

Ph.D., SEMESTER I

PAPER – BOT 701
RESEARCH METHODOLOGY

Examination Marks: 75
Assignment Marks: 25
Total Marks: 100
Pass marks: 50%

An overview of research methodology: Research Concept, Steps involved, Identification, selection and formulation of research problem, justification, hypothesis; Literature collection- textual and digital resources (internet).

Research design, data collection and interpretation: Research design; Sampling techniques, Collection and documentation, presentation, analysis and interpretation of data.

Statistical analysis of data: Measurement of central tendency- Mean, median, mode; Measures of dispersion- Range, variance, standard deviation; Correlation coefficient, types of correlation, regression equation, biological significance of correlation and regression; Test of significance, -chi-square test, analysis of variance, DMRT.

Scientific writing: Forms of scientific writing- Article, notes, reports, review article, monographs, dissertations, popular science articles, bibliographies.

Formulation of outlines- Outline preparation, drafting title, sub titles, tables, illustrations; Formatting tables- title, body footnotes; Figures & graphs- structure, title and legends.

Computer application: MS office, excel, power point, graphics (Sigma plot), statistical software (spss), Principal and applications of GIS & Remote sensing, remote sensing software.

Note: While setting the questions, paper setter may take care to cover entire part of paper. Ten (10) questions are to be set out of which students have to answer any five (5) questions.

Assignment:

An assignment of twenty five marks will be carried out by students for reviewing of published research work.

Suggested Readings:

Kothri CR 1990. Research Methodology- Methods and Techniques. Vishva Prakashan, C.A. Division of wiley Eastern, New Delhi.

Gupta S 1999. Research Methodology and statistical techniques. Deep and Deep Publications, New Delhi.

Gurumani, N. 2007. Research methodology for biological sciences. MJP Publishers, Chennai.

Batschelet, E. 1991. Introduction to Mathematics for Life Scientists. Springer International Student Edn., Narosa Publishing House, New Delhi.

Förthofer, L. 1995. Introduction to Biostatistics, Academic Press, New York.

Gupta, S.C. and Kapoor, V.K. 2002. Fundamentals of Mathematical Statistics, (11th Edn.). Sultan Chand & Sons, New Delhi.

Snedecor, GW and Cochran, WG. 1967. Statistical methods. Oxford & IBH Pub. New Delhi.

Zar, J. H. 2006. Biostatistical Analysis: Prentice-Hall.

John W. Creswell. 2009. Research Design: Qualitative, Quantitative, and Mixed method approaches. Sage Publication, USA.

Gerry P. Q. and Michael J. K. 2002. Experimental Design and Data Analysis for Biologists. Cambridge University Press.

Richard Colin Campbell. 1989. Statistics for Biologists. Cambridge University Press.

Jim F., Lou C. and Phil J. 1998. Practical Statistics for Field Biology. John Wiley & Sons

Calvin D. 2003. Choosing and Using Statistics: A Biologists Guide. Blackwell Publisher.

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Ph.D., SEMESTER I

PAPER – BOT 702
INSTRUMENTATION AND RESEARCH TECHNIQUES

Examination Marks: 75
Assignment Marks: 25
Total Marks: 100
Pass marks: 50%

- Culture techniques:** Isolation, purification, culturing and preservation of algae, bacteria, fungi, actinomycetes, viruses and Micropropagation techniques.
- Field techniques:** Collection and preservation techniques of specimens (algae, fungi and higher plants); Ecological methods.
- Analytical techniques:** Principle and applications of UV-Vis, IR, FTIR, AAS, AES, CD and NMR spectroscopy.
- Microtechniques:** Fixation, microtomy and staining; Specimen preparation for observation.
- Microscopy:** Principle and applications of Phase contrast, DIC, Fluorescence, SEM, TEM,
- Separation techniques:** Chromatography- principle and application of paper chromatography, TLC, Column chromatography (Gel filtration and Ion exchange, Affinity chromatography, GC, HPLC)
- Centrifugation:** Principle and types of centrifuges. Ultracentrifugation, density gradient centrifugation and continous centrifugation
- Electrophoresis:** Principle, Agarose gel and polyacrylamide gel and two dimensional electrophoresis
- Advance molecular techniques and Genome mapping:** Ribotyping, AFLP, T-RFLP, DGGE, FISH, Blotting techniques, PCR, Real time PCR, DNA/RNA microarray.
- Nucleic acid and protein sequencing.

Note: While setting the questions, paper setter may take care to cover entire part of paper. Ten (10) questions are to be set out of which students have to answer any five (5) questions.

Assignment:

An assignment of twenty five marks will be carried out by students based on experimental work using any equipment & technique given in this paper.

Suggested Readings:

- Becker, J.M., Caldwell, G.A. and Zachgo, E.A. 1996. Biotechnology: A Laboratory Course, 2nd Edn. Academic Press, Inc., San Diego, California.
- Wilson, K. and Walker, J. 1997. Practical Biochemistry: Principles and Techniques. Cambridge University Press, Cambridge.
- Dixon et al. Plant cell culture-A practical approach. IRL Press, Oxford.
- SS Bhojwani and MK Razdan. Plant tissue culture. Elsevier, Amsterdam.
- M.K. Razdan. 1993. An introduction to plant tissue culture. Oxford & IBH Pub. Co. New Delhi.
- Kalyan Kumar De. 1992. Plant tissue culture, New Central Book Agency, Calcutta.
- Cordon, M.H. and R. Macrae, 1987. Instrumental analysis in the Biological Science, Blackie and Son Limited, London.
- Frederick D. 1989. Separation and Purification Techniques in Biotechnology. Elsevier Publication
- Woon-Fong Leung. 2007. Centrifugal Separations in Biotechnology. Elsevier Publication

