MANGALORE UNIVERSITY

DEPARTMENT OF BIOSCIENCES

PhD ENVIRONMENTAL SCIENCE

PAPER I –RESEARCH METHODOLOGY

60 hrs (15hrs/unit)

Course Outcomes:

CO1 Understand the concept of research including advanced literature survey methods.
CO2 Understand the principles, instrumentation, working and applications of different instruments.
CO3 Describe the role of microorganisms in the abatement of pollutants.
CO4 Discuss advanced technology for soil analysis.
CO5 Describe bio-statistical methods and statistical packages.

Unit 1: Basic research concepts

Identification of research problem: Methods of review of literature, data collection, preservation and analysis, method of writing research paper, project report and thesis.

Plagiarism, Shodhganga, Laboratory and personnel safety measures: good laboratory practices. guidelines and ethics in animal experimentation: CPCSEA Guidelines and IAEC – Rules and regulations for breeding and maintenance of small laboratory animals; Human ethical Committee.

Unit 2: Principles of instrumental analysis

Instrumental methods of Analysis: Principles, instrumentation, working and applications of UV-visible, Infrared, Atomic absorption spectrophotometry, Flame emission spectrophotometry, Nephelometry, Turbidimetry, Thermogravimetry, Radio analytical techniques, Conductometry, Potentiometry, Polarography, Gas chromatography, flourmetry, HPLC and Ion-exchange chromatography.

Unit 3: Analytical techniques

Biological analysis: Selection of sampling sites, quantitative analysis of plant communities, quadrate method, transect method, loop method, pointless or point method, Staining techniques for identification of Microorganisms. Isolation and characterization microorganisms. Advanced methods for maintenance of pure culture. Screening of potential isolates of bacteria and fungi for the abatement of pollutants. Microtome-preparation of samples, fixation, embedding and preparation of blocks, microslide preparation and staining techniques.

Soil analysis: Determination of particle size distribution and their bulk density, determination of nutrients in soil. Wastewater treatment using advanced techniques – catalytic treatment, membrane treatment, field study for identifying the contour and drainage systems, mapping

of an area using remote sensing, evaluation of satellite image, approach of GIS for environmental management.

Unit 4: Bio-statistical methods

Graphical representation, mean,standard deviation, standard error. Theory of probability, normal distribution, parametric and non-parametric tests, independent/repeated measures design. Students t-test. Analysis of variance (ANOVA, ANCOVA, MANOVA). Statistical packages.

References:

1) Beven, K., 2002. Rainfall-Runoff Modeling: The Primer.
2) Gurumani, N. 2006. Research Methodology for Biological Sciences, MJP Publishers, Chennai.
3) Jan A Pechenik, 1987. A Short Guide to Writing about Biology Little, Brown and Company, Boston, Toronto.
4) Janathan Anderson, Berry, H. Durston and Millicent Poole, 1987. Thesis and Assignment Writing, Wiley Eastern Limited.
5) Jane Roskams and Linda Rodgers, 2004. Lab Ref-A Handbook of Recipes, Reagents and other Reference Tools for use at the Bench,I.K. International Pvt. Ltd., New Delhi
6) John W. Best, 1983. Research in Education, Fourth Edition, Prantice Hall of India Pvt. Ltd., New Delhi.
7) Joseph Gibaldi and Walter S. Achtert, MLA. 1989. Handbook for Writers of Research Papers, Third Edition, Wiley Eastern Limited, New Delhi
8) Karp, G. 1999. Cell and Molecular Biology – Concepts and Experiments. (Ed. JohnWiley& Sons, New York.
9) Ketan Tatu, 1999. Remote sensing for Wetland monitoring & Waterfowl Habitat Management.
10) Khan and Irfan, 1994. Fundamentals of Biostatistics, Ukaae Publication, Hyderabad.
11) Khopkar, S.N. 1988. Basic Concepts of Analytical Chemistry. II Edition, New Age Publishers.
12) Newbury Dale, E. 1988. Advanced Electron Microscopy and x-Ray Microanalysis. Plenum Publishers, New York.
13) Rastogi, V.B. 2006. Fundamentals of Biostatistics. Ane Book India, New Delhi.
14) Robert A. Day, 1983. How to Write and Publish a Scientific Paper, First Indian Edition, 1983, Vikas Publishing House Pvt. Ltd., New Delhi
15) Satguru Prasad, 1995. Fundamentals of Biostatistics (Biometry), EMKAY Publications, New Delhi, University Press, New York.
16) http://shodhganga.inflibnet.ac.in