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**COURSE CURRICULUM AND SCHEME OF EXAMINATION**

**For**

**Ph. D. Course (Environmental Science)  
(w.e.f. Academic session-2017-18)**



**Department of Energy and Environmental Sciences  
Chaudhary Devi Lal University  
Sirsa – 125055**

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Dr. P. S. Chauhan

18/11/17

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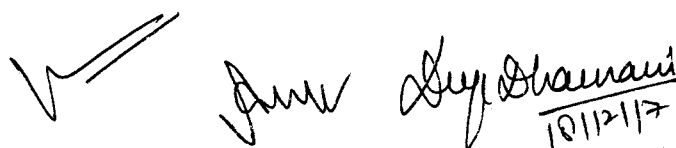

## COURSE CURRICULUM AND SCHEME OF EXAMINATION OF Ph.D. COURSE

S.No.	Course	Subject	Teaching schedule Credit	Examination schedule/marks		Duration of Exam (hrs)
				External	Internal	
1	EES-P171 (Core Compulsory paper)	Research Methodology	4	70	30	3
2	EES-P172 (Core Compulsory paper)	Recent Trends in Environmental Science	4	70	30	3
3.	EES-P173(A) (Core -Elective)	Integrated Environmental Management	4	70	30	3
	EES-P173(B) (Core -Elective)	Environmental Restoration and Management	4	70	30	3
	EES-P173(C) (Core -Elective)	Environmental Microbiology and Biotechnology	4	70	30	3
4	EES- OEC-P004	Environmental issues & Initiatives	2	30	20	2
		Total	14	350		

The department of Energy & Environmental Sciences will offer the following open elective course for the student of other departments of the university

The internal Assessment will be as follows

Theory Courses components	Weightage (4 credits)	Weightage (2 credits)	Evaluation
Mid term	20	10	Internal
Assignment	05	05	Internal
Attendance	05	05	Internal
End term exam	70	30	External
Total	100	50	

  
 Anurag Shrivastava  
 18/12/17  
  
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**EES – P171**  
**RESEARCH METHODOLOGY**

Credits  
4

Time: 3 hrs.  
Max Marks 70

**Note for the Paper setter:** The question paper will consist of nine questions in all. The first question (5X2 =10 marks) will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions (15 marks each) from each of the four units. The candidate is required to attempt four questions of 15 marks each, selecting at least one question of 15 marks from each unit.

**UNIT I**

**Research Methodology:** Meaning and objective of research, motivation in research, types of research, research approaches, significance of research, research methods versus methodology, selecting and defining the research problem, necessity of defining the problem, techniques for defining the problem, concept of plagiarism, types and consequences.

**UNIT II**

**Interpretation and Report writing:** Meaning and necessity of interpretation, techniques and precaution, significance of report writing, different steps in writing reports, layout of the research report, types of report, oral presentation, mechanics and precautions for writing research reports.

**UNIT III**

**Introduction to Statistical Analysis:** Measures of central tendency and dispersion: mean, median, mode, range, mean deviation and standard deviation,  
Regression and Correlation Analysis: Probability and Probability Distribution, Binomial, Poisson distribution, basic idea of testing of hypothesis.

**UNIT IV**

**Multimedia and the Internet:** Internetworking, Connections, Internet Services, The World-Wide-Web and HTML, Dynamic Web pages and XML, Multimedia on the Web; Tools for the World Wide Web: Web Servers, Web Browsers, Web page makers and Site Builders, Plug-ins and Delivery Vehicles: Text, Images, Sound, Animation, Video and presentation.

**Reference books:**

1. Pressman, Software Engineering – A Practitioner's Approach.
2. C.R. Khothari – Research Methodology Methods and techniques – Woshwa Prakashan Publishers – Second Edition.
3. Amos Gilat, MATLAB A Introduction with Applications – Willey student Edition.
4. Multimedia: Making it work – Tay Vaughan – TMH 5<sup>th</sup> edition.
5. J Banks: Discrete Time Simulation & Systems – PHI.

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EES-P172

**RECENT TRENDS IN ENVIRONMENTAL SCIENCE**

Credits  
4

Time: 3 hrs.  
Max Marks 70

**Note for the Paper setter:** The question paper will consist of nine questions in all. The first question (5X2 =10 marks) will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions (15 marks each) from each of the four units. The candidate is required to attempt four questions of 15 marks each, selecting at least one question of 15 marks from each unit.

**UNIT I**

**Environmental problems and challenges:** Drinking water, water table depletion, wastewater, solid waste, air pollution, energy, biodiversity, bioethics, biosafety, IPR, Plagiarism.

**UNIT II**

**Climate change-** History and environmental impacts, Green house effect: phenomenon, Green house gases and its environmental impacts, Global warming-its causes and environmental impacts, Ozone layer depletion-its major threats.

**UNIT III**

**National environmental initiatives:** Drinking water mission, rainwater harvesting initiative, energy conservation strategies- CFL and solar energy initiatives, solid waste management initiatives, Nirmal gram programme, National Afforestation programme, Wetlands conservation Strategy, Biodiversity Indian scenario- In situ and ex-situ conservation initiatives, Gene banks, National parks and sanctuaries, Biosphere reserves, Constitutional provisions for the protection of Environment.

**UNIT IV**

**International environmental initiatives-** The Club of Rome report, Stockholm declaration, Ramsar Convention on wetlands, Outer Space treaty, Vienna convention & Montreal Protocol, Kyoto Protocol, Earth Summit, IPCC, Copenhagen Summit.

**Reference books:**

1. Introduction to environmental engineering and Science-Gillbert Masters
2. Environmental Administration and Law: Paras Diana
3. Natural resources conservation: Oliver Owen and Chiras
4. Living in the environment: T.J. Miller
5. Air pollution control: Rao & Rao
6. Environmental Engineering: Peavy

*VIP*

*Suj. Shanmugam*  
18/11/17

**EES-P173 (A)**  
**INTEGRATED ENVIRONMENTAL MANAGEMENT**

Credits  
4

Time: 3 hrs.  
Max Marks 70

**Note for the Paper setter:** The question paper will consist of nine questions in all. The first question (5X2 =10 marks) will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions (15 marks each) from each of the four units. The candidate is required to attempt four questions of 15 marks each, selecting at least one question of 15 marks from each unit.

**UNIT I**

Energy: renewable and nonrenewable energy sources, their availability and impacts on environment, Energy consumption pattern in India, Rural Energy consumption patterns. Rural Energy Programmes in India-Govt. of India initiatives, performance and achievements, area based programmes and decentralized energy planning, role of field based research.

**UNIT II**

Water and wastewater management: Primary treatment methods-screening, grit removal, primary sedimentation; Secondary treatment methods-activated sludge process, trickling filters, rotating biological contacts, oxidation ponds and lagoons, Advanced waste water treatment methods-removal of nutrients and solids; waste water reuse and sludge disposal, Integrated Watershed management, case study for solving of drinking water problem, case study for solving of waste water problem.

**UNIT III**

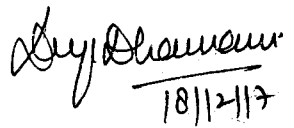
Management of solid waste; e-Waste: CFL, LED, Computer-ware, Mobile and electronic devices,


**UNIT IV**

Case studies: water management practices, solid waste management practices, energy management practices, integrated environmental management practices in domestic sector, agriculture sector, commercial and industrial sector.

**Reference books:**

1. Green to gold, New Delhi, TERI.
2. Hand book on energy audit and environmental management, New Delhi, TERI.
3. Cleaner is cheaper, New Delhi, TERI.
4. Energy efficient buildings in India, New Delhi, TERI.
5. Rural energy matter: the Dhanwas Experience, New Delhi, TERI.
6. Impact of energy development activities and user's needs-a case study, New Delhi, TERI.
7. Environmental Engineering: Peavy.
8. Introduction to Environmental Engineering and science: Gilbert Masters.

  
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**EES- P173(B)**  
**ENVIRONMENTAL RESTORATION AND MANAGEMENT**

Credits  
4

Time: 3 hrs.  
Max Marks 70

**Note for the Paper setter:** The question paper will consist of nine questions in all. The first question (5X2 =10 marks) will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions (15 marks each) from each of the four units. The candidate is required to attempt four questions of 15 marks each, selecting at least one question of 15 marks from each unit.

**UNIT I**

**Environmental Restoration:** Strategies and Processes, Restoration of Mining areas (Physical, Chemical and Biological methods) and degraded soils, Phytoremediation and Bioremediation; Restoration of Eutrophicated Wetlands and Lakes, Integrated Watershed Management,

**UNIT II**

**Trace element pollution of the Environment:** Sources, Sampling of water, air, soil, sediments and other environmental matrices, Approaches to investigate environmental pollution with trace elements by anthropogenic activities: Chemical, Mineralogical, Biological, geochemical and geo-statistical approaches. Chemical Speciation in terrestrial environment – Importance and Analytical methodologies for chemical speciation studies.

**UNIT III**

**Analytical Techniques:** UV-Visible spectrophotometer, Flame photometry, Atomic Absorption spectroscopy, Inductively coupled plasma - Atomic emission spectroscopy (ICP-AES), Gas Liquid chromatography, High Performance Liquid chromatography, X-ray diffraction. Titrimetry: Complexometry, Neutralization titrations, Oxidation-Reduction Titrations.

**UNIT IV**

**Solid Waste Management:** Characterization (Physical and Chemical), Collection, Transportation, Handling, Treatment, Disposal and Recycling, Hospital and e-waste- Management.

**Reference Books:**

1. Environmental Pollution Control Engineering: C.S. Rao
2. Introduction to Environmental Engineering and Science: Gilbert M. Masters
3. Undergraduate Instrumental Analysis by James W. Robinson
4. Ecology, Environment and Resource Conservation: Singh, Singh and Gupta
5. Instrumental Methods of Chemical Analysis: Chatwal and Anand
6. Text Book of Quantitative Chemical Analysis: Mendham, Denny, Barnes and Thomas
7. Limnology: Wetzel

*Dr. Dhananjay*  
18/12/17

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**EES-P173(C)**  
**ENVIRONMENTAL MICROBIOLOGY AND BIOTECHNOLOGY**

Credits  
4

Time: 3 hrs.  
Max Marks 70

**Note for the Paper setter:** The question paper will consist of nine questions in all. The first question (5X2 =10 marks) will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition eight more questions will be set unit-wise comprising of two questions (15 marks each) from each of the four units. The candidate is required to attempt four questions of 15 marks each, selecting at least one question of 15 marks from each unit.

**UNIT I**

Classification, characteristics, occurrence, distribution and ecological importance of microorganism.

**UNIT II**

Soil microorganisms and their interactions. Microbial toxins. Bacterial and fungal diseases of plants, Recombinant (R-DNA) technology and its applications. Role of microbial communities in bio-degradation process. Microbiological management of hazardous waste and wastelands. Genetically engineered microbes and environmental risk.

**UNIT III**

Biosensors. concept. application for detection of various pollutants. Advances in biosensor technology, Bioremediation: Mechanisms & techniques of Bioremediation An Overview on Bioremediation for pollution control of different industries i.e. Distillery industry, Pulp and paper industry. Phytoremediation: Mechanisms & techniques of Phytoremediation.

**UNIT IV**

Application of biotechnological tools in Environment, Agriculture, Pharmaceutical. Food and Forestry, Biotechnological approaches for preserving biodiversity: Gene bank.

**Reference books:**

1. Microbiology – J.G. Black
2. Microbiology-Pelezar
3. Introduction to Microbiology- John L. Ingraham & Catherine L Ingraham
4. Microbial Biotechnology- A.N. Glazer
5. Microbial ecology- R.M. Atlas and Barthas
6. Environmental biotechnology- S.N.J. Jogdanel

*Seyyid Shauhan*  
18/12/17

*VIP*

**OEC-EES- P004**  
**ENVIRONMENTAL ISSUES AND INITIATIVES**

Credits  
2

Time: 2 hrs.  
Max Marks 30

**Note for the Paper setter:** The question paper will consist of three questions in all. The first question (5X2 =10 marks) will be compulsory and will consist of five short questions of 2 marks each covering the whole syllabus. In addition two more questions with internal choice will be set on each of the two units (10 marks each). The candidate is required to attempt one question of 10 marks on each unit.

**UNIT I**

Introduction and significance of global environmental issues. Climate Change, Global warming, Ozone depletion, Sea level rise, melting of glacier, population explosion, environmental pollution types and effects.

**UNIT II**

International organizations and initiatives: UNEP, IPCC, WCI, national organizations and initiatives: MOEF & CC, CSIR, ICAR, ICMR, Non-governmental organizations and initiatives: CSE, CEE, MSSRF, Role of Environmental education in environmental awareness, Role of Society and people in environmental awareness, Role of Mass media in environmental awareness. Tehri movement, Narmada Movement, Chipko Movement.

**Reference Books**

1. Environmental Economics- Charles D Kolstad
2. Environmental Ethics- David R Keller
3. Environmental studies & Ethics- Gouri Suresh
4. Environmental Awareness- Annette Bogler

*Dr. J. S. Choudhary*  
18/12/17

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