

VIKRAM UNIVERSITY, UJJAIN



Faculty of Science

Ph. D. (Physics) Course Work

One Semester Course

(As per common Ordinance No. 11)

**Scheme of Examination and Courses of Studies
Including Recommended Books for the Examination of Year**

2017-18 and onwards

Sanjay K. Ghosh

EXAMINATION IN THE FACULTY OF SCIENCE

Ph.D. (Physics) Course Work

Scheme and Course

(As per common ordinance No. 11, Item No.-11(e) and (f))

Paper	Nomenclature	Credits	Marks
Paper I: PHYC 01	Research Methodology	04	100 (60+40 CCE)
Paper II: PHYC 02	Review of Research in the relevant field	03	100 (60 written report+ 40 oral presentation)
Paper III: PHYC 03	Computer Applications	03	100 (60+40 CCE)
Paper IV: PHYC 04	Advance Course (PLASMA PHYSICS AND NONLINEAR OPTICS)	03	100 (60+40 CCE)
Paper V: PHYC 05	Comprehensive Viva-Voce	03	100
Total		16	500

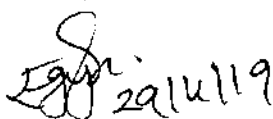
Notes:

- 1) The candidates has to obtain a minimum of 55% of marks or its equivalent grade points in aggregate in the course work in order to be eligible to continue in the Ph.D. programme.
- 2) If a candidate obtains 'F' or 'Ab' grade in the course/subject, he/she will be treated to have failed in that course. He/she has to reappear in the examination in the next semester.
- 3) If candidates further fails in course, he/she shall not be given another chance and shall be out of the Ph.D. programme.

Sajid K. G
29/4/19


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Paper I- PHYC 01 (Ph.D. Course Work)
RESEARCH METHODOLOGY

Unit I

Primary and Secondary data, Graphical representation of data, Measures of Central tendency: Arithmetic mean, Properties of arithmetic mean, Merits and Demerits of arithmetic mean, Geometric Mean, Median and Mode.

Unit II

Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Coefficient of dispersion, Coefficient of variation, Skewness and Kurtosis.

Reference Books:

- 1) Gupta S. C. and Kapoor V. K. (2010): Fundamentals of Mathematical Statistics; Sultan Chand & Sons.
- 2) Gupta S. C. and Kapoor V. K. (2010): Fundamentals of Applied Statistics; Sultan Chand & Sons.

Unit III

General definition of research, Components of research problems, Scientific hypothesis, Research Purpose, Research design, Literature Searching, Aims and objectives, Expected outcome, Methodology to be adopted, Planning of experiment/theory.

Unit IV

Paper writing and report generation: Basic concepts of paper/thesis writing and report generation, Writing research abstract, Introduction and references, Significance of report writing, Types of research reports, Methods of presentation for report, Format of publication in research journals.

Reference Books:

- 1) Day A. and Gastel T.: How to write and publish (Cambridge Univ. Press).
 - 2) Blaster L., Hughes C. and Tight M.: How to research (Vive Books).
 - 3) Kothari C.R.: Research Methodology: Methods and Techniques (New Age Publ.).
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Paper II- PHYC 02 (Ph.D. Course Work)
REVIEW OF PUBLISHED RESEARCH IN RELEVANT FIELD

At least recent 10 papers/books are to be reviewed on the field allotted by the supervisor. A written review is to be submitted for valuation (60 marks) and an open oral presentation has to be delivered that would also be evaluated for 40 marks

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Paper III- PHYC 03 (Ph.D. Course Work)
COMPUTER APPLICATIONS

Unit I

Computer Arithmetic: Floating point representation of numbers, Arithmetic operations with normalized floating point numbers, Consequences of normalized floating point representation of numbers, Some pitfalls in computing, Errors in numbers, Binary representation of numbers.

Unit II

Iterative Methods: Beginning of an iterative method, Method of successive bisection, Method of False position, Newton Raphson iterative method, Comparison of iterative methods.

Unit III

Least Square Approximation of Functions: Linear regression, Algorithm for linear regression, Polynomial regression, Fitting exponential and trigonometric functions.

Unit IV

Differential and Integration: Formula for numerical differentiation, Numerical integration, Simpson's rule, Errors in integration formulae, Gaussian quadrature formulae, Comparison of integration formulae.

Reference Books:

- 1) "Numerical Methods" by Rajaram (Chapter 2, 3, 6 and 8).

Paper IV- PHYC 04 (Ph.D. Course Work)
PLASMA PHYSICS AND NONLINEAR OPTICS

Unit I

Plasma Theory: Concept of plasma, Collective behavior, Debye shielding, Plasma parameters, Fluid description of plasma, Fundamental equations.

Waves and Oscillations in Plasma: Plasma oscillations, Electron plasma waves, Ion waves.

Unit II

Plasma Diagnostic Techniques:

Single probe technique: Measurement of electron temperature and electron temperature of plasma
Double probe technique: Measurement of electron temperature and density of plasma.

Reference Books:

- 1) Plasma Physics and Controlled Fusion: F. F. Chen.
- 2) Plasma Bhoutiki: S. K. Ghosh.
- 3) Plasma Mechanics: Vishwanath Chakraborty.

Unit III

Nonlinear Optics: Nonlinear optical susceptibility, Second and third order susceptibilities, Phase matching, sum frequency and harmonic generation, Difference frequency generation and parametric excitation, stimulated Brillouin and Raman scatterings.

Unit IV

Optical Waveguides: Asymmetric waveguide, Rectangular wave guide, Channel waveguide, Strip loaded waveguide, Coupled mode theory and Coupled mode devices.

Reference Books:

- 1) The Principles of Nonlinear Optics - Y. R. Shen.
- 2) Quantum Electronics, III Edition- A. Yariv
- 3) Semiconductor optoelectronic devices- P. Bhattacharya.

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Paper V- PHYC 05 (Ph.D. Course Work)
COMPREHENSIVE VIVA VOCE

A comprehensive viva-voce will be conducted at the end of the semester of the course work by a board of four examiners, at least ONE of whom shall be external.

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