DEPARTMENT OF ENVIRONMENTAL SCIENCE

University of Kalyani



PROPOSED SYLLABUS FOR Ph.D Course Work in Environmental Science, 2021-2022

University of Kalyani Curriculum of Ph.D Coursework 2021-2022

Paper Code	Name of Paper	Total Marks & Credit Distribution	
	Research Methodology (A)	60 (Term End) + 20 (Internal Assessment) + 20 (Viva-voce)= 100 (4 credits)	
Paper-7(01-RM/A)	Research and Publication Ethics		
	Computer Application		
	Training and Field Work		
Paper-7(02-RM/B)	Research Methodology (B)	60 (Report) + 20 (Presentation) + 20 (Viva-voce) = 100 (4 credits)	
Paper-7(03-ALC/A)	Advanced level course on subject(A) (Subject Specific Components)	60 (Term End) + 20 (Internal Assessment) + 20 (Viva-voce)= 100 (4 credits)	
Paper-7(04-ALC/B)	Advanced level course on subject(B) (Transdisciplinary Components)	60 (Term End) + 20 (Internal Assessment) + 20 (Viva-voce)= 100 (4 credits)	
Total Marks/Credit		400 marks (16 credits)	

Contents for Coursework (Ph.D) 2021-2022

Paper Code	Paper Name	Content	Total Marks & Credit Distribution
Paper- 7(01- RM/A)	Research Methodology (A)	 Group - A (Syllabus for Research Methodology and Statistics): General Track (For all students) Unit 1: Introduction to Research Methodology: Research – Definition, Importance, Characteristics – Types of Research - Research question – Importance of Survey of Literature – formulation of research question and objectives – Formulation of hypothesis – types of hypothesis - Research process – research design – developing a research plan - Types of research methods Unit 2: Types of data - Sources of data - Methods of collecting data – Sampling methods Special Track 1 (For students with basic knowledge): Unit 3: Qualitative Research Methods - Various qualitative research methods – Ethnography, Historical, Narrative, Phenomenological, Case studies, Grounded theory, Content analysis, Framing analysis, Rhetorical analysis, Discourse analysis Unit 4: Quantitative research methods: Frequency distribution – Presentation of data – Descriptive statistics – Correlation analysis Special Track 2 (For students with advanced knowledge): Unit 4: Quantitative research methods: Frequency distribution – Basic Regression analysis – Inference and hypothesis testing 	60(Term End) + 20 (Internal Assessment) + 20 (Viva- voce)= 100 (4 credits)

 GROUP - B (Research Ethics and Research Communication for all students) Unit 1: Ethical Aspects of Undertaking Research Concept of Philosophy, Basic Philosophical Assumption to Social Science Research, Major Philosophis, in Social Science Research, Pailosophi, Approaches to Theory Development in Research Philosophy, Approaches to Theory Development in Research, Ethical Judgements in Research Unit 2: Managing Scientific Conduct Concept of Academic Integrity: Integrity Concepts, Academic integrity; Scientific Misconduct and Research Fraud (Falsification, Fabrication and Plagiarism: FFP): Scientific misconduct, Research Fraud, Intellectual Honesty in Research; Redundant publications: Duplicate and Overlapping publications, Salami Slicing; Sclective Reporting and Misrepresentation of Data: Selective Reporting Misrepresentation of Data Unit 3: Publication Ethics, Research Ethics: Concept and Objectives, Ethics Committee, Managing Publication Ethics through Best Practices Standards: COPE, WAME; Publication & Research Misconduct: Concept of Research Misconduct, Concept of Plagiarism, Nature of Plagiarism, UGC Guidelines on Levels of Plagiarism, Plagiarism, UGC Guidelines on Levels of Plagiarism, Plagiarism, UGC Guidelines on Evels of Plagiarism, Plagiarism, UGC Guideline of Publication Misconduct and Appeal; Concept of Publication Misconduct, Responding to allegations of possible misconduct, Responding to allegations of possible misconduct; Responding to allegations of		1
 Unit 1: Ethical Aspects of Undertaking Research Concept of Philosophy, Basic Philosophics in Social Science Research, Research Philosophy, Approaches to Theory Development in Research, Ethical Judgements in Research Unit 2: Managing Scientific Conduct Concept of Academic Integrity: Integrity Concepts, Academic integrity, Scientific Misconduct and Research Fraud (Falsification, Fabrication and Plagiarism: FFP): Scientific misconduct, Research Fraud, Intellectual Honesty in Research; Redundant publications: Duplicate and Overlapping publications, Salami Slicing; Selective Reporting and Misrepresentation of Data: Selective Reporting, Misrepresentation of Data: Selective Reporting Misrepresentation of Data: Selective Reporting Misrepresentation of Data: Selective Reporting, Misrepresentation of Data: Selective Reporting, Misrepresentation of Data: Selective Reporting, Misrepresentation of Data: Selective Reporting Best Practices Standards: COPE, WAME; Publication & Research Misconduct: Concept of Research Misconduct, Concept of Plagiarism, Nature of Plagiarism, UGC Guidelines on Levels of Plagiarism, Plagiarism : Al vs AI; Plagiarism Detection Software-Selection of Appropriate Software, Violation of Publication Ethics, Authorship and Contributorship - Conflict of Interest; Note on Violation of Publication Ethics, Authorship and Contributorship, Conflict of Interest; Identification of Publication Misconduct and Appeal; Concept of Publication of Productory Journal, Characteristics of a Predatory Journal; Way to Find Predatory Journals and Publishers, Role of Academic Community to Fight Against Predatory Publication Unit 4: Scientific Writing Structure and components of Scientific Reports, Preparation of Projocal, Preparation of	GROUP - B (Research Ethics and Research Communication for all students)	
Unit 2: Managing Scientific ConductConcept of Academic Integrity: Integrity Concepts, Academic integrity; Scientific Misconduct and Research Fraud (Falsification, Fabrication and Plagiarism: FFP): Scientific misconduct, Research Fraud, Intellectual Honesty in Research; Redundant publications: Duplicate and Overlapping publications, Salami Slicing; Selective Reporting and Misrepresentation of Data: Selective Reporting Misrepresentation of DataUnit 3: Publication Ethics Concept of Publication Ethics, Research Ethics: Concept and Objectives, Ethics Committee, Managing Publication Ethics through Best Practices Standards: COPE, WAME; Publication & Research Misconduct: Concept of Plagiarism, Nature of Plagiarism, UGC Guidelines on Levels of Plagiarism, Plagiarism : AI vs AI; Plagiarism Detection Software-Selection of Appropriate Software, Violation of Publication Ethics, Authorship and Contributorship - Conflict of Interest; Note on Violation of Publication Ethics, Authorship and Contributorship, Conflict of Interest; Identification of Publication Misconduct and Appeal; Concept of Publication Misconduct; Predatory Journal, Appeal; Concept of Publication Misconduct; Predatory Journal, Characteristics of a Predatory Journal; Way to Find Predatory Journals and Publishers; Role of Academic Community to Fight Against Predatory PublicationUnit 4: Scientific Writing Structure and components of Scientific Reports, Preparation of Project Proposal, Preparation of manuscript for Seminar Presentation and Publication of Research paper, Components of Doctoral Thesis, Footnotes and Referencing Styles.	Unit 1: Ethical Aspects of Undertaking Research Concept of Philosophy, Basic Philosophical Assumption to Social Science Research, Major Philosophies in Social Science Research, Research Philosophy, Approaches to Theory Development in Research, Ethical Judgements in Research	
 Unit 3: Publication Ethics Concept of Publication Ethics, Research Ethics: Concept and Objectives, Ethics Committee, Managing Publication Ethics through Best Practices Standards: COPE, WAME; Publication & Research Misconduct: Concept of Research Misconduct, Concept of Plagiarism, Nature of Plagiarism, UGC Guidelines on Levels of Plagiarism, Plagiarism : AI vs AI; Plagiarism Detection Software-Selection of Appropriate Software, Violation of Publication Ethics, Authorship and Contributorship - Conflict of Interest: Note on Violation of Publication Ethics, Authorship and Contributorship, Conflict of Interest; Identification of Publication Misconduct, Responding to allegations of possible misconduct; Predatory Journals and Publishers: Backdrop, Meaning of Predatory Journal, Characteristics of a Predatory Journal; Way to Find Predatory Journals and Publishers, Role of Academic Community to Fight Against Predatory Publication Unit 4: Scientific Writing Structure and components of Scientific Reports, Preparation of Project Proposal, Preparation of manuscript for Seminar Presentation and Publication of Research paper, Components of Doctoral Thesis, Footnotes and Referencing Styles. 	Unit 2: Managing Scientific Conduct Concept of Academic Integrity: Integrity Concepts, Academic integrity; Scientific Misconduct and Research Fraud (Falsification, Fabrication and Plagiarism: FFP): Scientific misconduct, Research Fraud, Intellectual Honesty in Research; Redundant publications: Duplicate and Overlapping publications, Salami Slicing; Selective Reporting and Misrepresentation of Data: Selective Reporting, Misrepresentation of Data	
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		 Group – C (Syllabus for Computer Applications) General Track (For all students) Technology and Tools for Research: Brief description of Computer Hardware & Software; Preliminary knowledge of Computer Technology, Peripheral devices and their uses; Preliminary knowledge of Operating Systems; Basics of Word processing, spreadsheet and slides preparation (offline and cloud-based software). Literature search: Search techniques, search strategies, search tools; Open Access (OA) resources - Open Access Vs Toll Access, OA types, OA services; Open Access path finder services. Tools for literature review: Use of citation/reference networks in literature review; Tools and Techniques for literature review; AI based literature review. 	
		 Special Track 1 (For students with basic computer knowledge) Office Tools & Technology : Office document Management, Typesetting, Use of office Tools, Use of layout software, Preparation of Power Point Presentation, Table Management and basic calculations using Excel/other spreadsheet programs; Use of Internet; Digital Access Brokers. Special Track 2 (For students with advanced computer knowledge) Data Science & Statistical Tools: Statistical packages (R, SPSS etc.), Statistical Computing, Internet Technology and its Internal Architecture; Advanced Spreadsheet operations; Document and slides preparation in LaTeX; Digital Access Brokers; Data Wrangling Tools & Techniques. 	
		Training and Field Work : As per University Guidelines	
Paper- 7(02- RM/B)	Research Methodology (B)	Review of Published Research, Documentation/ Submission of Reports on Review Work and Presentation.	60(Report)+ 20(Presenta tion) +20 (Viva-voce) =100 (4 credits)

Paper- 7(03- ALC/A)	Advanced level course on subject (A) (Subject Specific Components)	 A) Analytical Techniques: Accuracy, Precision, Calibration, Method optimization; Interpretation of analytical data / results; Sampling Techniques - collection, treatment, preservation; Microbial Techniques, Microscopy; Titrimetry, Gravimetry, Nephelometry, Turbidimetry, Chromatographic Techniques, Gas Chromatography, Ion Chromatography, HPLC, Spectroscopy, Gel Electrophoresis, Mass Spectrometry, LCMS, GCMS etc. B) Instrument: Principles, Procedure and Applications: Petrological Microscope, Spectrophotometer, Flame Photometer, Atomic Absorption Spectrophotometer, Gas Chromatograph, Ion Chromatograph, High Volume Sampler, Spectrofluorimeter, Fluorescent Microscope, Inductively Coupled Plasma Mass Spectrometer, XRD, XRF etc. C) Spatial Technologies: Principles of Remote Sensing and GIS, Satellite Imagery, Toposheet Interpretation, Thematic Map Creation and GIS Analysis, Digital Image Processing (DIP) including Band Ratioing, Filtering using Filter Kernels and Image Classification, use of GIS Software 	60(Term End) + 20 (Internal Assessment) + 20 (Viva- voce)= 100 (4 credits)
Paper- 7(04- ALC/B)	Advanced level course on subject (B) (Transdisciplinary Components)	 Environmental Quality Monitoring and Management: A) Ecology and Environment; Air, Water and Soil Quality Monitoring, Pollution Studies, Toxicology, Waste Management and Waste Valorization, Remediation Techniques, Adsorption and Degradation studies of emerging contaminants, Thermodynamic and Kinetic studies, Green Synthesis and Bioprospecting, Development of Chemo-sensor and Application, Nano Technology and Applications, Statistical Analysis B) An overview of Sediment Water Interface, Concept of Scale and Creation of Thematic Maps, land Use study and Environment, water resource management, Remote Sensing (RS) and Geographical Information System (GIS) applications in environment C) Geo-Environmental control on pollutants spreading, creating human health hazards 	60(Term End) + 20 (Internal Assessment) + 20 (Viva- voce)= 100 (4 credits)