



Syllabus for Course Work in Ph. D. Programme

Department of Physics
Vidyasagar University
Midnapore 721102

Syllabus for Course Work in Ph. D. Programme in Physics

Total Marks: 200
Division of marks

Course Code	Marks
Course I	Theoretical: 40 Practical: 10 Total: 50
Course II	Theoretical: 40 Practical: 10 Total: 50
Course III (PHS)	Theoretical: 50 Total: 50
Course IV (PHS)	Theoretical: 50 Total: 50
Total	200

Structure of the Curriculum for Ph.D. Course work in Physics

Course Code	Course Name	Marks			Exam Time
		Theory	Assignment	Total	
Course I	Research Methodology	40	10	50	2 hours
Course II	Computer Application and Statistical Methods	40	10	50	2 hours
Course III (PHS)	Physics	50		50	2 hours
Course IV (PHS)	Special Topics in Physics	50		50	

Course Contents

Course Code: Course I

Course Name: Research Methodology

Marks: Theoretical – 40 + Assignment (Practical) – 10 = 50

Group A: Theoretical – 40 marks

- 1.1 Research: definition, importance, meaning and characteristics. Steps in research.
- 1.2 Research problem: identification, selection and formulation.
- 1.3 Sampling: definition, theory, types, techniques and steps. Sample size, advantages and limitations of sampling.
- 1.4 Data: definition, sources and types. Data collection methods. Limitations and cautions. Analysis of data.
- 1.5 Review of literature and Bibliography.
- 1.6 Research report: types, contents, styles and steps in drafting. Editing the final draft and Thesis writing.

Group B: Assignment writing on any one (Practical) – 10 marks

- (a) Review of articles
- (b) Research proposal
- (c) Sample design
- (d) Data analysis

Course Code: Course II

Course Name: Computer Application and Statistical Methods

Marks: Theoretical – 40 + Assignment (Practical) – 10 = 50

Group A: Theoretical – 20 marks

- 2.1 Operating system: latest version of WINDOWS, UNIX.
- 2.2 Database management System.
- 2.3 Office management: MS-Word, MS-Excel, MS-Power Point, and Latex.
- 2.4 Software Packages: MATHLAB, MATHEMATICA, Origin, etc.
- 2.5 Programming with C / C++ / Python

Group B: Theoretical – 20 marks

- 2.6 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.
- 2.7 The relevance of the research from perspective of the subject. Detailed review of state of the art. Scope of the work.

Group C: Assignment writing on any one (Practical) – 10 marks

Power point presentation on a research topic.

Course Code: Course III (PHS)

Course Name: Physics

Marks: 50

- 3.1 Introduction: Physical and chemical properties. Necessity of characterization.
Macroscopic properties: Optical, Electrical, dielectric, magnetic, mechanical.
Microscopic properties: Chemical structure, composition, surface characterization.
Probing bulk and nano-structure – XRD, SEM, TEM, HRTEM, Neutron scattering.
Phase changes, crystalline and amorphous fractions – DSC Thermo-gravimetric methods – TGA, DTA
- 3.2 Single crystals and their growth by different techniques
Conductivity, Photo-conductivity, Hall Effect, Thermoelectric Power in Semiconductor and their measurements. Measurement of drift mobility. Surface States.
- 3.3 Transistor Models: Ebers-Moll model, Gummel-Poon model.
- 3.4 Raman, FTIR, Optical microscopy, Photoluminescence, UVVIS, Optical Absorption and band gap determination, Photocurrent generation, optical device, quantum efficiency, photo responsivity.
- 3.5 Surface Science; Vacuum Technology, Vacuum based synthesis technology, Structure and topography, STM, LEED, AFM.

Course Code: Course IV (PHS)

Course Name: Special Topics in Physics

Marks: 50

- 4.1 Quantum Optics
- 4.2 IC design and simulation using PSPICE, low voltage and low power methodology of IC design.
- 4.3 Growth and characterization of semiconducting nanoparticles for different applications.
- 4.4 Optoelectronic materials for technological applications.
- 4.5 Low dimensional materials for energy and environmental applications.