FACULTY OF SCIENCES

SYLLABUS

FOR

INTERDISCIPLINARY COURSE IN PHYSICS (UG)

Examinations: 2019 - 20

GURU NANAK DEV UNIVERSITY AMRITSAR

Interdisciplinary Course in Physics (UG)

For Undergraduate odd semester
GENERAL PHYSICS-I

Course No.	**LTP**
PHL-001	**4 0 0**

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section A

Electric Charges; Coulomb's law, forces between multiple charges; Electrical field, electric field due to a point charge, electric-field lines; electric dipole, torque on a dipole in uniform electric field. Electric flux, Gausss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell; Electric potential, potential difference, electric potential due to a point charge and system of charges; electrical potential energy of a system of charges.

Section B

Capacitors and capacitance, combination of capacitors, capacitance of a parallel plate capacitor, energy stored in a capacitor. Electric current, drift velocity, mobility, Ohm's law, electrical resistance, electrical energy and power, electrical resistivity and conductivity, combinations of resistors; temperature dependence of resistance, Superconductor.

Section C

Concept of magnetic field, Biot-savart law and its application, Ampere's law and its applications, Force on a moving charge in uniform magnetic and electric fields.

Section D

Force on a current-carrying conductor in a uniform magnetic field, Force between two parallel current- carrying conductors, definition of ampere, Electromagnetic induction, Faraday's laws, induced emf and current, Lenz's Law.

Text and Reference Books:

1. Fundamentals of Physics 8th Edition: Resnick Halliday Walker
2. University Physics 12th Edition: Hugh D. Young , Roger A.Freedman , Lewis Ford
3. Concepts of Physics: H. C. Verma
4. Electrodynamics: Grifths

Interdisciplinary Course in Physics (UG)

For Undergraduate even semester
GENERAL PHYSICS-II

Course No.	**LTP**
PHL-002	**4 0 0**

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section A

Wave-particle dualitiy; Schroedinger equation and expectation values; Uncertainty principle; Solutions of the one-dimensional Schroedinger equation for a free particle, particle in a box, particle in a finite well, linear harmonic oscillator; Reflection and transmission by a step potential and by a rectangular barrier.

Section B

Stern-Gerlach experiment, electron spin, fine structure of hydrogen atom; L-S coupling, J-J coupling; Spectroscopic notation of atomic states; Zeeman effect; Elementary theory of rotational, vibratonal and electronic spectra of diatomic molecules.

Section C

Crystalline and amorphous structure of matter; Different crystal systems, space groups; Methods of determination of crystal structure; X-ray diffraction, scanning and transmission electron microscopies;

Section D

Thermal properties of solids, specific heat, Debye theory, Magnetism: dia, para and ferromagnetism; Elements of superconductivity, Meissner effect.

Text and Reference Books:

1. Concepts of Modern Physics - Arthur Beiser
2. Quantum Mechanics - P T Mathews
3. Introduction to Quantum theory -R Dicke and J Wittke
4. Quantum Mechanics - Ghatak and Loknatham
5. Introduction to Atomic Spectra - H. E. White
6. Atomic Spectra and Atomic structure by Gerhard Herzberg
7. An introduction to Solid State Physics - C. Kittel.
8. Solid State Physics - A.J. Dekkar.

Interdisciplinary Course in Physics (UG)

For Undergraduate odd semester
Time and Fourth State of Matter

Course No.	**LTP**
PHL-003	**4 0 0**

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section A

Defining time, Temporal measurement and history, History of the calendar, History of time measurement devices, Units of time.

Section B

History of clocks from Sun Dials to Most precise clocks, Defining Second, Periodic Motion, New candidates for second.

Section C

States of matter- Solid, Liquid, Gas, Introduction to plasma, Basic principles of plasma physics natural occurrence of plasmas.

Section D

Applications in Space plasma physics, Solar physics, Astrophysics, Controlled fusion research, High-power laser physics and Plasma processing, Environment, Medical, Industry.

Text and Reference Books:

1.Plasma Dynamics by R. O. Dendy.
2.History of Time by Stephen Hawkings
3.Plasma Physics and controlled fusion by F.F. Chen

Interdisciplinary Course in Physics (UG)

For Undergraduate even semester
Discover the Universe

Course No.	**LTP**
PHL-004	**4 0 0**

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section A

Introduction: Basic concepts in astronomy such as distances, constellations, Jovian Planets, Asteroids, & Comets, Dwarf Planets.

Section B

Introduction to Solar System: Sun-Properties of the Sun and the mechanics of nuclear fusion, Moon, Earth configurations that result in Moon phases and Solar and Lunar eclipses,

Section C

Tools of Astronomy: Formation of Planetary Systems, use of telescopes to study the Universe.

Section D

Stellar Evolution: White Dwarfs, and Neutron Stars, learning about the life cycle of stars, black holes, Dar matter, Structure and Expansion of the Universe, and the Big Bang, Life in the Universe

Text and Reference Books:

1. The Essential Cosmic Perspective, 6th Edition by Bennett, Donahue, Schneider, & Voit
2. Mastering Astronomy; Pearson Press.

Interdisciplinary Course in Physics (UG)

For Undergraduate odd semester
NONCONVENTIONAL ENERGY RESOURCES

Course No. **LTP**
PHL-005 **4 0 0**

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section A

Introduction: Various nonconventional energy resources- introduction, Availability, classification, relative merits and demerits.

Solar cells and Solar thermal energy: Solar radiation, Theory of solar cells, solar cell materials, solar cell array, solar cell power plant and limitations.
Flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

Section B

Geothermal energy: Resources of geothermal energy, thermodynamics of geothermal energy conversion- electrical conversion , non electrical conversion, environmental considerations.

Section C

Magneto hydro dynamics (MHD): Principle of working of MHD power plant , performance and limitations.

Thermoelectric and Thermoionic conversions: Principle of working, performance and limitations.

Section D

Wind Energy: Wind power and it's sources, site selection, criterion, momentum theory , classification of rotors, concentrations and augments , wind characteristics. Performance and limitations of energy conversion systems.

Text and Reference Books:

1. Non-Conventional Energy Sources by G.D. Rai.

Interdisciplinary Course in Physics (UG)

For Undergraduate even semester

Physics in Everyday Life

Course No.	**LTP**
PHL-006	**4 0 0**

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section A

Mechanics: Laws of physics applied to human body movement, basic concepts of biomechanics, principles of Joint design and a human joint, mobility and stability, ideas of fluid mechanics associated with human body.

Section B

Vision: Visible light spectra; concept of color, vision defects.

Hearing: Sound waves and hearing, sound intensity; the decibel scale,

Temperature Control: Basics of thermal energy, thermodynamics and temperature, human thermodynamics.

Section C

Radiation and its classification: electromagnetic radiations, acoustic radiations, particle radiations.

Electromagnetic Radiations: Introduction to Electromagnetic (EM) spectrum, concept of wavelength, frequency and energy, classification of EM spectra into radio waves, microwaves, terahertz waves, IR, visible, UV, X-rays and gamma rays. Generation and interaction of various components of electromagnetic spectra with matter, its physical significance and applications in different fields.

Section D

Acoustic Radiations: Classification of acoustic radiations, their interactions with matter and applications in imaging and industry.

Particle Radiations: Nuclear radiations and their classification, interactions with matter, significance and applications. Concept of radiation dose and protection

Text and Reference Books:

1. The Physics of Everyday Phenomena, Griffith, W. T. Brosing, J. W. ,McGraw-Hill.
2. Fundamentals of biomechanics, Duane Knudson, Springer.
3. Radiation Detection and Measurement, Glenn E Knoll, John Wiley & Sons.