Department of Physics:: Bodoland University

PhD Course work w.e.f. 2021-22

Department: Physics

Programme outcome:

- Educate and train the research scholars to better prepare for their strategic approach for Ph. D. research problem.
- Inspire the scholars to demonstrate and maintain highest standard in good research practices throughout their research carrier.
- Train the scholars on the learning scopes/tools from various sources appropriate for upgrading their skills and proper utilization.
- Introducing the scholars with up to date techniques and tools used in physical sciences research.
- To develop effective scientific and technical communication skills
- To provide a strong foundation in ethics related issues in research work (publications, patent, copyrights, plagiarism etc.) during their Ph. D. work and beyond.

Course Learning Outcome:

Paper - I

PHDPHY01: Research Methodology

Total Credit: 3 (2+1+0)

Course Learning Outcomes: After completing this paper, the students will be able to:

(i) identify research problems in various fields

(ii) review existing literature in the area of interest

(iii) identify a research problem and to approach investigations scientifically in order to find solutions for research problems of interest

(iv) selecting a suitable methodology for data collection and analyzing data

(v) enhance abilities of data analysis and interpretation

(vi) build acumen for preparation of effective report and presentation

(vii) prepare research report

Paper – II

PHDPHY02: Computational Physics

Total Credit: 3 (2+1+0)

Course Learning Outcomes: After learning this course, the learners will be able to:

(i) write article, report, letter, book, thesis, and beamer presentation using LaTex

(ii) perform matrix operations such as inversion, diagonalization, eigenvectors and eigenvalues using numerical method

(iii) perform polynomial interpolation such as Newton-Gregory and Lagrange interpolation method etc.

(iv) compute numerical integration using trapezoidal rule, Simpson's 1/3 rule, and Monte Carlo method

(v) solve first and second order linear differential equation using Euler method, Runge-kutta method and Numerov method

(vi) simulate random processes such as: coin tossing or dice throwing game, simulation of nuclear decay etc.

Paper - III

PHDPHY03: General Physics

Total Credit: 3 (2+1+0)

Course Learning Outcomes: After completing this course, scholars will be able to comprehend the:

(i) Construction of characteristic polynomial of a matrix and their use in identifying eigenvalues, Laplace transform and Fourier-transform in solving initial-value problems for linear differential equations with constant coefficients

(ii) Approximate methods for solving the Schrödinger equationin connection withvarious quantum mechanical problems

(iii) Basic principles of spectroscopy, rotational and vibrational spectra, idea about extracting the structure of an atoms and molecules from the interpretation of its IR and Fourier transform infrared (FT-IR) spectra

Paper - IV(A)

PHDPHY04A: Physics of Nanomaterials

Total Credit: 3 (2+1+0)

Course Learning Outcomes: This course is designed to introduce to nanoscale science and technology and to help students build the chemistry and physics foundation for their career or advanced education of this emerging field. Topics that will be discussed include nanomaterials synthesis, their unique properties and their broad applications.

On completion of the course the student will be able to

(i) Synthesis different structured nanomaterials using various synthesis methods

(ii) Characterization and analysis of the material for important properties using various tools

(iii) Explain the potential application of nanomaterials in various fields.

Paper - IV(B)

PHDPHY04B: Relativistic Heavy Ion Physics

Total Credit: 3 (2+1+0)

Course Learning Outcomes: After successful competition of the course, the learner will be able to

(i) apply conservation laws to predict different interaction processes

(ii) calculate various internal quantum numbers for elementary particles

(iii) apply the relativistic kinematics to solve scattering and decay problems

(iv) get the basic knowledge of heavy-ion physics and learn the indirect signatures of Quark-Gluon Plasma

(v) to simulate various Monte Carlo event generators in computer

(vi) get the basic idea of detector simulation and data analysis.

Paper - V

PHDPHY05: Research and Publication Ethics

Total Credit: 2 (2+0+0)

Course Learning Outcomes: This course is primarily designed for Ph. D students focusing philosophy of science and ethics. On completion of this course student will be able to:

(i) describe and apply theories and methods in ethics and research ethics

(ii) acquire an overview of important issues in research ethics, like responsibility for research, and scientific misconduct

(iii) acquire skills of presenting arguments and results of ethical inquiries