

**Syllabus**  
**For**  
**Research Entrance Test (RET)**  
**in Ecological Studies**

**2021**



**Department of Ecological Studies**

**Faculty of Science**

**University of Kalyani**

**Kalyani- 741235, West Bengal**

**Syllabus**  
**for**  
**Research Entrance Test (RET) in Ecological Studies**

## **Group A: Research Methodology**

### **1. Research Formulation**

Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research.

Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis

### **2. Data Collection and Analysis**

Execution of the research - Observation and Collection of data - Methods of data collection – Sampling Methods- Data Processing and Analysis strategies with statically package (SPSS for student t-test, ANOVA, etc.), hypothesis testing

### **3. Reporting, Thesis Writing and Scholarly Publication**

Structure and components of reports - Types of report – Technical reports and thesis – significance – different steps in the preparation – layout, structure and language of typical reports, illustrations and tables, bibliography, referencing and footnotes, Scholarly publishing-concept and design of research paper, citation and acknowledgement, plagiarism, journals, and impact factors

### **4. Research Ethics and Intellectual Property Rights (IPR)**

Ethics-ethical issues, ethical committees (human & animal); intellectual property rights (IPR) and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS)

## **Group B: Environmental Management**

### **1. Fundamentals of Environment and Ecology**

Life and Environment, Environmental Systems, Ecosystem, Biogeochemical Cycles, Population Ecology, Community Ecology

### **2. Fundamentals of Environmental Management and Environmental Economics**

Environmental Management, Principles of Management, Environmental Economics, Environmental Economics and Market Mechanisms, Environmental Taxes and Policies

### **3. Environmental Pollution and Management**

Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, Bio-pollution, Radiation pollution

### **4. Environmental Toxicology and Health**

Introduction to Environmental Toxicology, Toxic Metals and Metalloids, Fluoride and Nitrate, Pesticides, Emerging Contaminants, Genotoxic Agents, Occupational Health, Case Studies of Toxicological Disasters

### **5. Natural Resource Management**

Basics of Natural Resources, Energy Management, Management of Water Resources, Management of Coastal and Marine Resources, Management of Soil and Land Resources, Wetland Management and Conservation

## **6. Bioresource Management**

Basics of Bioresources, Conservation and management: Human Resource, Animal Resources Biodiversity, Forest and Wildlife

## **7. Environmental Management Tools**

Environmental Management Tools, Environmental Impact Assessment (EIA), Environment Management System (EMS), Life Cycle Assessment (LCA), Green Accounting and Reporting, Case Studies

## **8. Waste Management**

Introduction to wastes; management of municipal solid wastes, industrial wastes, wastewater, hazardous wastes, biomedical wastes and radioactive wastes

## **9. Interdisciplinary Environmental Approaches**

Environmental Biotechnology, Environmental Microbiology, Green Chemistry and Green Technology, Geoinformatics, Environmental Analytical Methods & Tools

## **10. Sustainable Development**

Perspectives of Sustainable Development, Sustainable Agriculture, Sustainable Aquaculture and Fisheries, Habitat Restoration, Sustainable Tourism.

## **11. Planning and Management of Water Resource**

Hydrological Concepts, Surface Water Resources, Groundwater/Sub-surface water hydrology, Water resource: evaluation, management and National Policies.

## **12. Ecological Engineering and Eco-sanitation**

Ecological Engineering: Concepts and principles Urban Development, Wastewater Management, Agro-ecological Engineering, Ecological Modeling, Ecological Sanitation

## **13. Climate Change**

Basic concepts of weather and climate, Greenhouse Effect and Global warming, Ozone Layer Depletion, Impacts of Global Warming and Climate Change, Climate Change Mitigation and Adaptation, Policy Perspectives

## **14. Disaster Management**

Introduction to Natural Disaster, Earthquakes, Volcanism, Slope instability/Mass wasting, Riverine Floods, Coastal & Marine Hazards, Drought / Desertification, Natural Disaster Management & Preparedness

## **15. Environment Related Acts and Rules**

The Environment (Protection) Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and Control of Pollution) Act, 1974; The Biodiversity Diversity Act, 2002; Forest (Conservation) Act, 1980; Wildlife Protection Act, 1972; Municipal Solid Wastes (Management and Handling) Rules, 2000; Hazardous Wastes (Management and Handling) Rules, 1989; Bio-medical Wastes (Management and Handling) Rules, 1998.

## Suggested Reading

### Group A

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K (2002). An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R. (1990). Research Methodology: Methods and Techniques. New Age International. 418p.
3. Sinha, S.C. and Dhiman, A.K. (2002). Research Methodology, Ess Ess Publications. 2 volumes.
4. Trochim, W.M.K. (2005). Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
5. Wadehra, B.L. (2000). Law relating to patents, trade mark, copyright designs and geographical indications. Universal Law Publishing.
6. Best J.W. and Kahn J.V. (1998). Research in Education Prentice-Hall of India private Limited, New Delhi
7. Ahuja, R. (2001). Research Methods. Rawat Publications
8. Hanahan, D.D. (2009). Introduction to Applied Statistics. Narosa Publishing House
9. Sachdeva, J.K. (2014). Business Research Methodology- Himalaya Publishing House
10. Banerjee, P.K. (2007). Introduction to Biostatistics S.Chand & Company Ltd., New Delhi
11. Blaesild, P. and Granfeldt, J. (2002). Statistics with Applications in Biology and Geology Chapman & Hall/ CRC Press

### Group B

1. Begon, M., Harper, JL & Townsend, CR. (2006). Ecology (Blackwell)
2. Odum, E.P.& Barrett, G.W. (2006). Fundamentals of Ecology (Cengage)
3. Botkin, DB& Keller, EA (2014).Environmental Science (John Wiley & Sons)
4. Chiras, D.D. (2012). Environmental Science (Jones &Barlett)
5. Cunningham et al. (2003). Environmental Science. (McGraw Hill )
6. Santra, S.C. (2010).Environmental Science. (NCBA)
7. Krishnamoorthy, B. (2009). Environmental Management (PHI)
8. Kulkarni, V.&T.V. Ramachandra (2006). Environmental Management (Capital)
9. Agarwal, S.K. (2005). Environmental Management (APH Publishing)
10. Agarwal, S.K (2001). Ecoinformatics (Vol I-IV) (APH Publishing)
11. Saxena, HM (2010).Environmental Management (Rawat).
12. Asolekar&Gopichandran (2005). Preventive Environmental Management (CUP)
13. Welford (2009). Corporate Environmental Management (Universities Press)
14. Shastri, S.C. (2015). Environmental Law (Eastern Book Company)
15. Mitchell, B. and Jacob, J. (2013). Resource and Environmental Management
16. Sengupta, R. (2001). Ecology and Economics (OUP).
17. Sankar, U. (2001). Environmental Economics (OUP).
18. Kolstad, C.D. (2000). Environmental Economics (OUP).
19. Sahu, N.C. & A.K. Choudhury (Eds 2005). Dimensions of Environmental and Ecological Economics (Universities Press).
20. Mitsch, W.J. &S. Jorgensen (2004). Ecological Engineering and Ecosystem Restoration (John Wiley & Sons)
21. Valdiya, KS (2004). Coping with Natural Hazards (Orient Longman).
22. Mitsch, W.J. & J.E. Gosselink (2015) Wetlands (John Wiley & Sons)
23. Masters, GM (2008).. Introduction to Environmental Engineering & Science (Prentice Hall).
24. Keddy, PA (2010). Wetland Ecology. (Cambridge University Press)
25. Manahan, SE (2006). Environmental Science and Technology (Taylor & Francis).
26. Manahan, SE (2009). Environmental Chemistry (CRC Press).
27. Dew, A.K. (2000). Environmental Chemistry (New Age International)
28. Banerjee, BP (2005). Handbook of Energy and Environment in India (OUP).
29. Negi, S.S. India's Forests: Forestry & Wild Life (Indus Pub.)
30. Parekh,JK and H. Datye(2003). Sustainable Management of Wetlands (Sage).
31. Klaassen et al. (2007) Casarett&Doull's Toxicology: The Basic Science of Poisons (McGraw Hill).
32. Yu.M.-H. (2011) Environmental Toxicology (CRC Press).
33. Hodgson, E. (2004). A Text Book of Modern Toxicology (Wiley Interscience)
34. Pandey, K., JP Shukla and SP Trivedi (2011) Fundamentals of Toxicology (NCBA).
35. Banerjee, G.C. (1998) Animal Husbandry (Oxford-IBH)
36. Eaton, E. and MAH Franson (2005). Standard Methods for the Examination of Water & Wastewater. American Public Health Association

37. Sawyer, CN, PL McCarty and GF Parkin (2003). Chemistry for Environmental Engineering and Science. (Tata McGraw-Hill)
38. Trivedy, R.K. & P.K. Goel (1987) Practical Methods in Ecology and Environment (EnviroMedia).
39. Pelczar, MJ, ECCS Chan and NR Krieg (1993) Microbiology (McGraw Hill)
40. Atlas, R.M. (1988). Microbiology: Fundamentals and Applications (Macmillan).
41. Scragg, A. (2014). Environmental Biotechnology (OUP)
42. Chatterjee (2007). Introduction to Environmental Biotechnology (PHI).
43. Rittman & McCarty. (2000). Environmental Biotechnology (McGraw Hill)
44. Biswas, A. (1997). Water Resources: Environmental Planning, Management and Development (McGraw Hill)
45. Tchobanoglous et al. (2003). Wastewater Engineering: Treatment and Reuse (McGraw Hill)
46. Jeffries, M. (1997) Biodiversity and Conservation (Routledge)
47. Maity, P. & Maity, P. (2011) Biodiversity. (PHI)
48. Canter, C.L. (1996). Environmental Impact Assessment (McGraw Hill)
49. Brady, N.C. (2008) Nature and Properties of Soils (Pearson)
50. Weiner, RF and R. Matthews (2003). Environmental Engineering (Elsevier)
51. Shah, M., Couto, S. R. & Biswas, J.K.. (Eds) (2021). An Innovative Role of Biofiltration in Waste Water Treatment Plants. (Elsevier)
52. Shah, M., Couto, S. R. & Biswas, J.K. (Eds) (2021). Development in Wastewater Treatment Research and Processes: Removal of Emerging Contaminants from Wastewater through Bio-Nanotechnology (Elsevier)
53. Shah, M. Couto, S. R. Vargas-De-La-Cruz and Biswas, J.K. (Eds) (2021). An Integration of Phycoremediation Processes in Wastewater Treatment. (Elsevier)
54. Rai, M. & Biswas, J.K. (Eds) (2018). Nanomaterials: Ecotoxicity, Safety and Public Perception (Springer Nature)