

**Scheme and Syllabi of Examination
for
Pre-Ph. D. Course Work
in
Physics
(w.e.f. academic session 2023-2024)
Offered by
Department of Physics
Under
(Faculty of Science)**



**Bhagat Phool Singh Mahila Vishwavidyalaya
Khanpur Kalan (Sonapat), Haryana-131305**

www.bpswomenuniversity.ac.in

Programme outcomes:

- Prepare and motivate the students to advance their research careers beyond a doctoral degree, pursue careers in academics and industries.
- Equip the students with such skills as to make them understand the properties of materials.
- Make the students understand that acquiring knowledge and skills appropriate to their professional activities is a never-ending process.
- Train-up the students in such a way that they can objectively carry out investigations, scientific and/or otherwise, without being biased or without having any preconceived notions.
- Enable the students to analyze problems starting from first principles, evaluate and validate experimental results, and draw logical conclusions thereof.
- As technology exploits the rules of Physics, students properly trained in physics research can be good value addition in the field of technology too.

Programme Specific Outcomes

- Develop specialization in a particular area of physics research i.e. material science.
- Acquire an overall idea of the ongoing scientific research in and outside the country.
- Inculcate logical reasoning among the students and help them develop such skills as to quantitatively solve a problem.
- Mature as a researcher having reasonably good communication skills - ability to present scientific results and thoughts before an educated audience. Understand the mysteries of nature in terms of the fundamental principles, hypotheses and laws of Physics.
- Train the students over a wide range of experimental techniques that can be applied in physics, in other scientific and technological domains.
- Acquire some amount of knowledge regarding the overall scientific progress (chronological) so that the results of a particular problem can be placed under proper perspective.

• **Scheme and Syllabi of Examination**

For

Pre-Ph.D. Course Work in Physics

With Effect from Academic Session 2023-2024.

Paper No.	Paper title	Teaching Scheme			Examination Scheme			Duration of Exam	Credit
		L	T	P	Internal Marks	External Marks	Total		
PPDL- 701	Research Methodology	4	0	0	20	80	100	3 Hours	4
PPDP- 703	Review of Literature and Seminar	0	0	0	20	80	100		4
PPDL-705 (Physics)	Characterization Techniques	4	0	0	20	80	100	3 Hours	4
CPERPE-2203	Research and Publication Ethics (Theory)	1	0	0	10	40	50	1.5 Hours	2
Total		9	----	2	70	280	350	-----	14

PPDL -701:Research Methodology

L T P
4 0 0 (4 Credits)

Marks for External Exam : 80
Marks for Internal Exam : 20
Total : 100
Time : 3 Hours

Note: The examiner is requested to set **nine** questions in all taking two questions from each unit and one **compulsory** question. The compulsory question will consist of four parts and will be distributed over the whole syllabus. The candidate is required to attempt **five** questions selecting one from each unit and the compulsory question.

UNIT-I

Introduction of Research Methodology: Meaning of research, objectives of research, types of research, significance of research, research and scientific method, research process.

Research Problem: Definition, necessity and techniques of defining research problem. Formulation of research problem. Objectives of research problem.

UNIT-II

Scientific Communications: Publishing Research Papers: Selection of a journal; writing of paper's abstract, formulation of problem, discussion and references, submission and handling of reviewer's comment.

Writing of thesis: Format of a thesis; Review of literature, formulation; Writing methods, results; preparation of Tables, figures; writing discussion; writing conclusion; writing summary and synopsis; Reference citing and listing/Bibliography. Avoiding Plagiarism.

UNIT-III

Computer Applications in Research: Practical aspects of MATLAB, Introduction to LATEX.

MS Office 2007: Word Basics, Mail Merge, Macros, Math Type, Equation Editor

MS Excel 2007: Excel Basics, Data Sort, Functions.

UNIT-IV

Presentation: Poster and Oral. Presentation tools: Introduction to presentation tool, MS Power Point: features and functions, creating presentation, customizing presentation, showing presentation.

Web Search: Internet Basics, Internal Protocols, Pre-requisites, Search Engines, Searching Hints, Using advanced search techniques

Books Recommended:

1. Gurumani, N. (2010), Scientific Thesis Writing and Paper Presentation, MJP Publishers
2. Kothari, C.R. (2010), Research Methodology (Methods and Techniques), New Age International Publishers.
3. Gerald, C.F. and Wheatley, P.O. : Applied numerical analysis, 6th Ed. Addison Wesley (2002)
4. Smith G.D. : Numerical solution of partial differential equations, Oxford University Press (1982)
5. Schwartz H.R., Stiefel: Numerical analysis of symmetric matrices, Prentice Hall (1976)

PPDP -703:Review of Literature and Seminar

L T P
0 0 0 (4 Credits)

Marks for External Exam : 80
Marks for Internal Exam : 20
Total : 100

Note: The candidates are required to submit a copy of Review of Literature of 25 research papers on the relevant research topic. The performance will be evaluated on the basis of submitted literature and the presentation given by the candidates before the evaluation committee.

PPDL- 705 (Physics): Characterization Techniques

L T P
4 0 0 (4 Credits)

Marks for External Exam : 80
Marks for Internal Exam : 20
Total : 100
Time : 3 Hours

Course Objective: To show overall knowledge of experimental techniques based on microscopy, chemical, physical, electrical and structure analysis, and thermal analysis techniques and to be able to show a knowledge of the capabilities and limitations of the different types of analysis introduced in the course.

Note: The examiner is requested to set **nine** questions in all taking two questions from each unit and one **compulsory** question. The compulsory question will consist of four parts and will be distributed over the whole syllabus. The candidate is required to attempt **five** questions selecting one from each unit and the compulsory question.

Unit –I

Basic principle and instrumentation of UV-Vis. spectroscopy, determination of optical band gap and other optical parameters, basic principle of FTIR, brief idea of set, deconvolution of the peaks, analysis of the spectra based on peak position, FWHM of the vibrational modes. (case study of each technique)

Unit –II

electrical characterization: two probe, four-probe and van-der pauw method for resistivity measurements, Hall effect experiment, dielectric characterization using impedance analyzer, electrochemical techniques: cyclic voltammetry (case study of each technique).

Unit –III

Brief review of crystal structure, X-ray diffraction methods, modern X-ray diffractometer, indexing of X-ray diffraction peaks, data analysis and interpretation, crystallite size and strain measurement in nanomaterials, basic principle of scanning electron microscopy, energy dispersive X-ray analysis, basic principle of transmission electron microscopy, brief idea of set up, sample preparation, imaging modes: bright field imaging, dark field imaging, selected area electron diffraction etc. (case study of each technique)

Unit –IV

Basic principle of scanning Electron microscopy, brief idea of set up/components, different modes of SEM and its importance,

TGA and DSC/DTA: principle, practical aspects, experimental variables, data analysis and interpretation(case study of each technique)

Books suggested:

1. Evans, C., Brundle, R., & Wilson. S. (1992). Encyclopedia of Materials Characterization: Surfaces, Interfaces, Thin Films. Butterworth-Heinemann.
2. Leng, Y. (2013). Materials Characterization: Introduction to Microscopic and Spectroscopic Methods. Wiley-VCH.
3. Hummel, R.E. (2011). Electronic Properties of Materials. Springer.
4. Goldstein, J., Newbury, D.E., Joy, D.C., Lyman, C.E., Echlin, P., Lifshin, E., Sawyer, L., Michael, J.R. (2003). Scanning Electron Microscopy and X-Ray Microanalysis. Springer.
5. Cullity, B.D., & Stock, S.R. (2013). Elements of X-Ray Diffraction. Pearson.
6. Kaufmann, E.N. (2003). Characterization of Materials (Vol 1 & 2). John Wiley and Sons.
- 7.

Research and Publication Ethics

Course Objective:

CPERPE-2203

L T P

2 0 0

Total Credits: 2

Internal Marks: 10

External Marks: 40

Total Marks: 50

1. Produce competent scholar for doing original and independent research.
2. To increase knowledge about the laws, regulations, and policies—government and institutional—and professional guidelines that govern the conduct of research.
3. To describe possible threats to research integrity in your work (what might tempt you to engage in misconduct?).
4. To familiarize the scholar with the professional and University resources for addressing ethical issues.

Course outcomes:

1. Understanding of publication ethics and knowledge of identifying research misconduct and predatory publications.
2. Knowledge of Indexing and citation databases.
3. Knowledge of open access publications and research metrics.
4. Knowledge of various plagiarism tools.

Content

UNIT- I	
Philosophy and Ethics: Introduction to philosophy: definition, nature and scope, concept, branches; Ethics: definition, moral philosophy, nature of moral judgments and reactions Scientific Conduct: Ethics with respect to science and research, Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP), Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data	
UNIT- II	
Publication Ethics: Publication ethics: definition, introduction and importance; Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.; Conflicts of interest; Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types; Violation of publication ethics, authorship and contributorship; Identification of publication misconduct, complaints and appeals; Predatory publishers and journals	
UNIT- III	
Open Access Publishing: Open access publications and initiatives ; SHERPA/RoMEO 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 Suggested, etc. Publication Misconduct: Subject specific ethical issues, FFP, authorship ; Conflicts of interest ; Complaints and appeals: examples and fraud from India and abroad; Use of plagiarism software like Turnitin, iThenticate and other open source software tools	

UNIT- IV	
Databases and Research Metrics: Databases- Indexing databases; Citation databases- Web of Science, Scopus, etc.; Research Metrics - Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score; Metrics: h-index, g index, i10 index, altmetrics journal database	
Suggested Text Books	
1.	Bird, A. (2006). Philosophy of Science, Routledge
2.	MacIntyre, Alasdair (17) A short History of Ethics, London
3.	P. Chaddah (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarised, ISBN: 978-937480865
4.	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 Academic press
5.	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.cm
6.	Becall, J (2012), Predatory publishers are corrupting open access. Nature, 489(7415),179.
7.	Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019).