

# **Syllabus for Ph.D. Coursework in Environmental Science**



**(w.e.f. the session 2020-21)**

**POST GRADUATE DEPARTMENT OF BOTANY  
UTKAL UNIVERSITY  
BHUBANESWAR-751004**

## **Ph.D. COURSEWORK in ENVIRONMENTAL SCIENCE**

**P.G. Department of Botany, Utkal University, Vani Vihar, Bhubaneswar**

*To be effective from the session 2020-2021*

### **Eligibility**

Any student who has passed M.Sc./M.Tech. in Environmental Science/ Life science/ Botany/ Zoology/ Geography/ Geology/ Physics/ Chemistry/ Forestry/ Agricultural Science/ Fishery/allied science and engineering and having minimum of 50% marks in Masters level.

### **Admission**

The candidates are to take admission after qualifying in an entrance test as per university guidelines. The merit list will be prepared after recommendation of SRC. The admission will be strictly as per the merit list in each category as per university norms.

### **Course and Regulation**

1. The course is of six months duration with one semester for two theory paper, one review paper presentation and one seminar presentation.
2. Each paper carries 100 marks and six credit points.
3. The semester system of examination will have internal system of evaluation as suggested and approved by Teacher's council.
4. In order to pass a semester examination a candidate must have to secure a minimum of 60% marks in aggregate and a minimum 50% mark is essential to pass in each paper.
5. Attendance in the semester shall be strictly adhered to University Rules.

Details of the Syllabus:

<b>Paper</b>	<b>Title</b>	<b>Marks allotted</b>	<b>Credit</b>
<b>I.</b>	<b>Research Methodology</b>	<b>100</b>	<b>06</b>
<b>II.</b>	<b>Core Paper-Environmental Science</b>	<b>100</b>	<b>06</b>
<b>III.</b>	<b>Review Paper Presentation</b>	<b>100</b>	<b>06</b>
<b>IV.</b>	<b>Seminar Presentation</b>	<b>100</b>	<b>06</b>
	<b>Total</b>	<b>400</b>	<b>24</b>

# **Detailed syllabus for Paper -I**

## **Research Methodology**

**P. G. Dept. of Botany, Utkal University**

**Credits: 06 FM:.100**

### **Course Objective**

- To get introduced to the fields of various instruments used in Environmental Science including the basic principle - application and working.
- To get idea on basic computational analysis and its applications.
- The course is designed to train the students in statistics, molecular tools and techniques essential for the understanding of Environmental Science.

#### Unit I

*General Analytical Techniques:* Concept of pH and buffer, Chromatography: techniques & application, Electrophoresis: techniques & principle, microscopy. *Spectroscopic Techniques:* UV-Visible spectrophotometry, Atomic absorption spectrophotometry, Plant Efficiency Analyser.

#### Unit II

*Statistical Methods:* Measures of Central tendency of data, t- and x<sup>2</sup>-test, F-test, correlation and regression analysis.

#### Unit III

*Computer Application:* MS office, Internet-working concept, bioinformatics application, Fundamental of Remote Sensing and Geographical Information System (GIS) and its application in various areas.

#### Unit IV

*Review and Research article:* Differences between review and original research article, types of review articles, writing research article and thesis, reference/bibliography formats.

#### Unit V

*Research ethics:* Philosophy and ethics, scientific conduct; publication ethics; open access; publishing, publication misconduct, databases & research metrics.

### **Course outcome**

- The students will develop the capability to carry out research involving several instrumentation techniques.
- The students will learn to approach a research problem logically and will be able to do statistical analyses in research.
- To help students to have an idea on basic mathematical and GIS modeling needed in environmental research.
- The course aware about research ethics in dealing with the environmental research.

## Detailed syllabus Paper-II

### Core Paper- ENVIRONMENTAL SCIENCE P.G. Dept. of Botany, Utkal University

Credits: 06    FM: 100

#### Course Objectives

- To explain the industrial aspects of Environmental Science for the production of various of industrial products of environmental origin.
- The course explains the application of microorganisms in environment and the role of microorganisms in industrial, food and dairy technology.
- This will also train students to design various problems related to environmental pollution and climate change.

#### Unit-I

*Fundamental of Ecology and Environment:* Concept of ecology and environmental science, Ecosystem, ecosystem energetic, Ecosystem productivity, community ecology.

#### Unit-II

*Natural Resources and Management:* Mineral Resources of India and Odisha in particular. Environmental impacts of mineral exploitation and environmental management plans. Biodiversity conservation, Alternate Energy resources.

#### Unit-III

*Environmental Pollution and Monitoring:* Methods of monitoring of air pollutants, control techniques. Water and soil pollution, Bio-monitoring.

#### Unit IV

*Instrumentation techniques, statistical models and Disaster management:* Analytical methods: BOD, COD measurement, Dust Sampler. Concept of disaster management, Lotka- Volterra model, Box model, Gaussian plume model, Validation and forecasting.

#### Unit V

*Environmental Impact Assessment and Climate Change:* Concept of Environmental Management System (EMS) and Environmental Impact Assessment (EIA), Air pollution, Emission of GHGs, Climate Change and its impact.

#### Course outcome

- The students get trained in basic aspects of Environmental Science.
- Obtain knowledge on basic principles and technologies of decontamination of persistent organic pollutants (dangerous contaminants of the environment) mainly by means of the biological approaches i.e. using bioremediation etc.
- The students will know about the principles and techniques underpinning the application to the environment.

**Paper-III: Review paper Presentation**

**Credits: 06 FM: 100**

*The candidate has to present a complete review paper pertaining to his/her probable research topic and also to submit a hardcopy of the same not exceeding 2000 words.*

**Paper-IV: Seminar Presentation**

**Credits: 06 FM: 100**

*The candidate has to present a paper pertaining to his/her topic of interest in the relevant subject and also to submit a hardcopy of the same not exceeding 1000 words.*