



Estd. 1962
 "A⁺⁺" Accredited by
 NAAC(2021)
 With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004,
 MAHARASHTRA

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शिवाजी विद्यापीठ, कोल्हापूर - ४१६००४, महाराष्ट्र

दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दूरध्वनी विभाग २३१-२६०९०९३/९४



SU/BOS/Science/ 510

Date: 11 / 07 / 2023

To,
 The Head of Department,
 Shivaji University, Kolhapur.

Subject :- Regarding Syllabi of Ph. D. Course Work Environmental Science degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi and Nature of question paper of **Ph. D. Course Work Environmental Science** under the Faculty of Science and Technology.

This syllabi and nature of question paper shall be implemented from the Academic Year **2023-2024** onwards. A soft copy containing the Syllabus is attached herewith and it is also available on university website (www.unishivaji.ac.in (students Online Syllabus))

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

**Dy Registrar
 (Dr. S. M. Kubal)**

Copy to:

1	The Dean, Faculty of Science & Technology	7	Appointment Section
2	Director, Board of Examinations and Evaluation	8	P.G.Seminar Section
3	The Chairman, Respective Board of Studies	9	Computer Centre (I.T.)
4	B.Sc. Exam	10	Affiliation Section (U.G.)
5	Eligibility Section	11	Affiliation Section (P.G.)
6	O.E. I Section	12	P.G.Admission Section

SHIVAJI UNIVERSITY, KOLHAPUR.



**Accredited By NAAC with 'A' Grade
Revised Syllabus For**

Ph. D. Course Work

Environmental Science

**Syllabus to be implemented from
June, 2023 - 24**

Shivaji University, Kolhapur
Syllabus for

Doctor of Philosophy in Environmental Science

• **PROGRAMME OUTCOMES (PO'S)**

The Ph.D. students are able to :

PO-1) To develop an awareness and sensibility to the total environment and its allied problems.

PO-2) To develop basic understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.

PO-3) To develop attitude to social values, strong feelings of concern for the environment and motivation for active participation in its prediction and improvement.

PO-4) The develop skills for solving environmental problems.

PO-5) To develop evaluation ability to evaluate environmental measures and educational programmes in terms of ecological, political, economic, social, aesthetic and educational factors.

PO-6) To develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems.

PO-7) To develop research aptitude and capabilities in up gradation of environmental aspects.

The syllabus of the Ph. D. in Environmental Science shall have following components.

a) **Paper – I** : Research Methodology (**100 marks**)

b) **Paper – II** : Recent Advances in Environmental Science (**100 marks**)

c) The term work of **100 marks**, will consists of , two Seminars of **25 marks** each and **Review of Published Research in the relevant field of his/her specialization** of **50 marks**.

(**Note** : The student has to secure minimum **40% marks** to successfully complete the course work in individual head (a),(b) and (c) stated above)

Paper – I

RESEARCH METHODOLOGY

● PROGRAMME OUTCOMES (PO'S)

The Ph.D. students are able to :

PO-1) To develop an awareness and sensibility to the total environment and its allied problems.

PO-2) To develop basic understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.

PO-3) To develop attitude to social values, strong feelings of concern for the environment and motivation for active participation in its prediction and improvement.

PO-4) The develop skills for solving environmental problems.

PO-5) To develop evaluation ability to evaluate environmental measures and educational programmes in terms of ecological, political, economic, social, aesthetic and educational factors.

PO-6) To develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems.

PO-7) To develop research aptitude and capabilities in up gradation of environmental aspects.

The syllabus of the Ph.D. in Environmental Science shall have following components:

Students are able to:

CO1: Get acquainted with principles of scientific research and experimentation

CO2: Familiarise with research grant proposal and reports

CO3: Aware about applications Biostatistics

CO4: Understand the basics of Computer Applications.

Unit 1. Principles of scientific research and experimentation

- a. Principles of scientific research experimentation in natural sciences. Postulation of hypothesis deduction, induction and generalization with special reference to Environmental Science.
- b. Design, execution, analysis and evaluation of experiments.
- c. Methodology : (i) Selection of Methodology of study various tools and their scope and limitation in application,
(ii) Selection of research topic, Library consultation, compilation of working, bibliography preparation from reference card.
- d. Technique and knowledge of preparation of abstracts, Manuscripts, Dissertation thesis and report writing.

Unit 2 Research grant proposal and reports:

- a. Writing research grant proposal and reports.
- b. Preparation of articles for scientific journal, typing / printing -manuscripts, margins, spacing, heading and title page numbers, tables and illustrations, corrections and

- insertion, preparation of contents.
- c. Preparation of list of work cited : General guidelines, placement, arrangement, citation of books, and other references, citation technique in report writing, information storage and retrieval sample entries, maintenance of field note book.
 - d. Abbreviations and reference words, standard abbreviations, scientific connotations, SI Units, geographical names, common scholarly abbreviations and reference/key works, publishers names, symbols and abbreviations used in printing technology and proof reading.
 - e. Social and ethical aspect of research plagiarism.
 - f. Copy Right Laws and their protection.

Unit 3 Biostatistics

- a. Definition, population and sample, sampling techniques and types of samples, statistics and parameters.
- b. Summarization of data and estimation
 - i) Measures of Central tendency – Mean, Median, Mode
 - ii) Measures of Dispersion – Variance and Standard Deviation
 - iii) Estimation – Confidence Interval
- c. Hypothesis testing – significance testing, Student's 't' test, Chi square test.
- d. Analysis – ANOVA, Regression and Correlation analysis.

Unit 4. Computer Applications :

- a. Spreadsheet Tool:** Introduction to spreadsheet application, features and functions, Using formulas and functions, Data storing, Features for Statistical data analysis, Generating charts/ graph and other features. Tools used may be Microsoft Excel, Open office or similar tool.
- b. Presentation Tool:** Introduction to presentation tool, features and functions, Creating presentation, Customizing presentation, Showing presentation. **Tools used may be Microsoft Power Point, Open Office or similar tool.**
- c. Web Search:** Introduction to Internet, Use of Internet and WWW, Using search engine like Google, Yahoo etc, Using advanced search techniques.

Reference books :

1. Bedekar V. H. 1982 – How to write assignments, research papers, dissertations. Kanak New Delhi.
2. Barzam J. and Graff Henry, 1977- The Modern Researcher. Hercoust Brace. Javanavish Inc. 3rd Ed.
3. Gatner, E. S. M. & F. Cardasco 1970 – Research and report writing, Pb. Bernes and Noble, N. Y.
4. Gibaldi psephe & Acheert Walters, 1981 – Modern Languaga Association Hand Book for Writers of Research paper – Affiliated East West press Pvt. Ltd.
5. Gupta S. P. 1978 Science and its methodology Ajanta pb.
6. Glick D. and Reschboam R. M. 1977 – Techniques of biological and biophysical methodology, J. Wilen & Sons, London
7. Salunkhe D. K. and Bapat D. R. 1984 – Preparation and Presentation of

scientific publications ph. Registrar M. P. K. V. Rahuri.

8. R. Raman Nair : Computer application to library and information service
1992, E.S. S. Ess pb., New Delhi
9. M. L. Gillenson – Data base step by step, J. Wilen & Sons, 1990 N. Y.
10. P. V. S. Rao & P. Sadanandan (Ed.) – Modern trends in information
technology 1988, Tata MacGrow Hill, pb.
11. Kothari C.K. (2004), 2/e, Research Methodology- Methods and Techniques (New Age
International, New Delhi).
12. Krishnaswamy, K.N., Sivakumar, Appa Iyer and Mathiranjani M. (2006), Management
Research Methodology; Integration of Principles, Methods and Techniques (Pearson
Education, New Delhi)
13. The complete reference Office Xp – Stephan L. Nelson, Gujulia Kelly (TMH)
14. Basic Computer Science and Communication Engineering – R. Rajaram (SCITECH)

Paper II

RECENT ADVANCES IN ENVIRONMENTAL SCIENCE

Students are able to:

CO1: Understand the trends and measure in conservations.

CO2: Get acquainted with recent trends in energy studies

CO3: Understand present status of water supply.

CO4: Know recent trends in organic waste conversion

CO5: Understand the recent trend in eco-toxicology

Unit 1. Trends and measure in conservations :

Recent trends in conservation of wild life, and genetic resources, gene pool and endangered species and their conservation and protection, culturing as conservation of species, national parks and animal in captivity, socio-psychological impact on them, biochemical changes as reflected by behavioral changes of wild animals, breeding in captivity of endangered animals sperm bank.

Tissue culture measures and conservation and preservation of biodiversity in plant species, data base and recent trends of preserving endangered species, Devarais as conservation method of forests. World trends and programme in conservation of biodiversities, legislation against poaching and hunting and their implementation some word examples of national parks.

Unit 2. Recent trends in energy studies :

Present state, Prospects and problems alternative measures, Energy from biomes, energy plantation, fast growing trees and environmental problems, plantation for clean environment and ecological balance, biogas, wind mills and rural energy supply, city garbage and domestic wastes and their recycling for energy and fertilizer, minihydal projects Vs major hydal projects, cost benefit ratio in terms of ecological conservation future plans, and possible means.

Unit 3. Water supply :

Present and past status and needs of urban and rural society, impact of industrialization and socio-economic transformation in urban structures, supply and demand ratio of water and sources. Need to diffuse urbanization and implementation of recycling system of waste water biological methods and chemical methods, revamping of sewage disposal system and need to recycle, water requirement of rural community, agro industries and socio-economic transformation and its impact on water supply, remedial measures in recharging of ground water, metrological problems and fluctuation in water resources, Integrated approach to the problem of short range and long range nature.

Unit 4. Recent trends in organic waste conversion:

Agricultural wastes as fertilizer and feed stuff, Brewery and distillery waste and their utilization, utilization of wastes from fermentation industry, wastes from paper factory and related cellulose wood and bark wastes as feed stuff and fertilizer. Recent trends in use of fish canning industries, trend in utilizing tannery waste. Trends of research assessment and study of movement at subsoil level in water bodies, mines and quarries agricultural practices, and

fertilizer and pesticide use and their movement, chemical approach, biological approach to the problem of Genetic engineering and its application in production of microorganisms and their use in garbage decomposition.

Unit 5. Recent trend in eco-toxicology :

Manual and methods of studying toxicology, animal agent in toxicology, evaluation method, toxicity test, statistical concept or LD₅₀, Dose effect and dose response. Relations ships, biological and chemical factors that influence toxicity response of ecosystems to chemical stress, recent trends in study and monitoring, pollution and evolution.

Reference books :

1. Salomons W. And Forstner U. (Ed) Environmental management of solid wastes Spinger V.
2. Bewick M. W. M. : (Ed.) Hand book of organic waste Conservation, V. N. Reinhold.
3. Levin S. A. Harwell M. A., Kelly J. R., Kuuball K. D. (Ed.) Ecotoxicology : Problems and Approach, Spinger V.
4. Bergon M. , Fitter A. H. and Mc Faybyen A. (Ed.) Advance in Ecological Research.
5. Text book of Environmental Engineering : P. Venugopala Rao, Prentice – Hall of India Pvt. Ltd. Delhi