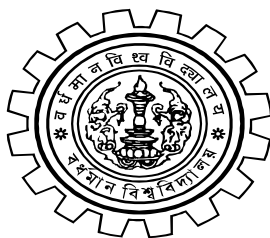


**ENVIRONMENTAL SCIENCE
THE UNIVERSITY OF BURDWAN**



**Ph.D. COURSE WORK SYLLABUS (CBCS)
[w. e. f. 2021]**

**DEPARTMENT OF ENVIRONMENTAL SCIENCE
THE UNIVERSITY OF BURDWAN
BURDWAN-713104**

COURSE STRUCTURE FOR Ph.D. COURSE WORK IN ENVIRONMENTAL SCIENCE

Semester	Course Code	Course Title	Credit Value	Marks Distribution
Semester- I	PHDCW101	Research Methodology	4	50
	PHDCW102	Research and Publication Ethics (RPE)	2	25
	PHDCW103	Compulsory/Optional Paper	4	50
	PHDCW104	Term Paper(s) & Related Seminar Presentation(s)	4	50 (25+25)
	Sub Total			14

PHDCW 101
[Compulsory]
[Research Methodology]

Total Lectures: 60

Credit: 4

I.	Basic Concept on research methodology	[4]
II.	Defining Research Problems	[4]
III.	Research Design	[5]
IV.	Sampling design	[5]
V.	Statistical analysis and processing of experimental data	[6]
VI.	Interpretation and Report Preparation	[5]
VII.	Basic instrumentation techniques	[6]
VIII.	Computer applications on research methodology	[5]
IX.	Developing Research Projects & Proposals	[5]
X.	Geospatial analysis techniques	[8]
XI.	Techniques of EIA and use of computer and expert systems in EIA	[7]

Books Recommended

An Introduction to Mathematical Statistics by Gupta and Kapoor Sultan Chand Publishers, New Delhi.
 Research Methodology — Methods and Techniques by Kothari, C R: New Delhi, Wiley Eastern Ltd., 1990

Quinn, G. and Koegh, M (2002) Experimental design and data analysis for biologist (Cambridge University Press) 537p.

Holmes,D., Moody, P., Diana, D. and Trueman, L (2016) Research methods for the biosciences. 3rd Edition.(Oxford University Press) 488p.

Legendre P. and Legendre, L (2012) Numerical Ecology. (Elsevier) 1006p.

Gotelli, N.J. and Ellison, A,M (2012) A Primer of Ecological Statistics. 2nd edition (Oxford University Press) 614p.

Zar JH (2010) Biostatistical Analysis 5th edition (Pearson Education) 944 p.

PHDCW 102
[Compulsory]
[Research and Publication Ethics (RPE)]

Total Lectures: 30

Credit: 2

I: Philosophy of ethics: Introduction of philosophy: Definition, Nature and scope, concept, branches; Ethics: Definition, moral philosophy, nature of moral judgements and reactions

II: Scientific conduct: Ethics with respect to science and research; Intellectual honesty and research integrity; Scientific misconducts: Falsification and Fabrication, and Plagiarism (FFP); Redundant publications: Duplicate and overlapping publications, Salami Slicing; Selective reporting and mispresentation of data

III: Publication ethics: Publication ethics: Definition, introduction and importance; Best practices/standards setting initiatives and guidelines: COPE, WAME, etc.; Conflicts of interest; Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice-versa, types; Violation of publication ethics, authorship and contributorship; Identification of publication misconduct, complaints and appeals; Predatory publishers and journals

IV: Open access publishing: Open access publications and initiatives; SHERPA/RoMEO online resource to check publisher copyright & self-achieving policies; Software tool to identify predatory publications developed by SPPU; Journal finder/journal suggestion tool viz., ZAME, Elsevier journal Finder, Springer journal suggester, etc.

V: Publication misconduct

A. Group discussion: Subject specific ethical issues, FFP, authorship; Conflicts of interest; Complaints and appeals: Examples and fraud from India and abroad

B. Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools

VI: Databases and research metrics

A. Databases: Indexing databases; Citation databases: Web of science, Scopus, etc.

B. research Metrics: Impact Factor of journal as per journal Citation report, SNIP, SJR, IPP, Cite Score; Metrics: h-index, g index, i10 index, altmetrics

PHDCW 103-1
(Compulsory Optional)

[Ecomodelling, Biofarming, Environmental Chemistry & Ecotoxicology]

Total Lectures: 60		Credit: 4
I.	Quantitative ecological techniques	[6]
II.	Modelling approach in environmental management	[7]
III.	Groundwater geochemistry - Aquifer geochemical system, solution, redox and gas exchange processes; Water-rock interactions	[7]
IV.	Adsorption chemistry	[7]
V.	Green chemistry and environmental protection	[6]
VI.	Biotransformation, detoxification, and biodegradation	[6]
VII.	Biofertilizer, role of plant growth promoting rhizobacteria	[7]
VIII.	Composting and vermicomposting	[7]
IX.	Introduction to Toxicodynamics; Toxicokinetics; Toxicology in the clinical laboratory and safe handling of chemicals	[7]

Books Recommended

Groundwater Geochemistry - Fundamentals and applications to contamination by William J. Deutch; Lewis Publishers, New York, 1997
 Environmental Meteorology - B. Padmanabha Murthy; I.K. International Pvt. Ltd., New Delhi, 2004
 Environmental Biotechnology - S.K. Agarwal; Indian Book Co. 1998
 Environmental Biotechnology: Principals and application by A.M. Chakraborty, M. Moo-Young and W.A. Anderson, 2007

OR

PHDCW 103-2
(Compulsory Optional)

[Environmental Analysis, Management & Toxicology]

Total Lectures: 60		Credit: 4
I.	Fundamental management of mineral biofertilizer	[7]
II.	Fundamentals of environmental chemistry	[5]
III.	Air, water and soil chemistry	[7]
IV.	Instrumental methods on environmental analysis	[7]
V.	Fundamentals of ecotoxicology	[7]
VI.	Interactions and connections of environmental toxicology	[6]
VII.	Mechanism of toxic action	[7]
VIII.	Introduction to Quantitative Structure Activity Relationship (QSAR)	[7]
IX.	Urban air pollution models; Environmental Indices	[7]

Books Recommended

Environmental chemistry By A.K. De; The New Age International Publisher; 6th Ed. 2006
 Environmental Chemistry with Green Chemistry by Asim kr Das; Books and Allied (P) Ltd. 2010
 Environmental Toxicology - Ed. Volume by Jhon H Duffus and Howard G J Worth - RSC Publishing, 2006.
 Molecular Toxicology - 2nd Edition, by P. David Josephy and Bengt Mannervik - Oxford University Press, 2006.
 Introduction to Environmental Toxicology by Wayne G Landi and Ming-Ho Yu - Lewis Publishers, 2004.

Paper – IV: PHDCW 104

Term Papers (two) and Related Presentations

Credit: 4