

**GOVT. V. Y. T. PG AUTO. COLLEGE,
DURG (C.G.)**



**Ph.D. Course Work Syllabus
(HEMCHAND YADAV VISHWAVIDYALAYA,
DURG (C.G.))**

PHYSICS

Session 2022-23

Program Outcomes:

At the end of Ph.D. programme, students will be able to:

- **Scientific Reasoning:** Critically apply theories, methodologies, and knowledge to address fundamental questions in their primary area of study
- **Problem solving:** Formulate and write research grant proposals with effective questions, hypotheses and experimental designs
- **Analytical thinking:** Develop the inductive and deductive reasoning skills to drive research projects productively and independently
- **Communication/digital skills:** Instill oral, written and digital communication skills sufficient to publish and present work, apply knowledge to undergraduate teaching and assessment of student learning
- **Moral and Ethical reasoning:** Ability to imbibe moral/ ethical values, follow the principles of ethics in their field and in academia, avoid unethical behavior such as fabrication, misrepresentation of data, committing plagiarism, non adherence to IPR etc.
- **Leadership Readiness:** Interact with people from diverse backgrounds as both leaders/mentors and team members with integrity and professionalism

Name and Signatures

V.C. Nominee	Departmental members
Subject Expert <i>Harneet</i> <i>26/07/22</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>Jagjeet</i> <i>26/7/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>RS</i>
Alumni	3. Dr. Anita Shukla
(member).....	4 Mrs. Siteshwari Chandrakar <i>BS</i>
Prof. from other Dept. of Sc. Faculty <i>Pul</i> <i>26/7/22</i>	5. Dr. Abhishek Kumar Misra <i>AK</i>
Specialist from	6. Dr. Kusumanjali Deshmukh <i>KJ</i> <i>26/7/22</i>
Industry..... <i>Dishal</i>	

**SCHEME OF EXAMINATION & SYLLABUS PRESCRIBED
FOR
THE
EXAMINATION OF Ph.D. Course Work
(Physics) EFFECTIVE FROM JULY 2020**

Scheme of Examination

The Course Work for Ph.D degree in Physics is a six month course after completion of P.G. degree in the subject. There shall be two compulsory papers based on the research areas of Physics. The structure of the course is given below:

S. No.	Theory Paper	Marks
1	1. Research Methodology, Quantitative Methods & Computer Applications 2. Research and Publication Ethics (RPE)	100
2	Review of Literature in Concerned Subject, Seminar/ Project Report	100
	Total	200

Paper – I

1. Research Methodology & Quantitative Methods and Computer Applications

UNIT- I Techniques for Structural, Microscopic, and Spectroscopic Characterization X-ray diffraction: coherent scattering of X-rays, reflected intensities, experimental methods of crystallography, particle size determination. Microscopy: Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning Transmission Electron Microscopy (STEM), Scanning Tunneling Microscopy (STM), Atomic Force Microscopy (AFM). Spectroscopy: Fourier Transform Infrared (FTIR) and Raman spectroscopy, Nuclear Magnetic Resonance (NMR), Electron Spin Resonance (ESR).

UNIT II Techniques for Characterization of Solid State Ionic and Luminescent Materials State Ionic Materials: Solid properties; AC Impedance Characterization of ion transport Spectroscopy (IS) for conductivity of (σ) measurements; DC polarization methods viz, Tubandt's method, Wagner's method, Transient Ionic Current (TIC) method for ionic mobility (μ), ionic transference number (tion), mobile ion concentration (n) and ionic drift velocity (vd) measurements. Temperature dependent studies on σ , μ , n, vd

Techniques for ML measurement and TL measurements. Measurement techniques to study Photoluminescence response, UV-visible spectrometry.

Thermal analysis: Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC), Thermal Gravimetric Analysis (TGA).

UNIT – III Astrophysical Techniques for Astronomical Observations Photometry: Instrumental magnitudes and colors, seeing and atmospheric effects, extinction correction. Standard photometric systems: UBV and other systems. Transformation to a standard photometric systems. Absolute and differential photometry. Spectroscopy: Basics of prism and grating spectroscopes. Basics of CCD data reduction: Plate scale, readout noise and gain, signal- to-noise ratio. correction for bias, dark and flat fielding, fringing and cosmetic effects.

UNIT – IV

(I) Programming in C

Getting Started: Elementary idea about C Language, Getting Started with C, the First C Program, Compilation and Execution, Receiving Input; C Instructions: Type Declaration Instruction, Assignment instruction, Integer and Float Conversions, Type Conversion in Assignments, Hierarchy of Operations, Associativity of Operators. Control Instructions in C.

Control Structures: The Decision Control Structures, If Statement, If-else Statement, Use of Logical Operators, The Conditional Operators. The Loop Control Structure: Loops, the while Loop, the for Loop, the Odd Loop, the break Statement, the Continue Statement, the do while Loop. **The Case Control Structure:** Decisions Using switch, switch Versus if-else Ladder The go to Keyword.

UNIT – V

(II) Programming in C

Functions & Pointers : What is a Function, Passing Values between Functions, Scope Rule of Functions calling Convention, Advanced Features of Functions; Function Declaration and Prototypes Call by Value and Call by Reference , An Introduction to pointers, Pointer Notation, Back to Function Calls, Conclusions.

Storage Classes in C: Automatic Storage Class, Register Storage Classes, Static Storage Classes, External Storage Classes, Which to Use When.

The C Preprocessor: Features of C Preprocessor, Macro Expansion, File Inclusion, Conditional Compilation, #if and #elif Directives, Miscellaneous Directives.

Arrays: What are Arrays; A Simple Program using Array. More on Arrays; Array Initialization, Bounds Checking, Passing Array Elements to a Function. Pointers and Arrays; Passing an Entire Array to a Function.

Recommended Text and Reference books:

1. Characterization of Materials: Wachtman J B (Butterworth-Heinemann)
2. Introduction to Nanotechnology by Charles P. Poole Jr. and Frank J. Owens (Willey Inter. Science Pub. 2003)
3. Condensed Matter Physics by Michal P. Marder (Willy Inter. Science Pub., 2000)
4. Superionic Solids- Principle and applications by S. Chandra (NH Pub., 1980)
5. Luminescence of Solids : R Vij (Plenum Press)
6. Digital Image processing: Gonzalez R. C. and Woods R. E. (Addision-Wesley)
7. Astronomical Photometry: Henden A. A. and Kaitchuck R H (Willmann-

Bell)

8. Astrophysical techniques: Kitchin C R , third edition (IOP publishing)
9. Optical Astronomical Spectroscopy: Kitchin C R (IOP Publishing).
10. Let us C by Yaswant Kanitkar
11. C Programming by Dennis Riche and Brian Karnighan
12. C Programming by Schauam Series.

2. Research and Publication Ethics (RPE)

• RPE 01: PHILOSOPHY AND ETHICS (3 hrs.)

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions

• RPE 02: SCIENTIFIC CONDUCT (5 hrs.)

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 overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

• RPE 03: PUBLICATION ETHICS (7 hrs.)

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

PRACTICE

• RPE 04: OPEN ACCESS PUBLISHING (4 hrs.)

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

• RPE 05: PUBLICATION MISCONDUCT (4hrs.)

A. Group Discussions (2 hrs.)

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

B. Software tools (2 hrs.)

Use of plagiarism software like Turnitin, Urkund and other open source software tools

• **RPE 06: DATABASES AND RESEARCH METRICS (7 hrs.)**

A. Databases (4 hrs.)

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

B. Research Metrics (3 hrs.)

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

Paper – II

Review of Literature in Concerned Subject, Seminar/ Project Report

Name and Signatures

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Industry..... <i>Singh</i>	