Research Project, By-S. Nicholas & R. William
12. Designing & Managing a research Project, y- M. J. Polonsky.
13. Blending qualitative & quantitative research methods in Thesis & Dissertation By – R. M. Thomas.
14. Bio-renewable resources, By – Robert C. Brown
15. Ozone depletion & Environmental Impact, By – H. S. Sharma & T. I. Khan.
16. Green Technologies for Envn. Management & Sustainable management By – Rajiv K. Sinha & Greneway, M, Pioneer publication.
17. Ground water Hydrology, By – D. K. Todd
18. Environmental Pollution, By-Anjali Gupta
19. Environmental Management, By – N. K. Uberoi
20. Environmental Accounting & Reporting, By A. K. Parmink
21. Intro. Envn. Toxicology, By – W. Landis & M. Ho Yu
22. Water shade management, By – k. Palanisami, D. S. Kumar, B. Chandra Sekharan
23. Environmental management & Audit, By- P. Sasi B. Rao, P. M. Rao
24. Organic Farming for sustainable Agriculture, By – A. K. Dahawa
25. Fundamentals of Ecology, By – M. C. Dash
26. Fundamentals of Ecology, By – E. P. Odum
27. Technology of Water Management, By – R. A. Raju
28. Sewage Disposal & Air Pollution Engineering Vol. II, By – S. K. Garg
29. Environmental Global Changes and Challenges, By – Ram Prakash
30. Instrumental Methods for Environmental Analysis, By – Karan Sareen
31. Environmental Policy in a market Economy, By – F.J. Deith & J.M. Heijman
32. Lab. Manual of Chemical and Bact. (Analysing of Water and Sewage), By – F.J. Theroxy & W.L. Mall
33. Phytoremediation of Contaminated Soil and Water, By – N. Terry & G. Banuclon
34. Sustainable Development, By – Susan Baker
35. Indian Industry a Geographical Perspective, By – K. Siddhartha & S. Mukherjee
36. Principles of Environmental Sciences Engineering & Management, By – A. M. Thirumurthy
37. Biotechnological Methods of Pollution Control, By – S.A. Abbasi & E. Ramasami
38. Environmental Health, By – W Purdom
39. Ecology, Chemistry and Management of Environmental Pollution, By – MC Dash
40. Living in the Environment (Principles, Interactions & Solutions), By – Miller
41. Statistical Methods for Environmental & Agricultural Sciences, By – A. Reza Hoshmund
42. Managing Industrial Pollution, By – S.K. Bhatia, Macmillan
43. A text book on Environmental Engineering by HD Kumar and SP Adhikari, India Tech publ.

Semester II

Paper I

ENS-621 REVIEW WORK AND PROPOSAL PRESENTATION

Total Marks = 50 (End Term-50)

Credit Hour =4

At the beginning of second semester (i.e. within 4 weeks) the students will carry out an extensive literature review on a topic of their interest pertaining to the theme of specialization/ elective paper. They have to prepare a report following a standard format of report writing along with their proposal for Dissertation work. With regard to the proposal for Dissertation work, the students will select a topic for Dissertation work in consultation with teacher (i.e. Research Supervisor) assigned to him/her by the Department. The students will submit the proposal in form of a brief report narrating objective of the work, methodologies to be followed, expected outcome and relevance of the work. The report of the review work and proposal for Dissertation would be a combined one (i.e. in two parts: 1st part for Review work and 2nd part for Dissertation proposal) bearing one paper code and number, not separately. The students will have to give a presentation of this paper, the date of which will be decided by the teachers' council and notified by the Head of the Dept. and it will be evaluated by the Teachers' council of the Dept.

Paper II (Pre M. Phil. Presentation)

ENS-622 PRESENTATION OF FINDING

Total Marks = 50 (End Term-50)

Credit Hour =4

The students will perform relevant literature review and carry out the Research Work and towards the end of the second semester will give a presentation, with a brief report giving emphasis on the findings only, which will be evaluated by the teachers of the Dept. The students will record due suggestions received during the presentation and will incorporate/rectify accordingly in their final Dissertation.

Paper III

ENS-623 DISSERTATION SUBMISSION, PRESENTATION AND VIVA-VOCE

Total Marks = 200 (End Term-200)

Credit Hour =16

The students will compile their findings in the form of a thesis, giving due importance to the suggestions received during Pre-M. Phil. presentation which will be submitted to the Department. The thesis must be written following the standard format of thesis writing with proper reference citations. For evaluation, the student will present and defend his/her findings before a Board of Examiners constituting the respective Supervisor and one External Examiner. Basing on the thesis and performance in the presentation, the Board will award the mark.