

# **Chaudhary Ranbir Singh University, Jind**

(A State University established under Haryana Act No. 28 of 2014 and recognized under section 12 (B) & 2f of UGC act, 1956)



## **DEPARTMENT OF PHYSICS**

**Examination Scheme**

**&**

**Syllabus**

**For**

**Ph.D. Course work**

**(w.e.f. 2020-21)**

*Signature*

**Chaudhary Ranbir Singh University, Jind**  
**Scheme of Examination for Ph.D. Course Work**

Semester-I (w.e.f. 2020-21)

Credits= 12

Marks=300

Sr. No.	Course/ Paper Code	Courses	Credits	Contact Hours per week	Examination Scheme		Total Marks
					End semester examination marks	Internal assessment marks	
1	20PHYPH- 101	Research Methodology	4	4	80	20	100
2	20PHYPH- 102	Experimental & Computational Techniques	4	4	80	20	100
3	20PHYPH- 103	Review of Literature	4	-	-	-	100
<b>Total</b>							300

300

**Chaudhary Ranbir Singh University, Jind**  
**Syllabus of Examination for Ph.D. Course Work**

**20PHYPH-101**

**Research Methodology**

Maximum Marks-100  
End Semester Examination -80  
Internal Assessment-20  
Time-3 hrs.

**Note:** *There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.*

**Unit-I**

**Concept 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, validity and reliability of research.

**Unit-II**

**Methods of data collection and analysis:** Experimental data, field data, data from other sources. Error analysis, statistical analysis.

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

**Unit-III**

**Computer Applications in Research:** Curve Fitting: Principle of least square fitting; Linear regression, Polynomial regression; Exponential and Geometric regression.

**Operating system and uses**

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

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

**MS Power Point:** Features and function, basics of presentation: Poster and Oral presentation.

**Drawing graphs and diagrams** – Origin/Xmgrace/Excel.

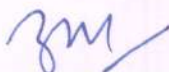
**Unit-IV**

**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, IPR, Patent, trademarks and copyright, Research ethics and Plagiarism.

**References:**

- Gurumani, N. (2010), Scientific Thesis Writing and Paper Presentation, MJP Publishers
- Kothari, C.R. and Garg Gourav (2014), Research Methodology (Methods and Techniques), 3rd edition New Age International Publishers.
- Schwartz H.R., Stiefel: Numerical analysis of symmetric E & Rustishauser matrices, Prentice Hall (1976)
- Computer Simulation in Physics, R.C. Verma, Anamaya Publ., New Delhi, 2004.
- Computer Simulation Methods, Harvey Gould and Jan Tobochnik, Addison-Wesley Publishing Company, New York, 1988.



## 20PHYPH102

### Experimental & Computational Techniques

Maximum Marks-100  
End Semester Examination-80  
Internal Assessment-20  
Max. Time- 3 hrs.

*Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.*

#### Unit-I

**Introduction to Materials Science:** Classification of materials, Glass and glass ceramics, Nanoparticles, Production control & planning, Annealing, Thermal treatment, Chemical treatment, Structural, Optical, Mechanical, Magnetic properties.

#### Unit II

**Synthesis of Materials:** Synthesis of Nano Materials (Wet Chemical Method, Solid State Reaction, Ball Milling, etc.), Glasses and their formation by different techniques, Properties of glasses, Modification in glass properties using various approaches

#### Unit-III

**Characterization:** XRD (principle, brief idea of set up), SEM/TEM (principle, brief idea of set up, Photoluminescence (PL) spectroscopy (principle and idea of instrumentation), UV-NIR/absorption: (principle and idea of instrumentation), Raman Spectroscopy (principle and idea of instrumentation), FTIR (principle, brief idea of set up), DSC/TGA (principle and idea of instrumentation), VSM (principle and idea of instrumentation).

#### Unit-IV

**Computational Techniques:** The MATLAB environments, Algorithms and structures, Basic arithmetic, Scalars, Arrays, Vectors, Matrices, Matrix operations, built in functions, user defined functions, scripts and functions (m-files), Controlling Command Window Input and Output, Control Structures (if... then, loops), Graphics functions: 2D and 3D plotting, MATLAB toolboxes, Eigenvalues and Eigenvectors, Doing Integration and Differentiation using MATLAB in built functions. Solution of Linear system of equations, Numerical Simulation of differential equations: Ordinary differential and partial differential equations. Introduction to Origin for data analysis, Mathematica (Introduction), LaTeX.

#### **References:**

- A Guide to MATLAB for Beginners and Experienced Users, Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, 2<sup>nd</sup> Edition, Cambridge University Press
- Getting started with Matlab, Rudra Pratap, 2010, Oxford University Press.
- W.D Callister Jr (2001), Materials Science and Engineering: An Introduction, John Wiley & Sons, Inc
- Principles of Fluorescence Spectroscopy, Joseph R. Lakowicz, Springer; 3<sup>rd</sup> Edition 2006
- B.D. Cullity, (1956), Elements of X-ray diffraction, Addison-Wesley Publishing Company
- B. Schrader, (1993), Infrared and Raman Spectroscopy, John Wiley & Sons
- J.M. Hollas, (1986), Modern Spectroscopy, John Wiley & Sons
- W. Demtroder, (2004) Laser Spectroscopy, Basic concept and Instrumentation, Springer

19PHYPH-103

**Review of Literature:**

Maximum Marks:100

The relevance of the research from perspective of the subject. Detailed review of state of the art. Scope of the work.

*Note: The Scholars shall review at least 25 research papers and shall submit the report as well as a presentation before three members committee duly constituted by the Dean of the Faculty and headed by the Chairperson of the concerned department for evaluation.*

ZMM

