

SYLLABUS

**M. Phil / Ph.D Course Work
for**

E.P. Odum School of Environmental Sciences



**Department of Ecology and Environmental Science
Assam University, Silchar
Year-2020**

	Name(s) of Paper	Credits	Full mark	Pass mark
Course I (ECMP-501)	Research and Publication Ethics	2	100	50
Course II (ECMP-502)	Research Methodology	4	100	50
Course III (ECMP-503)	Department Level Methodology	4	100	50
Course IV (ECMP-504)	Term Paper	6	100	50

For ECMP 501, 502 and 503

- Each of the paper is having 4(four) units.
- Candidates are to answer five questions, taking at least one from each unit.
- All questions are of equal value (20 marks). However, these 20 marks may be divided in to two halves, each carrying 10 marks.
- 6-8 questions may be set for each paper.

ECMP -501: Research and Publication Ethics (2 credit)

Unit-I (Publication ethics)

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

Unit-II (Philosophy, ethics and scientific conduct)

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions
3. Ethics with respect to science and research
4. Intellectual honesty and research integrity
5. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
6. Redundant publications: duplicate and overlapping publications, salami slicing
7. Selective reporting and misrepresentation of data

Unit-III: (Publication misconduct)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: Examples and fraud from India and abroad
4. Use of plagiarism software like Turnitin, Urkund and other open source software tools

Unit-IV: (Databases, research metrics and open access publishing)

1. Databases: Indexing databases; Citation databases: Web of Science, Scopus, etc.
2. Research metrics: Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score; Metrics: h-index, g index, i IO index, altmetrics.
3. Open access publishing: Open access publications and initiatives, SHERP AIRoMEO online resource to check publisher copyright & self-archiving policies, Software tool to identify predatory publications developed by SPPU, Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

Suggested readings:

1. Cooper, H. (2016). Ethical choices in research: Managing data, writing reports, and publishing results in the social sciences. American Psychological Association.

2. Resnik, D. B. (2005). *The ethics of science: An introduction*. Routledge.
3. Reiss, M. J. (1999). Teaching ethics in science. *Studies in Science Education* 34: 115-140.
4. Rollin, B. E. (2006). *Science and ethics*. Cambridge University Press.
5. Biagioli, M., Kenney, M., Martin, B. R., & Walsh, J. P. (2019). Academic misconduct, misrepresentation and gaming: A reassessment. *Research Policy* 48(2): 401–413.
6. Edwards, M. A., & Roy, S. (2017). Academic research in the 21st century: Maintaining scientific integrity in a climate of perverse incentives and hypercompetition. *Environmental engineering science* 34(1): 51-61.
7. Stretton, S., Bramich, N. J., Keys, J. R., Monk, J. A., Ely, J. A., Haley, C., ... & Woolley, K. L. (2012). Publication misconduct and plagiarism retractions: a systematic, retrospective study. *Current medical research and opinion* 28(10): 1575-1583.
8. Doherty, M. (1996). The misconduct of redundant publication. *Annals of the rheumatic diseases* 55(11): 783.
9. Laakso, M., Welling, P., Bukvova, H., Nyman, L., Björk, B. C., & Hedlund, T. (2011). The development of open access journal publishing from 1993 to 2009. *PloS one* 6(6): e20961.
10. Knoll, J. L. (2014). Open access journals and forensic publishing. *Journal of the American Academy of Psychiatry and the Law Online* 42(3): 315-321.
11. Ceri, S., Tanaka, K., & Tsur, S. (1993). *Deductive and Object-Oriented Databases: Third International Conference, DOOD'93, Phoenix, Arizona, USA, December 6-8, 1993. Proceedings (Vol. 760)*. Springer Science & Business Media.
12. Moed, H. F. (2007). The future of research evaluation rests with an intelligent combination of advanced metrics and transparent peer review. *Science and Public Policy* 34(8): 575-583.
13. Das, A. K. (2015). *Research evaluation metrics (Vol. 4)*. UNESCO Publishing.

ECMP-502: Research Methodology (4 credit)

Unit-I (Important tools in research)

1. Methods of acquiring knowledge: traditional, empirical, etc.
2. Role of assumption, construct, law, theory, hypothesis, deductive, inductive reasoning, logical fallacies, analytical and synthetical thinking
3. Types of research: basic research, applied research, action research
4. Methods of research: theoretical, field-based, experimental and analytical; data mining

Unit-II (General methodological approaches in research)

1. Research problem selection, research objective and statement of the problem
2. Research proposal designing and formulation, review of literature, citing of references
3. Sampling strategy and methodology for socio-economic analysis
4. Statistical techniques in research
5. Ecological scaling

Unit-III: (Instrumentation)

1. Principles and applications of Spectrophotometry
2. Principles and applications of Chromatography, GC-MS
3. Principles and applications of atomic absorption spectrometry
4. Scanning and transmission electron microscopy: principles and sample preparation techniques

Unit-IV: (Techniques in Ecology & Environmental Science)

1. Wetland vegetation sampling, boundary delineation, mapping and conservation techniques
2. Conservation and eco-restoration of wetlands for climate change mitigation and adaptation
3. Mass cultures of microalgae and sea weed
4. Techniques for immobilisation of enzymes and algae
5. Techniques in bioaccumulation and bioremediation studies
6. Carbon management for carbon market
7. Meteorological tools in environmental science

Suggested readings:

1. Burns, R.B. (2000) *Introduction to Research methods*, New Delhi, Sage Publication.

2. Cochran, W.G and M.G. Cox (1946) *Experimental designs*. John Wiley & Sons, New York.
3. De, A.K (2010) *Environmental Chemistry (7th Edition)*. New Age International Publishers Pvt. Ltd.
4. Dubey, R. C. (1998), *A textbook of Biotechnology*, S Chand & Co., New Delhi
5. Fisher, R.A. (1935) *The design of experiments*. Oliver and Boyd, London.
6. Kothari C.K. (2014), *Research methodology- Methods and Techniques (3rd Edition)* (New Age International, New Delhi).
7. Montgomery, Douglas C. (2007), *Design and analysis of experiments (5th Edition)* Wiley India.
8. Singh, B. D.(2006), *Biotechnology*, Kalyani Publishers, Ludhiana
9. Tiner, R.W. (1999) *Wetland Indicators; A guide to wetland identification, delineation classification and mapping*. CRC Lewis Publisher.
10. Zar, J.H. (2010) *Biostatistical analysis (5th Edition)* Pearson Education.

**ECMP- 503: Department level methodology (2 credit)
+ Research area specific (2 credit) (=4 credit)**

Unit-I (Forest and agricultural systems and their management)

1. Methods of sampling terrestrial vegetation
2. Sampling techniques in pest management studies and integrated pest management
3. Methods for studying phenology of trees
4. Land use change and its implications for ecosystem carbon balance
5. Agroforestry systems for improving nutrient recycling and soil fertility on degraded lands
6. Net ecosystem production and ecosystem carbon management
7. Conservation agriculture, soil organic matter and Phyto-occluded carbon sequestration

Unit-II (Soil ecosystem and its management)

1. Methods of studying physico-chemical properties of soil
2. Extraction of soil fauna
3. Measurement of microbial diversity and culture techniques
4. Role of soil inhabiting micro-arthropods in nutrient management
5. Methods of studying physico-chemical properties of sediments
6. Plant functional traits, soil organic matter and soil carbon sequestration

Unit-III (Aquatic ecosystem and its management)

1. Methods of studying physico-chemical properties of water
2. Methods for obtaining value added products (VAPs) from algae.
3. Rapid assessment approaches to biomonitoring of water using benthic macro-invertebrates
4. Methods for studying zooplankton communities
5. Surface and ground water resource management
6. Recent advances in watershed management

Unit-IV (Wildlife conservation and ethnobiology)

1. Herpetology: Methods of collection-tools and techniques, morphometric studies, studies of feeding behaviour
2. Census and monitoring technique for wildlife population, Ecological indices
3. Wildlife diseases
4. Tools for wildlife study
5. Ethnobiology in biodiversity management
6. Methods of ethnobotanical study and drug discovery

Suggested readings:

1. Alcock, J. (1989) *Animal Behavior: An Evolutionary Approach*. Fourth Edition. Sinauer Associates, Inc. Sunderland, Massachusetts.
2. Allen, S.E (ed.) (1989) *Chemical analysis of Ecological Materials* (second edition) Blackwell Scientific Publications.
3. Anderson, J.M. and Ingram, J.S.I (1993) *Tropical Soil Biology and Fertility: A Handbook of Methods*, 2nd Edition. CAB International Wallingford, U.K.
4. Anonymous (1989) *Wildlife Management Techniques*. ed. R.N. Giles, The Wildlife Society, Washington DC.
5. Anonymous (1972) *Plant Pathologists Pocket Book*. Commonwealth Mycological institute, Kew, Surrey, England.
6. Balick, M.J. (1994) Drug Development and Biodiversity conservation and exploring the linkages. *Ethnobotany and search for new drugs*. John Wiley & Sons Ltd., Chichester.
7. Becker, E.W. (1994) *Microalgae: biotechnology and microbiology*, Cambridge University Press, Cambridge.
8. Darley, W.H. (1982) *Algal Biology: A Physiological Approach*. Blackwell Scientific Publication Oxford.
9. Das, A.K., Ranjana, R., Khatoon, R. & Singh, P.K. (2017) *Glimpses of Ethnobotany & Medicinal Plants of Manipur, N. E. India*. Deep Publication, New Delhi.
10. De, A.K (2010) *Environmental Chemistry* (7th Edn). New Age International Publishers Pvt. Ltd.
11. Dent, M.K. (1997) *Methods in Ecological and Agricultural Entomology*, CAB International Wallingford, U.K.
12. Dhingra, O.D. and J.B. Sinclair, (1995) *Basic Plant Pathology Methods*. CRC Lewis Publishers.
13. Duellman, W.E. and L. Trueb (1994) *Biology of Amphibia*. The John Hopkins Univ. Press.
14. Hudson, I.L. and Keatley, M.R. (2010) *Phenological Research: Methods for Environmental and Climate Change Analysis*. Springer.
15. Hynes, H.B.N (1974) *The Biology of Polluted Waters*. Liverpool University Press.
16. Jain S.K. (1987) *A Manual of Ethnobotany*. Scientific Publishers. Jodhpur.
17. Marr, I. L. and M. S. Cressor. (1983) *Environmental Chemical Analysis*. International Textbook Co. Glasgow.

18. Martin, P. and B. Patrick (1988) *Measuring Behaviour: An Introductory Guide*. Cambridge University Press. Cambridge.
19. Martin, G.J. (1995) *Ethnobotany: A methods manual*. Chapman & Hall, London.
20. Mueller Dombois & H. Ellenberg (1974) *Aims & Methods of Vegetation Ecology* John, Wiley & Sons.
21. Negi S.S. (1991) *Handbook of National Parks, Sanctuaries and B.R. in India*. Indus Publishing Co. New Delhi
22. Pedigo, L. (1996) *Entomology and Pest Management*. Prentice Hall.
23. Price, P.W. (1975) *Insect Ecology*. Jon Wiley and Sons.
24. Ramesh, R. and Anbu, M. (1996) *Chemical Methods for Environmental Analysis – water and sediment*. Macmillan India Limited.
25. Resh V. H. and D. M. Rosenberg. (1984) *Ecology of Aquatic Insects* Praeger
26. Rosenberg D. M. and Resh V. H. (1993) *Freshwater biomonitoring and benthic macroinvertebrates*. Chapman and Hall, Inc.
27. Schwartz M.D. (2003) *Phenology: An Integrative Environmental Science*. Springer
28. Singh S.K. (2005) *Text Book of Wildlife Management*. International Book Distributing Co. New Delhi
29. Subba Rao N.S. (1986) *Soil Microorganisms and Plant Growth*, Oxford and IBH Publishing Co. Ltd.
30. Wiersma, G.B (Ed.)(2004) *Environmental Monitoring*. CRC Press.
31. <http://ifs.nic.in/rt/main/course/wildlife-census.pdf>.

ECMP- 504: Term Paper (6 credit)

Term paper is to be assigned in the beginning of the semester to each Ph.D. student for its submission to the Department. The paper may be prepared with an aim to coverage to research title for registration.