



Programme Specific Outcomes (PSOs) and Course Outcomes (COs)

For

Bachelor of Science in Physics Programme

The Department of Physics,

St. Anthony's College,

Shillong



PROGRAMME SPECIFIC OUTCOMES

The Department of Physics, St. Anthony's College, Shillong offers the three year undergraduate Honours course in Physics. The Department has a defined set of Programme Specific Outcomes (PSOs) which guides the teaching learning and evaluation process in the Department. On completion of this course the student should attain the following attributes.

- PSO1. A scientific attitude and temperament
- **PSO2.** Acquire a comprehensive knowledge and sound understanding of the fundamentals of the subject and its relevance to the present context.
- **PSO3.** Develop practical, analytical and mathematical skills in the subject.
- **PSO4.** Develop skills of experimental techniques, measurement, data analysis, calculation and error estimation.
- **PSO5.** Be able to apply one's knowledge and understanding of the subject and skills to new contexts
- **PSO6.** Be able to identify and analyze problems and issues and seek solutions to real life problems.
- **PSO7.** Demonstrate subject-related and transferable skills that are relevant to Physics related jobs and other employment opportunities.
- **PSO8.** Develop the ability to transmit technical information relating to all areas in Physics in a clear and concise manner in writing and oral for better understanding.
- **PSO9.** Attain sufficient conceptual knowledge of the subject needed for higher studies and research in the subject
- **PSO10.** Be capable of self-paced and self-directed learning aimed at personal development and for improving knowledge and skills in all areas of Physics.



COURSE OUTCOMES (COs)

The Department follows the syllabus and curriculum structure as mandated by the affiliating University. During the three years of the BSc Physics Honours programme, spread over 6 semesters, 8 theory papers and 5 practical papers are taught. The Semester wise distribution of the Papers and their Course Outcomes are listed below.

SEMESTER-I		
Name of the Paper: Mathematical Physics-I, Mechanics, Waves and Acoustics Paper Code: PHY01(T)	SEMESTER-I Upon completion of this course the students will learn, understand and develop the concepts of C01. Vector algebra C02. Ordinary differential equations C03. Frames of reference and their applications C04. Conservative forces, their properties and applications C05. Dynamics of a system of particles and its applications to different systems C06. Rigid body dynamics C07. Theory of Elasticity and its applications C08. Dynamics of fluids C09. Simple harmonic motions and its applications C010.Oscillations and waves C011.Ultrasonics their properties and applications	
SEMESTER-II		
Name of the Paper:	Upon completion of this course the students are expected to learn, understand and develop the concepts of	
Electromagnetism, Electronics – I	 CO1. Theory of electrostatics CO2. Electric fields in Dielectric media CO3. Electrical images and its applications 	

Paper	CO4. Magnetostatics
Code: PHY02(T)	CO5. LR, CR and LCR circuits - Series and Parallel
	CO6. Basics of Power supply
	CO7. Laws of Mutual and self inductance and their applications
	CO8. Maxwell's equations
	CO9. Basic circuit analysis
	CO10. Analog and Digital signals
	CO11. Elementary digital electronics and Boolean
	algebra
Name of the Paner:	Upon completion of this course students will understand the
i tune of the I uper	theory and be able to perform the following experiments and apply the
Experimental	underlying principles to perform other such experiments. Also it should
Physics-I	help them develop conceptual knowledge of the underlying theory
Paner Code•	through experiential learning.
PHY(02(P)	
111102(1)	co1. Determination of the value of acceleration due to gravity using
	compound pendulums
	CO2. Determination of the moment of inertia by using torsional
	pendulum.
	CO3. Determination of the rigidity modulus of a cylindrical body by
	static torsion apparatus
	CO4. Determination of the co-efficient of viscosity of liquid by capillary
	tube method.
	CO5. Determination of the surface tension of a liquid by Jaeger's
	method.
	CO6. Determination of the frequency of a tuning fork by Melde's
	method.
	CO7. To verify the inverse square law in magnetism
	CO8. Determination of the resistance per unit length of the potentiation of the resistance per unit length of the potentiation of the resistance per unit length of the potentiation of the potentiation of the resistance per unit length of the potentiation of the potentiation of the resistance per unit length of the potentiation of the potentia
	wire by Carey-Foster method.
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	CO9. Determination of the value of the capacitance of an unknown
	capacitor by using the de-Sauty's bridge.
	SEMESTER-III
Name of the Paper:	Upon completion of this course the students are expected to learn,
Thermal Physics,	understand and develop the concepts of
Optics	CO1. Kinetic theory of gases and its applications.
D	CO2. Transport phenomena in gases
Paper Code: PHY03(T)	CO3. Laws of thermodynamics and their applications to understand different characteristics of gases
	CO4. Liquefaction of gases
	CO5. Theory of Black body radiation
	CO6. Theory of geometric optics and image formations
	CO7. Aberration in image formations
	CO8. Theory of Black body radiation
	CO9. Theory of Interference, diffraction and polarizaton
	CO10. Introductory theory of dispersion and scattering
	CO11. Introduction to lasers and fibre optics
Name of the Paper:	Upon completion of this paper, students will understand the
Experimental	theory and be able to perform the following experiments and apply the
Physics-II	underlying principles to perform other such experiments. Also it should
1 1195105-11	help them develop conceptual knowledge of the underlying theory
Paper Code:	through experiential learning.
PHY03(P)	co1. Determination of the co-efficient of linear expansion of a solid by
	using Pullinger's apparatus and optical lever.
	CO2. Determination of the specific heat of a liquid by the method of
	cooling.
	CO3. Determination of the co-efficient of thermal conductivity good
	Non

conductor by Searle's method. C04. Determine the mechanical equivalent of heat by Joule's calorimeter. C05. Determination of the refractive index of a prism by a spectrometer using monochromatic light. C06. Determination of the radius of curvature of a lens by Newton's ring method. C07. Determination of the grating constant by using a spectrometer. C08. Determination of the refractive index of the materials of convex lens by measuring its focal length (displacement method) and radi of curvature (using spherometer). C09. Determination of the refractive index of the materials of convex lens by measuring its focal length (displacement method) and radi of curvature (using spherometer). C010. To study the frequency response of a series and parallel LCR circuit Special Theory of Relativity, Quantum Upon completion of this course the students are expected to lear understand and develop the concepts of Relativity, Quantum C01. Basics of the theory of relativity C02. Introductory to quantum mechanics and Schrodinger's equation C03. Introductory Atomic Physics – Radioactivity, properties of nucleus nuclear Physics-I C04. Introductory Nuclear Physics – Radioactivity, properties of nucleus nuclear reactions		
C04. Determine the mechanical equivalent of heat by Joule's calorimeter. C05. Determination of the refractive index of a prism by a spectrometer using monochromatic light. C06. Determination of the radius of curvature of a lens by Newton's ring method. C07. Determination of the grating constant by using a spectrometer. C08. Determination of the refractive index of the materials of convex lens by measuring its focal length (displacement method) and radio of curvature (using spherometer). C09. Determination of the refractive index of the materials of convex lens by measuring its focal length (displacement method) and radio of curvature (using spherometer). C010. To study the frequency response of a series and parallel LCR circuit Special Theory of Relativity, Quantum C01. Basics of the theory of relativity Mechanics -I, C02. Introductory to quantum mechanics and Schrodinger's equation Atomic Physics-I Atomic Physics-I C03. Introductory Nuclear Physics – Radioactivity, properties of nucleus nuclear reactions		conductor by Searle's method.
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CO6. Introductory Solid State Physics - theory of crystals and their	1 1195105-1	
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C04. Use of a multimeter to measure the output voltages of half wave and full wave rectifiers and find the value of ripple factors. C05. Determination of Planck's constant by photocell or by heating method. C06. Determination of the specific charge (e/m) of an electron by magnetron/Thomson's method. C07. Determination of the value of an unknown low resistance by using potentiometer. C08. Determination of the emf of a battery by using potentiometer. C09. Verification of Thevenin's theorem. C010. Verification of Norton's theorem. C011. Verification of Superposition theorem. SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of		Potentiometer	
COV. Ose of a mutualited to measure the output voltages of mail wave and full wave rectifiers and find the value of ripple factors. COS. Determination of Planck's constant by photocell or by heating method. CO6. Determination of the specific charge (e/m) of an electron by magnetron/Thomson's method. CO7. Determination of the value of an unknown low resistance by using potentiometer. CO8. Determination of the emf of a battery by using potentiometer. CO9. Verification of Thevenin's theorem. CO10. Verification of Norton's theorem. CO11. Verification of Superposition theorem. SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of		COM Use of a multimeter to measure the output voltages of half	
wave and run wave recenters and run due value of hipple factors. CO5. Determination of Planck's constant by photocell or by heating method. CO6. Determination of the specific charge (e/m) of an electron by magnetron/Thomson's method. CO7. Determination of the value of an unknown low resistance by using potentiometer. CO8. Determination of the emf of a battery by using potentiometer. CO9. Verification of Thevenin's theorem. CO10. Verification of Norton's theorem. CO11. Verification of Superposition theorem. SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of		wave and full wave rectifiers and find the value of rinnle factors	
COS. Determination of Franck's constant by photocen of by nearing method. COG. Determination of the specific charge (e/m) of an electron by magnetron/Thomson's method. CO7. Determination of the value of an unknown low resistance by using potentiometer. CO8. Determination of the emf of a battery by using potentiometer. CO9. Verification of Thevenin's theorem. CO10. Verification of Norton's theorem. CO11. Verification of Superposition theorem. CO11. Verification of Superposition theorem. CO12. Verification of this course the students are expected to learn, understand and develop the concepts of		COE Determination of Planck's constant by photocell or by heating	
CO6. Determination of the specific charge (e/m) of an electron by magnetron/Thomson's method. CO7. Determination of the value of an unknown low resistance by using potentiometer. CO8. Determination of the emf of a battery by using potentiometer. CO9. Verification of Thevenin's theorem. CO10. Verification of Norton's theorem. CO11. Verification of Superposition theorem. SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of		method	
COR Determination of the specific charge (charge		CO6. Determination of the specific charge (e/m) of an electron by	
C07. Determination of the value of an unknown low resistance by using potentiometer. C08. Determination of the emf of a battery by using potentiometer. C09. Verification of Thevenin's theorem. C010. Verification of Norton's theorem. C011. Verification of Superposition theorem. SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of		magnetron/Thomson's method	
Image: Construction of the value of an analytic of a battery by using potentiometer. CO8. Determination of the emf of a battery by using potentiometer. CO9. Verification of Thevenin's theorem. CO10. Verification of Norton's theorem. CO11. Verification of Superposition theorem. SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of		CO7 Determination of the value of an unknown low resistance by	
CO8. Determination of the emf of a battery by using potentiometer. CO9. Verification of Thevenin's theorem. CO10. Verification of Norton's theorem. CO11. Verification of Superposition theorem. SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of Mathematic Physics Concepts of		using potentiometer	
CO9. Verification of Thevenin's theorem. CO10. Verification of Norton's theorem. CO11. Verification of Superposition theorem. SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of Mathematic Physics Image: Concepts of Con		cos Determination of the emf of a battery by using potentiometer	
CO10. Verification of Norton's theorem. CO10. Verification of Superposition theorem. CO11. Verification of Superposition theorem. SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of Mathematic Physics Concepts of		CO9 Verification of Thevenin's theorem	
CO11. Verification of Superposition theorem. CO11. Verification of Superposition theorem. SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of Mathematic Physics Concepts of		CO10 Verification of Norton's theorem	
Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of		CO11 . Verification of Superposition theorem	
SEMESTER-V Name of the Paper: Upon completion of this course the students are expected to learn, understand and develop the concepts of Mathematic Physics			
Name of the Paper:Upon completion of this course the students are expected to learn, understand and develop the concepts ofMathematic Physics	SEMESTER-V		
Mathematic Physics understand and develop the concepts of	Name of the Paper:	Upon completion of this course the students are expected to learn,	
Mathematic Physics		understand and develop the concepts of	
Wallemater Thysics-	Mathematic Physics-	Difference in the second	
II, Quantum CO1. Different coordinate systems and their inter relations	II, Quantum	CO1. Different coordinate systems and their inter relations	
5.			
Shillow		Shillong	

Mechanics-II	CO2. Theory of matrices and their properties; Characteristic
	equations, Eigen vectors and Eigen Values
Paper Code:	CO3. Second order differential equations and their solutions
PHY05(T-A)	CO4. Legendre and Hermite Polynomials
	CO5. Partial differential equations and their solutions
	CO6. Gamma and Beta functions and their properties
	CO7. Elementary tensor analysis
	CO8. Operator formalism of Quantum Mechanics
	CO9. Applications of time independent Schrodinger's equation
	CO10. Angular momentum operators in spherical polar coordinates
	CO11. Solution of Hydrogen problem using Schrodinger's equation in
	polar coordinates
Name of the Paper:	Upon completion of this course the students are expected to learn,
	understand and develop the concepts of
Classical Mechanics,	
Electrodynamics,	CO1. Introductory Lagrangian and Hamiltonian formulation of
Statistical Physics,	Classical Mechanics
Energy Sources	CO2. Maxwell's Equations in vacuum and material media
Danan Cadar	CO3. Electric field inside matter
	CO4. Boundary conditions satisfied by E and D at the interface
PHY05(1-B)	between two homogeneous dielectrics
	CO5. Electromagnetic Potentials
	CO6. Electromagnetic waves, Poynting's theorem and Poynting
	Vector
	CO7. Thermodynamic relations
	CO8. Introductory statistical Mechanics
	CO9. Renewable energy sources



Upon completion of this course, students will understand the
theory and be able to perform the following experiments and apply the
underlying principles to perform other such experiments. Also it should
help them develop conceptual knowledge of the underlying theory
through experiential learning
unough experiential learning.
CO1. Measurement of temperature by using a thermocouple.
co2 . Determination of wavelength of the spectral lines of an
element by using a plane diffraction grating and spectrometer.
co3. Determination of electrical conductivity of solid electrolyte by
Kaulrauch method.
CO4. Determination of the co-efficient of thermal conductivity of a
bad conductor by Lee's method.
cos. Determination of the specific rotation of solution using
polarimeter.
CO6. Determination of Young's modulus (Y) of glass using Cornu's
Method.
co7. Determine the refractive index of the material of a prism.
CO8. To measure the width of single slit from the study of its
Fraunhoffer diffraction.
co9. Determination of the wavelength of sodium light using
biprism.
CO10 . Determination of the monochromatic wavelength by
Michelson interferometer.
co11. Determination of the reduction factor of a tangent
galvanometer and also the value of horizontal component of
earth's magnetic field by electrolysis method.
CO12. Determination the velocity of ultrasonic waves in liquid.
SUL SUL



	SEMESTER-VI
Name of the Paper:	Upon completion of this course the students are expected to learn,
Solid State Physics-	understand and develop the concepts of
II, Electronics-II and	CO1. Crystal structures and their symmetry
Fortran	CO2. Theory of diffraction by crystals
Programming	CO3. Bonding in Crystals
	CO4. Theory of Lattice vibrations
Paper Code:	CO5. Quantum mechanical treatment of free electrons in metals
PHY06(T-A)	CO6. Introduction to band theory of solids
	CO7. Langevin theory of diamagnetism and paramagnetism
	CO8. Weiss theory of ferromagnetism; anti – ferromagnetism and
	ferri - magnetism
	CO9. Introductory theory of Superconductors
	CO10. FET, OPAMP, Amplifiers, and Oscillators
	co11. Elements of communication systems, features of radio
	communication
	CO12. TTL Logic families, multiplexer, demultiplexer, digital
	comparator
	CO13. Fortran 77 programming language
Name of the Paper:	Upon completion of this course the students are expected to learn,
	understand and develop the concepts of
Atomic Physics-II,	
Molecular	CO1. Vector atom model
Spectroscopy,	CO2. Zeeman effect – experiment and theory
Nuclear Physics –II,	CO3. Theory of Alkalı spectrum
Astrophysics	CO4. Two electrons system: L-S coupling, j-j coupling, Pauli's
	exclusion principle, spectra of helium atom and alkaline
Paper Code:	atoms, singlet and triplet fine structure, selection rules

1. Mar

РНҮ06(Т-В)	CO5. Types of molecular spectra – rotational, vibrational and
	electronic spectra
	CO6. Quantum mechanical theory of rigid body rotator
	CO7. Electronic spectra: Electronic band systems, sequence and
	progression, Frank Condon principle
	CO8. Raman effect and its brief quantum mechanical explanation,
	CO9. Fundamental ideas of UV and IR spectroscopy
	CO10. Nucleus and its properties
	CO11. Binding energy of a nucleus and its variations
	CO12. Semi empirical Binding energy Formula
	CO13. Different Nuclear models
	CO14. Properties of nuclear forces, two nucleon system, square well
	solution of the deuteron problem
	CO15. Geiger – Nuttal law, Gamow's theory of α decay, Fermi's
	theory of β – decay
	CO16. Nuclear radiation and energy levels
	CO17. Biological effects of nuclear and electromagnetic radiations
	CO18. Nuclear Reactions and its energetics
	CO19. Nuclear Fission and the Bohr Wheeler theory of nuclear fission
	CO20. Four factor formula for a nuclear multiplication factor
	CO21. Nuclear reactors and its types
	CO22. Nuclear fusion and fusion in plasma,
	CO23. Tokamak experiment in fusion systems.
	CO24. Basic theory of Elementary Particles
	CO25. Fundamental interactions, forces and fields
	CO26. Symmetries and Conservation laws, Baryon and Lepton
	number conservation
	CO27. Resonant particles: discovery and important properties
	CO28. Gell-mann Nishijima scheme and the quark model
	CO29. Stellar evolution
	CO30. Spectral Classification of stars
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	CO31. Star systems
	CO32. Solar cycles, its activity, Butterfly diagram and Photosphoric
	phenomena
Name of the Paper:	After completion of this paper, students will understand the
F 1	theory and be able to perform the following experiments and apply the
Experimental	underlying principles to perform other such experiments. Also it should
Physics-V	help them develop conceptual knowledge of the underlying theory
	through experiential learning.
Paper Code:	
PHY06(P)	CO1. To study the a full wave rectifier
	CO2. To study the characteristics of a transistor in different
	configurations
	CO3. To study the characteristics of JFET.
	CO4. To design and study simple logic gates using ICs
	CO5. To study Lissajous figures using C.R.O.
	CO6. To study the frequency response of RC coupled amplifier.
	CO7. To write simple Fortran programs.
	CO8. Study the operation and characteristics of a GM counter.

