Department of Physics
Tripura University (A Central University)

Curricular Plan
Academic Year 2016 - 17

Prof. Debajyoti Bhattacharjee		
Semester	**Paper and Topics**	**Teaching Methodology**
I	**PH-701C: Mathematical Physics: Credit=04** **Group A [NLP=14]:** Functions of a Complex variable and Complex algebra **Group B [NLP=25]:** Group Theory. Differential Equations, Green's function, Dirac Delta Function, Group Theory Special Functions: Gamma functions. Bessel functions of first kind. Legendre functions. Associated Legendre functions. Spherical harmonics. Hermite functions. Lagguerre functions. Hypergeometric functions. Integral Transforms: Laplace transform;; Fourier series; Fourier integral and transforms.	Traditional classroom teaching. PDF notes and question banks as well as their hard copies are provided to the students. Hard copies of related chapters from text and reference books are provided to the students.
I	**PH-703C:** **Computer Programming & Basic Electronic design practical** **Credit=04: For my part, Credit=02** **Group A Theory: 20 NLP + Practical [NLP=75+75 for two group of students]: Computer Programming** LINUX Syntax of GFORTRAN language: With problems from set.-I to set-IX. Numerical Analysis: Theory: Solution of nonlinear equations; iteration; bisection method; secant method; Newton - Raphson method. Interpolation: Lagrange's interpolation; numerical differentiation, Numerical integration, Riemann, trapezoidal and Simpson's rules; Solution of linear simultaneous equations - Gauss elimination; Gauss - Jordan elimination. Matrix algebra; eigen values and eigenfunctions of matrices.	Traditional classroom teaching. PDF notes and question banks as well as their hard copies are provided to the students. Hard copies of related chapters from text and reference books are provided to the students. Set-I to Set-IX of programming questions and solutions are given in PDF format.
IV	**PH-1001C: Condensed Matter Physics: Credit=04** **Group A [NLP=25]:** Crystal Physics, Interaction of X – rays with matter, The reciprocal lattice. The Laue, powder and rotating crystal methods. Crystal structure factor Point Group. Crystal Defect. Lattice Vibration. Lattice specific heat, Free Electron Theory. **Group B [NLP=25]:** Dielectric Functions and Ferroelectric, Optical Processes and Excitons, Band Theory of Solids Magnetic Properties of solid, Superconductivity	Traditional classroom teaching. PDF notes and question banks as well as their hard copies are provided to the students. Hard copies of related chapters from text and reference books are provided to the students.
IV	**PH-1004E: Advanced Physics** **Credit=04: For my part, Credit=01**	Traditional classroom teaching. PDF notes and question banks as

	Group B [NLP=10]: UV-Vis Absorption Spectroscopy, Fluorescence Spectroscopy, FTIR , Brewster Angle Microscopy (BAM), Fluorescence Imaging Microscopy (FIM)), applications of thin films.	well as their hard copies are provided to the students. Hard copies of related chapters from text and reference books are provided to the students.
IV	**PH 1003C: Project work : Credit=06** Project work for 4th Semester students	One topic is allotted to each student and they investigate the problem on the basis of literature survey and some laboratory work. Finally, they prepare a dissertation on the work done and give a presentation..

Prof. Surya Chattopadhyaya

Semester	Paper	Topics	Teaching Methodology
I	PH-702C: Classical Mechanics Credit=04	**Group A [NLP=25]:** • Review of Newtonian mechanics • Lagrangian formulation and its applications • Rotating Frame of References • Rigid body motion • Hamilton's principle and its applications **Group B [NLP=25]:** • Small oscillation in couples systems • Hamiltonian formulation and its applications • Canonical transformation • Hamilton-Jacobi theory • Action-angle variables • Lagrangian and Hamiltonian formulation of continuous system	Traditional classroom teaching. PDF notes as well as their hard copies will be provided before each lecture. Hard copies of related chapters from text and reference books will be provided to the students. Question Bank and List of Numerical Problem will also be supplied.

I	PH-703C: Computer programming & Basic Electronic design practical Credit=04 For my part, Credit=02	**Group B [NLP=75+75] for two group of students]:** • Construction of power supply (±12 V & +5 V) • Design and study of different logic gates with both discrete components and digital ICs (74**). • Design and study of different adder and subtractor circuits with ICs. • Design and study of different amplifier and filter circuits using OP-AMP(IC-741/536/555) • Designing and study of common emitter (CE) amplifier circuit with NPN/PNP transistor. • Designing and study of emitter follower (CC) amplifier circuit with NPN/PNP transistor	Instruction manuals, Pin diagrams of different ICs, Transistors will be provided before commencement of the practical classes. Hard copies of related chapters from text and reference books will be provided to the students. Traditional Classroom mode of teaching will be conducted before each experiment to explain the details of each circuit. Hands-on demonstration of design & study of each circuit will be done by the teacher before allowing students to handle it.
II	PH-802C: Statistical Mechanics Credit=04	**Group A [NLP=25]:** • Foundations of statistical mechanics • Macro & microstates, thermodynamic probability. • Classical statistics of ensembles • Foundation of quantum statistics • Density matrix & its applications **Group B [NLP=25]:** • Statistics of indistinguishable particles • Features and applications of BE & FD statistics • Fluctuations and transport phenormena	Traditional classroom teaching. PDF notes as well as their hard copies will be provided before each lecture. Hard copies of related chapters from text and reference books will be provided to the students. Question Bank and List of Numerical Problem will also be supplied.

		• Cluster expansion for a classical non-ideal gas • Ising model • Phase transition	
III	PH-902C: Atomic & Molecular Physics Credit=04 For my part, Credit=02	**Group B [NLP=25]:** Molecular Physics • Fundamentals of molecular spectroscopy • Microwave spectroscopy • Infrared spectroscopy • Raman spectroscopy • Electronic spectra • Mossbauer spectroscopy	Traditional classroom teaching. PDF notes as well as their hard copies will be provided before each lecture. Hard copies of related chapters from text and reference books will be provided to the students. Question Bank and List of Numerical Problem will also be supplied.
IV	PH-1004E: Advanced Physics Credit=04 For my part, Credit=01	**Group D [NLP=13]:** Introductory theoretical chemical physics • Approximation methods in quantum mechanics. • Pre & post Hartree-Fock approximations • Density Functional Theory (DFT) & its applications	Traditional classroom teaching. PDF notes as well as their hard copies will be provided before each lecture. Hard copies of related chapters from text and reference books will be provided to the students. Question Bank and List of Numerical Problem will also be supplied.
IV	PH 1003C: Project work Credit=06	Project work for 4^{th} Semester students	One topic will be allotted to each student and they will investigate the problem on the basis of literature survey and some laboratory work. Finally, they will prepare a dissertation on the work done and give a presentation. The assessment will be made on the basis of the dissertation, presentation and viva-voce.

Dr. Syed Arshad Hussain			
Semester	**Paper**	**Topics**	**Teaching Methodology**
I	**PH-701C**: Mathematical Physics	**Group A [NLP=11]:** Matrices And Tensors	Traditional classroom teaching using whiteboard and overhead projector when required. Handout will be provided before each lecture Class note are give through website https://arshadnotes.wordpress.com/matrix/
II	PH-801C: Basic Electronics	**Group A [NLP=25]:** Bipolar devices, Field-effect transistor, Microwave device, Photonic device, Memory device, Operational Amplifiers (OPAMP) applications **Group B [NLP=25]:** Analog circuits, Feedback amplifiers, Power circuits and system, Power supply, Communication Electronics.	Traditional classroom teaching using whiteboard and overhead projector when required. Handout will be provided before each lecture Class note are give through website https://arshadnotes.wordpress.com/electronics-i/
	PH-904C: Advanced Practical – I	**Practical paper [NLP=75]:** Experiments based of solid state devices	Handout will be provided before each practical Tutorial class will be arranged Practical experiments will be demonstrated Students will perform each experiments
III	PH-903C: Atomic & Molecular Spectroscopy	**Group A [NLP=25]:** Atomic Spectroscopy, Lasers	Traditional classroom teaching using whiteboard and overhead projector when required. Handout will be provided before each lecture Class note are give through website https://arshadnotes.wordpress.com/atomic-spectroscopy/
	PH-1004C: Advanced Practical - III	**Practical Paper [NLP=150]:** Experiments based of Advanced Electronic Design	Handout will be provided before each practical Tutorial class will be arranged Practical experiments will be demonstrated Students will perform each experiments
IV	PH-1002C: Advanced Electronics	**Group A (NLP=14):** Analog to Digital Conversion, Simplifying Logic Circuit & Mapping & code conversion	Traditional classroom teaching using whiteboard and overhead projector when required. Handout will be provided before each lecture Class note are give through website

			https://arshadnotes.wordpress.com/electronics-ii/
	PH-1004E: Advanced Physics	**Group B [NLP=10]** Importance of thin films, different thin film preparation techniques: Spin Coating, Langmuir-Blodgett (LB), Layer-by-Layer (LbL) Self Assembly, Atomic Force Microscopy (AFM), Application of thin films	Traditional classroom teaching using whiteboard and overhead projector when required. Demonstration of research laboratory instruments. Handout will be provided before each lecture Class note are give through website https://arshadnotes.wordpress.com/phys-1004e-advance-physics/

Dr. Anirban Guha			
Semester	**Paper**	**Topics**	**Teaching Methodology**
II	PHYS-805E: Microprocessor Architecture and Programming	Introduction to 8085 hardware, programming in assembly level language, practical using microprocessor kit and simulator **[NLP=50]**	Traditional classroom teaching using whiteboard and overhead projector when required.
III	PHYS-901C: Electrodynamics and Plasma Physics	Maxwell's equation, inhomogeneous wave equations, electrostatic multipole expansion, dielectrics, plasma physics **[NLP=40]**	Traditional classroom teaching using whiteboard and overhead projectorwhen required.
	PHYS-904C: Advanced Practical -III	Experiments based of Advanced Electronic Design**[NLP=150]**	Traditional laboratory teaching using whiteboard and overhead projector when required.
IV	PH-1002C: Advanced Electronics	Digital communication, modulation techniques, fiber optic communication, satellite communication, optoelectronics **[NLP=30]**	Traditional classroom teaching using whiteboard and overhead projectorwhen required.
	PHYS 1004C: Project Work	Experimental works related to electronic design and advanced programming using open source language **[NLP=50]**	Traditional classroom and laboratory teaching using whiteboard and overhead projector when required.
	PHYS 1004E: Advanced Physics	Basics of atmospheric science, instrumentation **[NLP=12]**	Traditional classroom teaching using whiteboard and overhead projector when required. Demonstration of research laboratory instruments.

Dr. Ratan Das			
Semester	**Paper**	**Topics**	**Teaching Methodology**
I	PH-701C: Mathematical Physics	**Group B [NLP=11]:** Special functions and Group theory	Traditional classroom teaching Hard copy of class notes and related materials would be provided before each lecture
II	PH-801C: Basic Quantum Mechanics	**Group A [NLP=25]:** Dirac formalism, unitary operator, Time evolution operator, number operator, annihilation and creation operator and their matrix representation, Unitary transformation, Basis change, Different Picture, symmetries and equation of motionSolving simple harmonic oscillator problem by algebraic method. **Group B [NLP=25]:** Orbital angular momentum operator, Pauli spin matrices and its eigen-functions as spherical harmonics. Free particle and its partial wave expansion. Time independent perturbation theory, Variational Method and WKB approximation , Anharmonic oscillator.	Traditional classroom teaching Hard copy of class notes and related materials should be provided before each lecture.
II	PH-806E: Astrophysics and Astronomy	**Group A [NLP=20]:** Magnitude systems, Color index; Different Constellations: Saha's equation; spectral classification; H-R Diagram; X-ray, UV, IR, and Radio Telescope, Photometry and polarimetry, Astronomical Co-ordinates and Celestial	Traditional classroom teaching Hard copy of class notes and related materials should be provided before each lecture.

		Mechanics: Star formation in Interstellar medium (ISM), Hydrostatic equilibrium, **Group B: [NLP-20]** Massive stars, White dwarfs, Chandrasekhar limit, Neutron stars and pulsars, Black Holes. Standard Cosmological model, Dark Matter and Dark Energy, Gamma ray bursts, Gravitational Waves. Curved space-time, Einstein's Field equations.	
II	PH-804C: Advanced Practical - II	Practical paper [NLP=75]: Experiments related to detection of radiation, magnetism and solid state physics	Manuals of each experiments along with details experimental procedure of each experiments would be provided. Practical experiments should be demonstrated So that students can perform each experiments.
III	PH-903C: Nuclear Physics and Particle Physics	**<u>Group A</u> [NLP=25]:** Basic nuclear concepts, Isospin formalism. Nuclear Force and Deuteron Problem, Nucleon-Nucleon scattering, exchange forces, Yukawa interaction, Nuclear Reactions Shell model, magnetic moments and Schmidt lines; Collective model of the nucleus. Different counters and detectors and **Group B [NLP-25]** Interaction of alpha radiation with matter- Gamma interaction with matter, Mossbauer effect. Gammow's theory; Fermi's theory of	Traditional classroom teaching Hard copy of class notes and related materials should be provided before each lecture..

		beta decay Elementary Particles Hadrons, Mesons and leptons, CP and CPT invariance, Quark model.	
	PH-905E: Advance Quantum mechanics	**Group A [NLP-25]** Space translation operator, Hamiltonian as the generator of time translation. Addition of Angular momentum and Clebsch Gordon Coefficients. Formal theory scattering amplitude, differential and total cross section, Optical theorem. Born approximation and partial wave analysis. Time dependent perturbation theory: Interaction picture. Adiabatic and Sudden approximation.	Traditional classroom teaching Hard copy of class notes and related materials should be provided before each lecture.
IV	PH-1001C :	**Group B (NLP=12):** Magnetic Properties: Diamagnetism. Quantum theory of paramagnetism. Paramagnetic properties of solids. Heisenberg's theory. Saturation magnetization. Magnons. Ferromagnetic and antiferromagnetic systems. Domains. Magnetic bubble domains. Superconductivity: Meissner effect. Heat capacity. Isotope effect. London's equation. BCS theory (qualitative ideas).	Traditional classroom teaching Hard copy of class notes and related materials should be provided before each lecture.
	PH-1004E: Advanced Physics	**Group C[NLP=12]:** Different nanomaterials and their special properties. Quantum Dots. X-Ray Diffractometer and its principle:	Traditional classroom teaching Hard copy of class notes and related materials should be provided before each lecture.

		Structural Characterization, Morphological analysis by electron microscopy. Different Application of nanomaterials including photonics and plasmonics.	