

KAKATIYA UNIVERSITY, WARANGAL  
FACULTY OF SCIENCE

**Pre-Ph.D (Zoology)**

**Paper – I: Research Methodology**

**Unit I: Research problem and reporting results**

**12 Hours**

**Formulation of Research Problem:** Identification and formulating the research problem - Assessing the status of the problem - Formulating the objectives - Review of literature and patents - Identifying gap areas - Development of research plan: Exploration, description, diagnosis and experimentation.

**Reporting and thesis writing:** Preparation of manuscript for Publication of Research paper - Oral presentation - Importance of effective communication - Types of report and structure: Research paper, Research project proposal, GANTT Chart, Research project report, Thesis - Illustrations - Pictures and tables - Footnotes - Acknowledgement - Bibliography - Citation styles.

**UNIT II: Research publications**

**12 Hours**

**Publication ethics:** Definition - Introduction and importance - Best practices/standards - Setting initiatives and guidelines - Conflicts of interest - Violation of publication ethics, authorship and contributor ship – Intellectual property right, Publication misconduct, complaints and appeals - Predatory publishers and journals – Plagiarism and Software tools (Turnitin, Urkund and Ouriginal)

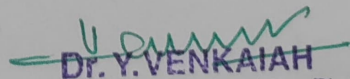
**Research metrics:** Open Access and Subscribed journals - Indexed journals - Science Citation Index (SCI) - Engineering Index (EI) – Scopus Indexing – Consortium for Academic and Research Ethics (CARE) listed journals - SNIP, SJR, IPP, Cite Score. Impact factor of journal as per journal citation report - Individual and Institutional Metrics: Definition and Importance of h-index, g-index, i10-index.

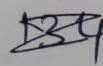
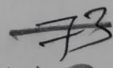
**UNIT III: Experimental Techniques and Analytical Tools:**

**12 Hours**

Types of microscopy; microtomy. Analysis of biomolecules using UV/visible, fluorescence, NMR. Ultracentrifugation; Gel filtration, ion exchange & affinity chromatography; thin layer chromatography; gas chromatography; High pressure liquid chromatography (HPLC).

Electrophoresis (starch, agarose, PAGE); Electrofocussing. Enzyme technology: Animal protein/enzyme purification; DNA and Protein isolation techniques; DNA sequencing; Polymerase Chain Reaction; Animal tissue culture; Flow cytometry.

  
**DR. Y. VENKAIAH**  
M.Sc; Ph.D.  
Chairperson Board of Studies  
Dept. of Zoology  
Kakatiya University  
WARANGAL - 506 009, T.S.

  
  
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**Unit IV: Biostatistics & Data Analysis Tools:**

**12 Hours**

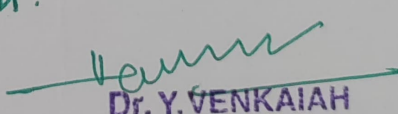
Meaning, Fundamental Concepts, Approaches to measurement of Probability (p value); Fundamentals of hypothesis testing-Standard error point; Mean, mode & Analysis of variance (ANOVA).

Determination of toxicity (Acute, Chronic); Nucleic acid and Protein sequence databases; web-based tools for sequence searches; Sequence Alignment; Immunoassays & Diagnostic applications.

**Reference Books:**

1. C. R. Kothari, 1990 Research Methodology: Methods and Techniques. New Age International, 418p.
2. S. C. Sinha, A. K. Dhiman, 2002, Research Methodology, Ess Publications, 2 Volumes.
3. Kumar Ranjit, 2005, Research Methodology- A step by step Guide for Beginners, 2<sup>nd</sup> edition, Pearson Education.
4. P. Chaddah, 2018, Ethics in Competitive Research, Do not get scooped; Do not get plagiarized, ISBN: 978-9387480865.
5. Indian National Science Academy (INSA) Ethics in Science and Education, Research and Government (2019) ISBN: 978-81939482-1-7.  
[http://www.insaindia.res.in/pdf/Ethics\\_Books.pdf](http://www.insaindia.res.in/pdf/Ethics_Books.pdf)
6. Molecular cloning A Laboratory Manual 3rd edition Vol. 1, 2, 3- Sambrook and Russell, Churchill press, 2007.
7. Molecular Cell Biology, J. Darnell, H. Lodish and D. Baltimore Scientific American Book.
8. Statistical Methods for Research: S. Singh et al (1988) Central Publishing Ludhiana
9. Statistical Methods: S.P. Gupta. S. Chand Publication
10. Fundamentals of Biostatistics- Khan and Khanna, Ukaz Publication

11. Hilary Glasman Deed, Science Research Writing, Imperial College Press.

  
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12. [www.wikipedia.com](http://www.wikipedia.com)

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