

Syllabus for Ph.D. Course Work

Mugberia Gangadhar Mahavidyalaya

(Affiliated to Vidyasagar University)

Interdisciplinary Research Centre

(Community Sustenance)

**Thrust area: Mathematical and Computational approaches for
Community based Sustainable Research**

Structure of the Curriculum for Ph.D. Course work

Course Code	Course Name	Distribution of Marks			Credit	Credit Hours
		Theory	Assignment	Total		
Course I	Unit I: Research Methodology	20	10	50	4	16
	Unit II: Research Publication Ethics	20				
Course II	Unit I: Computer Application	20	10	50	4	16
	Unit II: Statistical Methods	20				
Course III	Research Trends in Interdisciplinary Science	50		50	4	16
Course IV	Emerging Issues in Core areas of Research	50		50	4	16
Total				200	16	64

Detailed Syllabus

Course I: Research Methodology & Research Publication Ethics

Credit Hours: 16

Marks: 50 [Written: 40 (Exam Hours: 2) + One Assignment: 10]

Unit: I [Marks: 20] Research Methodology

Research: Definition, importance, meaning and characteristics. Steps in Research. Research problem: identification, selection and formulation. Data: definition, types, sources, data collection methods. Review of literature and Bibliography. Research report: types, contents, styles and steps in drafting. Editing the final draft, way of writing papers and Thesis writing. Significance of Impact factor, citation index, science citation index, IST, SCOPUS etc.

References

- Richard Veit, Christopher Gould and John Clifford – Writing, Reading and Research (2ndEdn.).
- Norman Blaikie – Approaches to Social Enquiry.
- C. R. Kothari &GauravGarg – Research Methodology – Methods and Techniques (3rdEdn.)
- Kate L. Turabian – A Manual for Writers of Research papers, Theses and Dissertation.

Unit: II [Marks: 20] Research Publication Ethics

Philosophy and Ethics

1. Introduction to philosophy: Definition, nature and scope, concept, branches
2. Ethics: Definition, moral philosophy, nature of moral judgements and reactions, different branches of ethics, research ethics.
3. Responsibilities of researchers to fellow researchers, respondents, the public and the academic community.

Scientific Conduct

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP)
4. Redundant publications: Duplicate and over lapping publications, salami slicing
5. Selective reporting and misrepresentation of data
6. Privacy, autonomy, confidentiality and anonymity
7. The funding and sponsorship of research.

Publication Ethics

1. Publication ethics: definition introduction and importance
2. Best practices /standards setting initiatives and guidelines: COPE (Committee of Publication Ethics), WAME (World Association of Medical Editors), etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice-versa, types
5. Violation of publication ethics, authorship and contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals
8. The role of the researchers.

Practice

Open Access Publishing

1. Open access publications and initiatives
2. SHERPA (Securing a Hybrid Environment for Research Preservation and Access) /RoMEO (Rights Meta data for Open Archiving) online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU (Sabitribai Phula Pune University)
4. Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester etc.

Publication Misconduct

A. Group Discussions

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools

Use of plagiarism software tools

Data Bases and Research Metrics

A. Databases

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, i10 index, altmetrics

Assignment: Review of articles and Research proposal

References:

- Bird A (2006) *Philosophy of Science*. Routledge.

- Mac Intyre, Alasdair (1967) *A Short History of Ethics*, London.
- P. Chaddah, (2018): *Ethics in Competitive Research: Do not get scooped; do not get plagiarized*, ISBN: 978-9387480865
- National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition*. National Academies Press.
- Resnik, D. B. (2011). What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
- Beal L.J.(2012). Predatory publishers are corrupting open access; *Nature*, 489(7415), 179-179. <https://doi.org/10.1038/489179a>
- Indian National Science Academy (INSA), *Ethics in Science Education, Research and Governance* (2019), ISBN: 978-81-939482-1-7. (www.insaindia.res.in/pdf/EthicsBook.pdf)
- Oliver Paul: *The Students Guide to Research Ethics*, Open University Press, McGraw Hill
- H. Martyn and Anna Trainanou: *Ethics in Qualitative Research: Controversies and Contexts*, Sage, New Delhi.

Course II: Computer Application and Statistical Methods

Credit Hours: 16

Marks: 50 [Written: 40 (Exam Hours: 2) + One Assignment: 10]

Unit: I [Marks: 20]

Operating system such as DOS, WINDOWS, UNIX. Internet: data uploading and downloading, e-mail and e-journal. Office management: MS-Word, MS-Excel, MS-Power Point, and Latex. Programming: C, PYTHON; Software Packages: MATLAB, MATHEMATICA, And ORIGIN.

Unit: II [Marks: 20]

Probability distribution. Distribution Free Approach, Test for goodness of fit for a proposed distribution. Correlation coefficient: simple linear, multiple linear, and partial. Regression; simple, multiple and stepwise. Sampling: definition, theory, types, techniques and steps.

Assignment: Power point presentation on a research topic. Analysis of data on given statistical methods.

Course III: Research Trends in Interdisciplinary Science

Credit Hours: 16

Marks: 50 [Written: 50 (Exam Hours: 2)]

Advanced Mathematical Methods, Soft Computing, and Applied Dynamical Systems

Magneto Fluid Dynamics, Flow in a Porous Medium, Operations Research, Graph Theory, Fuzzy Set Theory, Rough Set Theory, Soft Computing, Mathematical Methods, Optimization Techniques, Prey – Predator Model, Web let, integral equation, fuzzy integral equation, Numerical Analysis, Classical Mechanics, Lattice Algebra, Fixed point theory etc.

Green Chemistry and Advanced Techniques for Biomolecular Interaction Studies

Green Chemistry: Principles of Green Chemistry, Examples, Renewables for Sustainability, Green Synthesis

Application of advanced techniques to study modes of biomolecular interaction monitored by (a) UV-Vis spectroscopy (c) Fluorescence spectroscopy (d) Cyclic voltammetry (e) Circular dichroism spectroscopy (CD) and (f) Isothermal titration calorimetry (ITC).

Nuclear Structure, Radiation Detection, and Spectroscopic Techniques

Basic nuclear properties: mass, binding energy, nuclear radius, liquid drop and semi-empirical mass models, shell model, magic numbers, spin-orbit coupling, collective models, nuclear deformation and quadrupole moments. Nuclear spin, parity, angular momentum coupling, isospin formalism, nuclear transitions and selection rules. Multipole radiation, transition probabilities, gamma decay, internal conversion, and lifetime measurements. Radiation interaction with matter and nuclear detectors including gas, scintillation, and semiconductor detectors. Alpha, beta, and gamma spectroscopy, coincidence and angular correlation techniques, Mössbauer spectroscopy, spectrum analysis, calibration, nuclear level schemes, and applications in nuclear structure, astrophysics, medicine, and industry.

References

1. Bioinformatics and functional genomics (Third edition) - Jonathan Pevsner
2. Mathematical Biology 1: An Introduction (Third edition) - J. D. Murray
3. Electrokinetically-driven microfluidics and nanofluidics - Leslie Y. Yeo
4. Computational Fluid dynamics - John D Anderson
5. Zhang, S.; Zhao, J.; Guo, Y.; Hu, J.; Chen, X.; Ruan, H.; Cao, T.; Hou, H. Thiosemicarbazone N-Heterocyclic Cu(II) complexes inducing nuclei DNA and mitochondria damage in hepatocellular carcinoma cells. *Journal of Inorganic Biochemistry*, **2022**, 236, 111964.
6. Gomaa, M., Gad, W., Hussein, D., Pottou, F. H., Tawfeeq, N., Alturki, M., Alfahad, D., Alanazi, R., Salama, I., Aziz, M., Zahra, A., Hanafy, A. Sulfadiazine

Exerts Potential Anticancer Effect in HepG2 and MCF7 Cells by Inhibiting TNF α , IL1b, COX-1, COX-2, 5-LOX Gene Expression: Evidence from In Vitro and Computational Studies. Pharmaceuticals (Basel). **2024**, 17, 189.

7. Principles of Soft Computing (3rd edition) (Wiley) - S. N. Sivanandam, S. N. Deepa <https://drive.google.com/file/d/1OdNfa7ez0EIke-DTewGkqJzWn-jPMWhh/view?usp=sharing>
8. Introductory Nuclear Physics - K. S. Krane
9. Basic Ideas and Concepts in Nuclear Physics - K. Heyde
10. Nuclear Physics: Principles and Applications - J. Lilley
11. Radiation Detection and Measurement - G. F. Knoll
12. Nuclear Structure, Vol. I & II - Bohr & Mottelson

Course IV: Emerging Issues in Core areas of Research

Credit Hours: 16

Marks: 50

[A Literature Review on the related research topic be submitted by each scholar to the associated Supervisor and after evaluation supervisor submits the Marks to HOD]