DEPARTMENT OF PHYSICS

BISWANATH COLLEGE

PROGRAMME OUTCOMES

PROGRAMME: B.SC. PHYSICS

Link to GU Syllabus:

1. Physics Major/General (Non-CBCS): https://sites.google.com/a/gauhati.ac.in/syllabus-ug-old/undergraduate-courses/tdc-in-physics-major-general
2. Physics Honours (Non-CBCS): https://sites.google.com/a/gauhati.ac.in/syllabus-ug-cbcs/honours/physics
3. Physics Regular (CBCS): https://sites.google.com/a/gauhati.ac.in/syllabus-ug-cbcs/regular/physics

1. Knowledge and Understanding:

a. In Mathematical Physics, students get the opportunity to learn vectors, vector calculus, Differential Equations, Matrices, Tensor Analysis, and Complex Variables etc.

b. Students learn various facts of Electricity and Magnetism. They also learn the basics of transmission lines, principle of operation of electric motors, electric generator. A comprehensive review on Gauss's Law and its applications in determination of Electric field intensity in different electrical set up.

c. Students will gain adequate knowledge on laws of thermodynamics and its applications in Heat engine, refrigerator etc. They will also grasp the utility of second law in describing entropy of thermodynamic systems and its connection to evolution of universe.

d. Students will learn the basics of electronics, principle of operation of diodes, transistors etc. It will help in understanding the working of rectifiers used for AC-DC conversion, amplifiers etc.

e. Students get the opportunity to learn various computational techniques like C, C++, FORTRAN, and Python. They will also be made acquainted to software's like MATLAB, MATHEMATICA. However, because of time constraint it may not be possible to learn enough on every language or software's.

f. Students learn the evolution of different Atom Models discussed under Atomic Physics. The program will enable students to understand the physics of Hydrogen spectra, fine structure lines in spectroscopy and splitting of spectral lines in external fields. It has far reaching implications in understanding the composition of astrophysical objects of interest.

g. Students will learn the theories and models of Nuclear and Particle Physics. This knowledge will help in understanding the working of modern day detectors, counters.

The concept of Binding Energy will help in understanding the fundamentals of nuclear stability.

h. With the introduction of Statistical Physics, students will understand the physics of many particle systems. The knowledge on classical and quantum statistics will describe the behavior of Bose Einstein's Condensate, Fermi pressure and the behavior of white dwarf star.

i. Students will learn geometrical optics, physical optics and holography to understand various optical phenomena and will understand the designing of optical instruments.

j. The physics of bodies moving at speed comparable to light is indeed very interesting and it conceptualize the understanding on different frame of reference. The students will learn Special Theory of Relativity and its applications.

2. Development of intellectual faculties:

a. Mathematics is the language of Physics. The course will promotelogical and analytical thinking amongst students.

b. Students will eventually develop the art of relating the facts learned in different papers and this will inculcate constructive thinking and will develop problem solving capacity.

c. During the process of performing experiments, a systematic approach is required. This systematic study develops a sense of chronological approach towards a problem.

d. In performing experiments relatedto Electronics paper, students will acquire the skill of designing circuit and assembling components.

e. While learning various facts, students will develop a sense of visualization. It will help them to grasp the nature of subatomic particles and behaviour of different physical systems of interest.

f. Students will develop imaginative power and will also acquire the skill to estimate measurements or make legitimate guess in physics problems.

3.Practical Skills:

a. Students learn the basic measuring techniques of length using slide callipers, screw gauge, spherometer etc.

b. Students will get the exposure to certain experiments of electricity, thermal physics, mechanics, nuclear physics, electronics and so forth.

c. Students will learn how to handle analog and digital multimeters. They will experience the utility of different electronic instruments.

d. Students will get the opportunity to handle function generator and CRO (Cathode Ray Oscilloscope). By this process, they will learn to measure frequency, wavelength of a wave or signal.
e. Students are supposed to pursue a project on a novel topic. This fosters a sense of creativity amongst the students. Also, the students will get a basic feel of research. They will acquire some computational skill, writing skill and will develop physical insight on the problem.
f. Students will get hands-on training on the latest computational techniques like Python, Sci-Lab etc.

4. **Communication and Other Skills:**

a. Students are allowed to prepare a topic holistically and after that they are asked to present. This polishes their communication skills. In other words, the communication skill is developed.
b. While performing the project work, students are encouraged to participate in group discussion with the supervisor, other faculty members and some of the students. This will develop a confidence and art of speaking/delivery in public platform. Sometimes projects are carried out in group. By that process, they develop a team spirit, sportsmanship etc.
c. The course exposes the students to various facets of computer programming and other relevant diagnostic techniques that may have important applications in developing future technology.

5. Prospects of employment:

(a) After the successful completion of this course, a student becomes eligible to pursue higher studies such as MSc (Physics) in different reputed institution across the country.

(b)A student of BSc Physics can be absorbed as a science teacher in a school provided he/she fulfils other eligibility criteria.

(c) A student of BSc Physics may get the opportunity to pursue a course on Geophysics, Biophysics, Sound engineering and so forth.

(d) A student of BSc Physics may get employment in the fields of instrumentation, nuclear medicine, radiology etc.

(e) A student pursuing BSc in Physics may dream of getting placement as Scientists in reputed organization like ISRO, DRDO other research institutes like IUCAA, S.N. Bose institute, SINP, Kolkata after completion of Ph.D and adequate research in respective fields.

(f) Students may undertake various training after completion of BSc and may get a scope to

serve the country through civil services.

(g) Students will get ample opportunity to build a career in reputed Govt. owned enterprises like OIL, ONGC, and IOCL after completion of BSc.

(h) There are opportunities to get a placement in Central, Cooperative Banks as PO, Asst Branch Manager, and Client relationship officer after completion of BSc in Physics, which serves as eligibility criteria.

6. **Ethics**:

(a) In the process of project preparation students will be made aware of IP tools such as copyright. They will learn about plagiarism issues and will practice genuine techniques in preparing projects and other reports related to academics. This will develop an independent feel and bring out creativity amongst students.

(b)Students will understand the protocols of Laboratory work and learn discipline in performing their duties.

Head
Deptt.of Physics

Learning Objective & Outcomes

B.Sc.1st Semester

Subject:Mathematical Physics I **Subject Code:PHY-HC-1016**

Learning Objective

1. The students will be introducedto Mathematical tools needed to address any problems in Theoretical Physics
2. The course will giveknowledge about Vector Calculus, Differential Equations, Curvilinear Coordinates, and Special Functions which have proved to be vital components in understanding key concepts of Electrodynamics, Quantum Mechanics, and Statistical Mechanics.
3. The course is designed in a framework that can inculcate analytical thinking among the students.

Learning Outcomes

After the completion of the course-

1. Students will acquire adequate knowledge about Vector and its applications in various fields.
2. The course will enable the students to apply the knowledge of Differential Equations in different core papers to be learned in subsequent semesters.
3. At the end of the course, the students are expected to understand the importance of different coordinate systems i.e. Cartesian, spherical and cylindrical in studying Physics.
4. The course will enable students to pursue a career in Theoretical Physics in the future.

Learning Objective & Outcomes

B.Sc. 1st Semester
Subject: Mechanics **Subject Code:PHY-HC-1026**

Learning Objective

1. This paper deals with Newtonian mechanics and its importance in classical world.
2. The paper is introduced with the very motive to familiarize students with various conservation laws of nature, physics of astrophysical objects, rigid body dynamics, physics of materials used in daily life.
3. Above all, Special theory of Relativity is introduced to learn the importance of inertial frames, Transformation equations and physical events admissible at speed comparable to light.

LearningOutcomes

After the completion of the course, Students will be ableto

1. Distinguish between inertial, non-inertial frames and physics associated with this reference frames.
2. Understand the Simple Harmonic Motion and the characteristics of such oscillating systems.
3. Grasp the principle of projectile motion and their applications in technological advancement.

Learning Objective & Outcomes

B.Sc. 2nd Sem.

Subject: Electricity and Magnetism **Subject code:PHY-HC-2016**

Learning Objective

This Course is designed to

1. Give detail knowledge on Electric Potential, Fields of different charge configurations. Promote comprehensive discussion on the utility of Laplace's and Poisson's Equation.
2. Develop ideas and gain knowledge on the Dielectric properties of matter and its applications.
3. Generate inquisitiveness among the students about magnetic properties of materials and its contribution in technological advancement.
4. To gain knowledge about Network theorems applicable in circuits.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

1. Understand the details of Electric and Magnetic Fields in matter.
2. Visualize the importance of Faraday's Laws of EM Induction in various applications such as transformer, ac generator etc.
3. Realize the concept of displacement current.
4. Apply knowledge of Kirchhoff's law to understand the operation of various electrical circuits used in modern devices.
5. Understand the functioning of Ballistic galvanometer.

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Department of Physics

Learning Objective & Outcomes

B.Sc. 2nd Semester

Subject: Waves and Optics **Subject Code:PHY-HC-2026**

Learning Objective

1. The objective of the course is to develop understanding on the characteristics of mechanical and EM waves.
2. To introduce superposition principle and discuss wave properties like interference, diffraction.
3. To introduce Holography, its principle and applications in defense, medical industry.

Learning Outcomes

After the completion of the course, Students will be able to:

1. Understand the applications of superposition principle and will be able to see the physical origin of Beats.
2. Grasp the physics of musical instruments.
3. Gain knowledge on various Interferometers and understand EM phenomena that occur due to interference and diffraction of light.

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Department of Physics

Learning Objective & Outcomes

B.Sc.3rdSemester

Subject: Mathematical Physics II **Subject Code:PHY-HC-3016**

Learning Objective

1. To teach students about the analytical functions, develop the concept of singularity, Frobenius Method, Partial Differential Equations.

2. To introduce Fourier series to the students and show the applications in square and triangular waves.

3. The course discusses the utility of Hermitian, anti Hermitian, symmetric, antisymmetric matrix which will find applications in Quantum Mechanics to be studied in the subsequent semester.

LearningOutcomes

After the completion of the course, Students will be ableto

1. Solve second order ODE using Power series and Frobenius method.
2. Understand the utility of Legendre Polynomial, Hermite polynomial, Laguerre's polynomial and their significance in Electrodynamics, solution of Schrodinger equation.

3. Visualize the mathematical origin of complex wave pattern in signal processing.

4. Do Fourier analysis to understand the complicated periodic function.

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Department of Physics

Learning Objective & Outcomes

B.Sc. 3rd Semester

Subject:T h e r m a l P h y s i c s **Subject Code:PHY-HC-3026**

Learning Objective

1. To teach the applications of 1st, 2nd Laws of Thermodynamics and introduce the thermodynamic parameters.
2. To demonstrate the working of Heat Engine, Refrigerator, Carnot cycle.
3. To introduce the concept of entropy, Second law in terms of entropy and its consequence.
4. The develop the concept of Maxwell's Thermodynamic Relations and its applications.
5. To discuss the utility of Clausius-Clapeyeron equation and description of the variation of boiling and melting point with pressure.

LearningOutcomes

After the completion of the course, Students will be ableto

1. Understand the physics of Thermodynamic systems, their phase behavior, conversion mechanism of heat into work.
2. Grasp the concept of reversible and irreversible processes, First law in different thermodynamic processes.
3. Gain knowledge on various thermodynamic potentials and the relations between them.
4. Understand the phase diagram of thermodynamic systems and to assess the order of phase transition with the use of free energy.
5. Develop skill to identify and describe various thermodynamic variables.
6. Figure out the deviation of real gas from ideal ga

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Department of Physics

Learning Objective & Outcomes

B.Sc.3rdSemester

Subject :Digital Systems and Applications **Subject Code : PHY-HC-3036**

Learning objectives

1. The course will introduce CRO and its functioning to the students.
2. To teach the utility of active and passive components in electrical circuit.
3. It is designed to familiarize students with Integrated Circuits and its classifications.
4. The course includes topics on Boolean Algebra which will help in realizing the logic of different gates.
5. The course discusses sequential circuits, memory elements.
6. The course will also introduce Microprocessor and its utility to the students.

Learning outcomes

1. Students will be able to apply the knowledge of Boolean algebra in designing digital circuits.
2. Students will be able to analyze combinational logic circuits.
3. Students will be able to analyze and design sequential logic circuits.
4. Students will gain knowledge on different IC's and their utility in designing electrical circuits used in modern accessories.

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Department of Physics

Learning Objective & Outcomes

B.Sc.4th Semester

Subject :M a t h e m a t i c a l P h y s i c s I I I **Subject Code :PHY-HC-4016**

Learning Objective

1. To teach the basics of complex algebra, analytic functions and singularity.
2. To introduce residue theorem and its applications in different physical systems.
3. To develop the concept of Fourier space and transformation of variables from real space to Fourier space.
4. The course aims at developing a concrete idea on tensor analysis among the students with the introduction to kronecker delta, Levi-Civita symbols.

LearningOutcomes

After the completion of the course, Students will be ableto

1. Understand the Mathematical tools needed to address Special and General Theory of Relativity; learn Particle Physics in the future.
2. Apply the knowledge of Fourier and Laplace's Transforms in solving Differential Equations.
3. Grasp the utility of contra variant and co-variant tensors.

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Department of Physics

Learning Objective & Outcomes

B.Sc. 4th Semester

Subject: Elements of Modern Physics **Subject code:PHY-HC-4026**

Learning Objective

This Course Enable the Students to

1. Learn the bridge connecting Classical and Quantum Physics.
2. Understand the limitations of Classical Physics with concrete discussion on Black Body radiation, Photoelectric effect and Compton scattering.
3. Grasp the concept of wave particle duality of subatomic particles and its implications, Schrodinger equation for nonrelativistic particles, energy, momentum operators in quantum world.
4. Learn the emission mechanism of alpha, beta and gamma rays from unstable nuclei, utility of semi empirical mass formula, concept of mass defect.
5. Learn about the principle of harnessing nuclear energy, thermonuclear fusion on earth and its success till date.
6. Learn about Laser Physics and its vast utility in the field of medicine, industry.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

1. Derive the Planck's Radiation Formula with the understanding of discrete exchange of energy between matter and radiation, concept of probability. This will be useful to formulate Wien's Displacement law that can help in measurement of surface temperature of stellar objects.
2. Understand the application of Quantum idea in measuring the power radiated off a stellar body.
3. Distinguish the characteristics of Quantum mechanical systems from the classical ones.
4. Acquire adequate knowledge on Binding Energy curve which can be helpful in explaining several nuclear phenomena and importance of magic number.
5. Learn the physics of He-Ne and Ruby Laser and its vast applications in the industrial and medical sectors.

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Department of Physics

Learning Objective & Outcomes

B.Sc. 4th Semester

Subject:Analog Systems & Applications **Subject Code:PHY-HC-4036**

Learning Objective

1. To learn the physics of semiconductor devices, physical concept of band gap and biasing of diodes.

2. Learn the usage of Rectifiers in conversion of AC to DC, applications of Zener diode as voltage regulator.

3. The course intends to present a detail description of Transistors and its various configurations. The mechanism of current flow in active electrical components is also included.

4. The course will establish the underlying physical concept of transistor acting as an amplifier and switch.

5. To learn about OPAMP and its utility as an adder, subtractor, Differentiator in analog electronics.

LearningOutcomes

After the completion of the course, Students will be ableto

1. Understand the working of PN junction diodes, photo diodes, zener diodes, solar cell etc. as applications of Semiconductor Physics.
2. Gain knowledge on amplifier circuit and the mechanism of feedback in such amplifiers.
3. Understand the utility of OPAMP and oscillator circuits in electronic devices.

Biswanath College, BiswanathChariali

Department of Physics

Learning Objective & Outcomes

B.Sc.(Physics) 5thSemester

Subject :Quantum Mechanics & Applications **Subject Code :PHY-HC-5016**

Learning Objective

1. To teach the students about time dependent Schrodinger Equation, energy, momentum operators, Eigen functions.
2. To help students inanalyzing the physical meaning of wave functions, the normalization and orthogonality relation concerning the wave function associated with a quantum mechanical system.
3. Students will be taught about time independent Schrodinger equation, wave packets and linear combination of stationary states.
4. To teach the application of Schrodinger equation in Hydrogen like atoms and simple harmonic oscillator.
5. To course intends to provide a detail description on the key concepts of atomic physics such as vector atom model, spectroscopic property of multi electronic atoms and their behavior in electric and magnetic fields.

LearningOutcomes

After the completion of the course, Students will be ableto

1. Understand the fundamentals of Quantum Mechanics and the developed framework to understand the behavior of atoms and subatomic particles.
2. Grasp the concept of free particle, stationary and non-stationary states, the method for solving Schrodinger equation in time dependent and time independent situations.
3. Learn the concept of spatial quantization, spinning electron hypothesis and its applications in spectroscopy.
4. Learn about the physical origin of fine structure lines, its intensity and various selection rules of Quantum mechanical origin.
5. Analyze the splitting of spectral lines in electric and magnetic fields : Stark and Zeeman effect.

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Department of Physics

Learning Objective & Outcomes

B. Sc. 5th Semester

Subject:Solid State Physics **Subject Code: PHY-HC-5026**

Learning objectives

1. To introduce crystalline solids, concept of unit cell, miller indices, reciprocal lattice and Bravais lattice to the students.
2. To teach X ray diffraction : Bragg's law as an experimental diagnostic for analysis of crystal structure.
3. To highlight the importance of specific heat and present a detail description of specific heat for solids: Dulong'sPetit's law, Debye-Einstein theory.
4. To discuss about the magnetic properties of solids, Spontaneous magnetization, Curie's law, Hysteresis and energy loss.
5. The course is designed to teach students about dielectric properties of materials, dispersion relation of normal modes.
6. To teach the students about Free Electron theory, Weidman Franz law and the band theory for distinguishing conductors, semiconductors and insulators.
7. To introduce Superconductivity, Meissner effect and the applications.

Learningoutcomes

1. Students will learn about various types of crystalline solids, their packing fraction, interatomic force and hardness and softness of solids.
2. Students will learn about the behavior of specific heat of solids at low temperature.
3. Students will understand the relation between thermal and electrical conductivity of solids.
4. The course will enable students to learn about cooper pairing and its consequence, critical temperature and critical magnetic field and its significance.
5. Students will also learn about Hall effect and its applications in detecting P type, N type SCs and in measuring conductivity.

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Department of Physics

Learning Objective & Outcomes

B. Sc. 5th Semester

Subject: Advanced Mathematical Physics I **Subject Code:** **PHY-HE-5036**

Learning objectives

1. To teach the students about Linear independence and dependence of a vector.
2. To teach about Eigen values, Eigen vectors and rotations in 3D in matrix algebra.
3. Students will be introduced to Minkowski space, symmetric and anti-symmetric tensor and metric tensor.

Learning outcomes

Upon Completion of the course students will be able to-

1. Grasp knowledge on matrix algebra, Linear Vector Space and Tensor.
2. Deal with the advanced mathematical tools to address problems in theoretical physics.

Learning Objective & Outcomes

B. Sc. 6th Semester

Subject: Electromagnetic Theory **Subject Code:** PHY-HC-6016

Learning objectives

1. To review the Maxwell's Equations, furnish a detail discussion on Lorentz and Coulomb gauge transformation equations, propagation of EM wave through vacuum, dielectric and conducting medium.
2. To make the students acquainted with reflection and refraction of plane waves at the interface, Fresnel's Formula, Polarization and Brewster's law.
3. To give idea on numerical aperture, single and multiple mode fibers.

Learning outcomes

Upon Completion of the course students will be able to-

1. Evaluate EM energy density and quantify rate of energy flow through a surface.
2. Gain knowledge on Poynting Vector,formulate energy conservation principle in the light of Poynting Theorem.
3. Students will understand the propagation of EM waves in homogenous isotropic media.
4. Learn about the boundary conditions operative at the interface. Determination of Reflection, Transmission coefficients and Fresnel's formula.

Biswanath College, BiswanathChariali

Department of Physics

Subject: Statistical Mechanics **Subject Code:** PHY-HC-6026

Learning objectives

1. To introduce the concept of macro state, microstate, develop idea on configuration/phase space.
2. To avail a detail discussion on different types of ensemble admissible in real physical systems.
3. To acquaint students with the characteristics of thermal radiation. Classical description of radiation with the formulation of Wien's law, Rayleigh-Jeans law.
4. To provide adequate knowledge on Quantum theory of radiation, describe Planck's radiation formula and its implications.
5. To discuss in detail Classical and Quantum Statistics and description of many body systems in the light of Distribution law formulated for MB, BE and FD statistics.

Learning Outcome

Upon Completion of the course students will be able to-

1. Understand the application of Statistical Mechanics in addressing various problems of Astrophysics, Plasma Physics also in Chemistry and Life sciences.
2. Describe the behavior of many body systems such as a container filled with gas or a metallic sample with millions of electrons.It can be accomplished with the utility of the Classical and Quantum Statistics.
3. Utilize Wien's Displacement law for measurement of surface temperature of celestial objects, Stefan's law for measurement of radiated power from an object.
4. Grasp the failure of Classical Rayleigh Jean's and Wien's law in describing the Black Body radiation. Understand the concept of Ultra violet Catastrophe.

Course Outcome of Non CBCS Course (Current semesters in practice)

Subject: Mathematical Methods and Classical Mechanics **Subject Code:** PHY-M-5.1

Learning objectives

1. To teach Complex variable with detail discussion on Argand diagram, Euler's formula and De Moivre's Theorem.
2. To discuss analytic functions, Contour integrals and Cauchy Integral Theorem.
3. To develop idea on Residues, zeros and utility of Residue theorem.
4. To discuss motion of objects in central force fields, conservation laws as an outcone of Newtonian mechanics, Constraints.
5. The course will provide discussion on Lagrange's equation and its advantage over Newton's equation of motion.
6. The course also includes application of Lagrange's equation in describing the dynamics of simple pendulum, Atwood's machine, Keplerian motion etc.

7. To provide adequate knowledge on Hamilton's principle and its utility. Applications of Hamilton's formulation to understand the behavior of Oscillating systems, Kepler's problem.

Learning Outcome

Upon Completion of the course students will be able to-

1. Use the knowledge of Complex algebra to solve problems in real physical systems and conduct Fourier space analysis.
2. Understand the dynamics of Planet-Star system in the light of Kepler's law.
3. Determine the nature of orbits in Central force motion.
4. Learn Calculus of variation and its use in the discussion of Hamilton's variational principle.

Subject: Atomic Physics **Subject Code:** PHY-M-5.2

Learning objectives

1. To give a detail idea on Bohr's atomic Model, Determination of total energy of electron, radius of electronic orbit. Drawbacks of the model.
2. To discuss fine structure of spectral lines in the light of Sommerfeld's model.
3. To present a detail description on Vector Atom Model, Concept of Spatial quantization and spinning electron hypothesis.
4. To elucidate the physical mechanism underlying Zeeman Effect, Stark Effect and Pashen Back Effect.
5. To discuss in detail continuous and characteristic x rays and its production.
6. To discuss Raman Effect and its applications.

Learning Outcomes

Upon Completion of the course students will be able to-

1. Understand the Quantization of angular momentum, stationary orbits. Develop enough idea on Bohr's Atomic model.
2. Grasp the utility of X ray and its applications.
3. Understand Rutherford's Atomic model, scattering of particles off a heavy target.

Subject: Quantum Mechanics and Astrophysics **Subject Code:** PHY-M-5.3

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Department of Physics

Learning Objective

1. To teach the students about time dependent Schrodinger Equation, energy, momentum operators, Eigen functions.

2. To help students in analyzing the physical meaning of wave functions, the normalization and orthogonality relation concerning the wave function associated with a quantum mechanical system.

3. Students will be taught about time independent Schrodinger equation, wave packets and linear combination of stationary states.

4. To teach the application of Schrodinger equation in one Dimensional potential barrier, 1D Harmonic Oscillator.

5. To course intends to provide a detail description on development of Quantum Mechanics, failure of Classical idea. Description of BlackBody Radiation and Planck's Quantum Hypothesis.

6. To develop idea on Celestial coordinates, stellar magnitude system and spectroscopic Parallax to measure distance in astrophysical scenario.

LearningOutcomes

After the completion of the course, Students will be ableto-

1. Understand the fundamentals of Quantum Mechanics and the developed framework to understand the behavior of atoms and subatomic particles.
2. Grasp the concept of free particle, stationary and non-stationary states, the method for solving Schrodinger equation in time dependent and time independent situations.
3. Visualize the importance of Quantum tunneling in devices.
4. Grasp the knowledge of stellar magnitude and distance measurement system.
5. Understand the spectral classification and Stellar Evolution.

Biswanath College, BiswanathChariali

Department of Physics

Subject: Electronics **Subject Code:** PHY-M-5.4

Learning objectives

1. To discuss the working of PN junction diode, Half and Full wave rectifier, development of regulated power supply.
2. Introduce Network theorems with examples.
3. Introduce Transistor, CB, CE mode of operation.
4. Discuss Transistor action, transistor as an amplifier.
5. Understand the Feedback mechanism and working principle of oscillators.
6. Introduction to Logic gates, Binary Number system and Flip Flops.

Learning outcomes

After the completion of the course, Students will be ableto-

1. Understand the working of SC diode.
2. Grasp the use of transistor in signal amplification and switching action.
3. Understand the functioning of memory element i.e. Flip Flops and will classify the types of Flip-flop available.

Subject: Nuclear Physics **Subject Code:** PHY-M-6.1

Learning objectives

1. To develop idea on nuclear force and stability of various nuclei.
2. To provide an outline on Yukawa Meson Theory.
3. To introduce radioactive decay process in Nuclear Physics. Understanding on alpha, beta and gamma radiation.
4. To learn about nuclear reactions, accelerators, construction and working of cyclotron.

Learning outcomes

After the completion of the course, Students will be ableto-

1. Understand the concept of binding energy, mass defect and stability of nuclei.
2. Learn the detail of nuclear fission, chain reaction.
3. Learn the fundamental concept of nuclear fusion, fusion barrier and challenges ahead.
4. Gain knowledge on cosmic rays and physical mechanism involving extensive air

shower.

Subject: Mathematical Methods and Solid State Physics **Subject Code:** PHY-M-6.2

Learning objectives

1. Understand Tensor analysis, contra variant and covariant tensors, rules for combination of tensors.
2. To introduce crystalline solids, concept of unit cell, miller indices, reciprocal lattice and Bravais lattice to the students.
3. To teach X ray diffraction: Bragg's law as an experimental diagnostic for analysis of crystal structure.
4. To teach the students about Free Electron theory, Weidman Franz law and the band theory for distinguishing conductors, semiconductors and insulators.

Learning outcomes

After the completion of the course, Students will be ableto-

1. Grasp idea on use of tensor in different fields.
2. Understand the magnetic properties of solids, energy loss in hysteresis.
3. Gain introductory idea on superconductivity, Meissner effect. Applications of superconductors in MRI, NMR and tokamak.

Subject: Modern Optics&EM Theory**Subject Code:** PHY-M-6.3

Learning objectives

1. To teach interference of polarized light, Babinet compensator.
2. To provide adequate knowledge on the principle of Holography, idea about optical fibers.
3. To review the Maxwell's Equations, furnish a detail discussion on Lorentz and Coulomb gauge transformation equations, propagation of EM wave through vacuum,

dielectric and conducting medium.
4. To make the students acquainted with reflection and refraction of plane waves at the interface, Fresnel's Formula, Polarization and Brewster's law.

Learning outcomes

After the completion of the course, Students will be ableto-

1. To introduce polarization, Brewster's Law.
2. Evaluate EM energy density and quantify rate of energy flow through a surface.
3. Gain knowledge on PoyntingVector, formulate energy conservation principle in the light of Poynting Theorem.
4. Students will understand the propagation of EM waves in homogenous isotropic media.

Subject: Statistical Mechanics **Subject Code:** PHY-M-6.4

Learning objectives

1. To introduce the concept of macro state, microstate, develop idea on configuration/phase space.
2. To avail a detail discussion on different types of ensemble admissible in real physical systems.
3. To discuss in detail Classical and Quantum Statistics and description of many body systems in the light of Distribution law formulated for MB, BE and FD statistics.
4. Application of Maxwell velocity Distribution Law, application of FD to discuss electronic specific heat.

Learning Outcome

Upon Completion of the course students will be able to-

1. Understand the application of Statistical Mechanics in addressing various problems of Astrophysics, Plasma Physics also in Chemistry and Life sciences.
2. Describe the behavior of many body systems such as a container filled with gas or a metallic sample with millions of electrons. It can be accomplished with the utility of the Classical and Quantum Statistics.
3. Utilize BE distribution function to determine Planck's Radiation Formula.
4. Grasp idea on BE condensation.