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College of Arts, Science & Commerce (Autonomous)

SIES

RISE WITH EDUCATION

NAAC REACCREDITED - 'A' GRADE

SIES COLLEGE OF ARTS, SCIENCE AND COMMERCE
(Autonomous)
Affiliated to
UNIVERSITY OF MUMBAI

Syllabus for
SEM V & VI

Program Name: T.Y.B.Sc.

Course: Physics

(Credit Based Semester and Grading System with effect from the academic year 2023–2024)

Syllabus for T.Y.B.Sc. Physics (Theory & Practical)

As per credit based system
Third Year B.Sc. 2023-2024

The revised syllabus in Physics as per credit-based system for the Third Year B.Sc. Course will be implemented from the academic year 2023–2024.

Preamble:

This is a revised part of the undergraduate programme (Six Semesters) in Physics, to be taught in Semester V & VI from the academic year 2023-24 onwards.
Eight courses in semester V and VI is devoted to developing the basic understanding of core subjects so that the learner is ready to take master's program. These have been tailored to fit in with the existing FYBSc syllabus (SEM I and SEM II) and SYBSc (SEM III and SEM IV) in terms of continuity and to ensure delivery of quality content to the learner.
Separate syllabus (applied component) is framed for applied physics.

Eligibility: Passed Semester I, Semester II, Semester III and Semester IV as per rules of passing

Course code	Title of Course	Credits
Semester V		
SIUSPHY51	Mathematical methods, Statistical and Thermal Physics	2.5
SIUSPHY52	Solid State Physics	2.5
SIUSPHY53	Atomic and Molecular Physics	2.5
SIUSPHY54	Electrodynamics	2.5
SIUSPHYP51	Practical Course - 51	3
SIUSPHYP52	Practical Course - 52	3
		Total = 16
Semester VI		
SIUSPHY61	Classical Mechanics	2.5
SIUSPHY62	Electronics	2.5
SIUSPHY63	Nuclear Physics	2.5
SIUSPHY64	Theory of Relativity	2.5
SIUSPHYP61	Practical Course - 61	3
SIUSPHYP62	Practical Course - 62	3
		Total = 16

Scheme of Examination:

1. **Theory:**

(A) Internal Examination: 40 marks.

Sr. No.	Particulars	Marks
1.	One Class Test/online examination to be conducted in the given semester.	20
2.	Assignment based on the curriculum and active Participation in routine class instructional deliveries to be assessed by the teacherconcerned	20

(B) Semester End Examination: 60 marks.

Each theory paper shall be of two-hour duration.

Each paper shall consist of FOUR questions. All questions are compulsory and there will be internal option within questions.

Q – I is from Unit - I,

Q – II is from Unit - II,

Q - III is from Unit - III,

Q - IV is from Unit – IV.

2. **Practical Examination**:**100 Marks**

There will not be any internal examination for practical. There will be TWO practical examinations, one for each Practical Course.

The semester end examination per practical course will be conducted as per the following scheme:

Sr. No.	**Particulars of External Practical Examination**	**Marks**
1	Laboratory Work	80
2	Journal	10
3	Viva	10
	Total	100

A candidate will be allowed to appear for the practical examination only if the candidate submits a certified journal of T.Y.B.Sc Physics or a certificate from the Head of the Department to the effect that the candidate has completed the practical course of T.Y.B.Sc Physics as per the minimum requirements.

Program Outcomes and Program Specific Outcomes

Upon completion of this undergraduate degree program, a student will be able to accomplish the following program outcomes.

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome; Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E Evaluate; C-Create	
NO.	**Details**
PO1.	**Solving Complex Problems:** Applying the knowledge of various courses learned under a program with an ability to break down complex problems into simple components, by designing processes required for problem solving. Cognitive Levels: An, Ap
PO2.	**Critical Thinking and reasoning ability:** Exhibits ability to understand abstract concepts, analyze, and apply them in problem solving. Ability to formulate and develop logical arguments. Developing the ability to think with different perspectives and ideas. (Skills necessary for progression to higher education and research.) Cognitive Levels: U, An
PO3.	**Research Aptitude:** Acquiring the ability to explore and gain knowledge in independent ways through reading assignments, problem solving assignments, projects, seminars, presentations. Cognitive Levels: Ap, An, E, C
PO4.	**Proficiency with ICT**: Equip to select, apply appropriate tools and techniques, resources through electronic media for the purpose of visualizing mathematical objects, geometrical interpretations, coding, and analyzing data. Cognitive Levels: U, Ap
PSO1.	Understand the basic concepts and fundamentals of mechanics, properties of matter, current electricity and electrodynamics. Cognitive Levels: R, U
PSO2.	Understand the basic of quantum mechanics, relativistic physics, nuclear physics, optics, atomic physics, solid state physics, statistical physics, thermodynamics, mathematical physics & biophysics. Cognitive Levels: R, U
PSO3.	Understand and apply the concepts of electronics in designing of different analog & digital circuits and also in instrumentation. Cognitive Levels: U, Ap
PSO4.	Understand the basics of computer programming, assembly language & numerical analysis. Cognitive Levels: U, Ap, An
PSO5.	Apply and verify theoretical concepts through laboratory experiments. Cognitive Levels: U, Ap
PSO6.	Applications of theoretical concepts Cognitive Levels: U, Ap, An

PSO7.	To get familiarized with current and recent scientific and technological developments. Cognitive Levels: U, An
PSO8.	To enrich knowledge through problem-solving, hands-on activities, study visits & projects Cognitive Levels: U, Ap, An.

Revised Syllabus in Physics (Theory and Practical)

As per Credit Based Grading system.

Third year B.Sc. 2023-24

The revised syllabus in Physics as per credit based system of the Third Year B.Sc, course will be implemented from the academic year 2023-24

Semester V

Theory Course - SIUSPHY51: Mathematical methods, Statistical and Thermal Physics

Course Outcomes: T.Y.B.Sc.

Each course of the program aims at developing certain skills, attitudes and knowledge base of the students. The outline of Course Learning Outcomes is described below.

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome;
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create

Semester V

Course Code	Credits	Lectures/week	Course Name
SIUSPHY51	**2.5**	**4**	Mathematical, Thermal and Statistical Physics
	Unit1: Probability Unit2: Differential Equations and Transforms Unit3: Thermal and Statistical Physics Unit4: Thermal and Statistical Physics (distribution)		

CO No.	Course Outcome of SIUSPHY51 Upon completion of this course, students will be able to	Cognitive Level	Affinity with PO/ PSO
CO1	Understand and apply Probability and propagation of probability	**R, U, Ap, An**	**PO1, PO2, PSO2,PSO6**
CO2	Apply probability in daily real systems	**R, U, Ap, An**	**PO1, PO2, PSO2,PSO6**
CO3	Solve second order non-homogenous linear differential equation and solve on practical problems.	**R, U**	**PO2, PSO2, PSO6**
CO4	Understand the use of indirect method of solving differential equation using Laplace transformation.	**R, U**	**PO2, PSO2, PSO6**
CO5	Understand partial differential equation and solve them using Fourier transforms.	**R, U, Ap**	**PO2, PSO2, PSO6**
CO6	Understand probability and its distribution in terms of a system using ensemble and its use it to further derive the macroscopic properties from the microscopic properties.	**R, U, Ap**	**PO1, PSO2, PSO6**
CO7	Describe interacting system and understand the energies associated to a system	**R, U, Ap, An**	**PO2, PSO2 PSO3**

CO8	Study the phase transformation in terms of interactions and derive the laws of thermodynamics from them.	**R, U, Ap**	**PO2, PSO2**
CO9	Understand and identify various types of quantum and classical distribution and determine the outcomes, correlate with the experimental observations.	**R, U, Ap**	**PO2, PSO2**

UNIT I: Probability **15 lectures**

1. Review of basic concepts: sample space, events, independent events, conditional probability, probability theorems, permutations and combinations, discrete and continuous random variables.
2. Probability distributions: Binomial distribution, joint distributions and covariance, the normal distribution, the Poisson distribution, statistics and experimental measurements, Chebyshev's inequality, law of large numbers, central limit theorem.

UNIT II: Differential Equations and Transforms **15 lectures**

1. Second-order Differential Equations: Nonhomogeneous linear differential equations with constant coefficients, the method of successive integrations and the method of undetermined coefficients. Forced vibrations and resonance. The Laplace transform and its use in the solution of differential equations.
2. Fourier transforms: Introduction, formal development of the complex Fourier transform, cosine and sine transforms, the transforms of derivatives (with proofs), solutions of partial differential equations (wave and heat equation) using Fourier transforms.

UNIT III: Thermal and Statistical Physics **15 lectures**

1. Description of a system : Why statistical approach, Particle-states, System-states, Microstates and Macro states of a system, Equilibrium and Fluctuations, Irreversibility, The equiprobability postulate, Statistical ensemble, Number of states accessible to a system, Phase space, Reversible processes.
2. Thermal and Adiabatic Interactions : Thermal interaction, Canonical distribution, Energy fluctuations, Entropy of a system in a heat bath, Helmholtz free energy, Adiabatic interaction and enthalpy, General interaction and the first law of thermodynamics, Infinitesimal general interaction, Gibbs free energy, Phase transitions.

UNIT IV: Thermal and Statistical Physics **15 lectures**

1. Statistical Mechanics: Phase space, The probability of a distribution, The most probable distribution, Maxwell-Boltzmann statistics, Molecular speeds.
2. Quantum Statistics: Bose-Einstein statistics, Black-body radiation, The Rayleigh-Jeans formula, The Planck radiation formula, Fermi-Dirac statistics, Comparison of results, Transition between states.

References:

1. **MB:** Mathematical Methods in the Physical sciences:- Mary L. Boas Wiley India3rd ed.
2. **LG:** Statistical and Thermal Physics- : S. Lokanathan and R. S. Gambhir. an introduction (Prentice Hall of India : 2008)

3. **AB:** Perspectives of Modern Physics: Arthur Beiser. (Mc Graw Hill International)

Additional References:

1. Mathematical Physics: A K Ghatak, Chua – 1995Macmillian India Ltd.
2. Mathematical Method of Physics: Riley, Hobson and Bence. Cambridge (Indian edition).
3. Mathematical Physics: H. K. Dass, S. Chand & Co.
4. Mathematical Methods of Physics: Jon Mathews & R. L. Walker, W A Benjamin inc.
5. A Treatise on heat:Saha and Srivastava. (Indian press, Allahabad)
6. Fundamentals of Statistical and Thermal Physics (Mc Graw - Hill): F. Reif

Theory Course - SIUSPHY52: Solid State Physics

Course Outcomes: T.Y.B.Sc.

Each course of the program aims at developing certain skills, attitudes and knowledge base of the students. The outline of Course Learning Outcomes is described below.

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome;
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create

Semester V

Semester	Course Code	Credits	Lectures/week	Course Name
V	**SIUSPHY52**	**2.5**	**4**	**Solid State Physics**
	Unit1: Crystal Physics Unit2: Electrical Properties of Metals Unit3: Conduction in Semiconductors Unit4: Diode, Magnetism and Superconductivity			

CO No.	Course Outcome of SIUSPHY52 Upon completion of this course, students will be able to	Cognitive Level	Affinity with PO/ PSO
CO1	Understand Unit cell, SCC, BCC, FCC crystal structures	**R, U, Ap, An**	**PO1, PO2, PSO2,PSO6**
CO2	Understand Miller indices, Reciprocal lattice and X-Ray diffraction	**R, U, Ap, An**	**PO1, PO2, PSO2,PSO6**
CO3	Understand Classical and quantum free electron theory of metals.	**R, U**	**PO2, PSO2, PSO6**
CO4	Understand Band theory of solids and study Kronig-Penney model	**R, U**	**PO2, PSO2, PSO6**
CO5	Understand conduction mechanism of electron and holes in intrinsic and extrinsic semiconductor with help of fermi level.	**R, U, Ap**	**PO2, PSO2, PSO6**
CO6	Understand Hall effect.	**R, U, Ap**	**PO1, PSO2, PSO6**
CO7	Study Qualitative theory of the p-n junction diode	**R, U, Ap, An**	**PO2, PSO2 PSO3**
CO8	Understand Magnetic properties of Matter.	**R, U, Ap**	**PO2, PSO2**
CO9	Study superconductivity and superconductor	**R, U, Ap,**	**PO2, PSO2**

UNIT I: Crystal Physics **15 lectures**

1. Crystal Structures: Introduction, Lattice points and space lattice, The basis and crystal structure, Unit Cells and lattice parameters, Primitive Cells, Crystal Systems, Crystal Symmetry, Bravais space lattices, Metallic crystal structures, relation between the density of crystal material and lattice constant in a cubic lattice.
2. Lattice & Planes in Crystals: Planes, Miller Indices, Important planes in simple cubic structure, separation between lattice planes in a cubic crystal, Reciprocal Lattice(Omit Vector-algebraic discussion), X-ray Diffraction

UNIT II: Electrical properties of metals **15 lectures**

1. Classical free electron theory of metals: Drude model, Drawbacks of classical theory, Relaxation time, Collision time and mean free path.
2. Quantum theory of free electrons: Sommerfeld model Fermi Dirac statistics and electronic distribution in solids, Density of energy states and Fermi energy, The Fermi distribution function, Heat capacity of the Electron gas, Mean energy of electron gas at 0 K, Electrical conductivity from quantum mechanical considerations.
3. Band theory of solids: The Kronig- Penney model, Brillouin zones, Number of wave functions in a band, Motion of electrons in a one- dimensional periodic potential, Distinction between metals, insulators and intrinsic semiconductors.

UNIT III: Conduction in Semiconductors **15 lectures**

1. Electrons and Holes in an Intrinsic Semiconductor: Conductivity, Carrier concentrations in an intrinsic semiconductor, Donor and Acceptor impurities, Charge densities in a semiconductor, Fermi level in extrinsic semiconductors, Diffusion, Carrier lifetime, The continuity equation, Hall Effect
2. Semiconductor-diode Characteristics : Qualitative theory of the p-n junction, p- n junction as a diode, Band structure of an open-circuit p-n junction

UNIT IV: Diode, magnetism and superconductivity **15 lectures**

1. P-N junction Diode: The current components in a p-n junction diode, Quantitative theory of p-n diode currents, The Volt-Ampere characteristics, The temperature dependence of p-n characteristics, Diode resistance.
2. Magnetic Properties of matter: Diamagnetism and Paramagnetism, The origin of permanent magnetic dipoles, Diamagnetism and Larmor precession, The static paramagnetic susceptibility
3. Superconductivity: A survey, Mechanism of Superconductors, Effects of magnetic field, Critical Currents, The Meissner effect, The penetration depth, Type I and Type II Superconductors.

References:

1. SOP: Solid State Physics: S. O. Pillai, New Age International. 6thed.

2. SOP: Modern Physics and Solid State Physics : Problems and solutions New Age International.
3. MH: Electronic Devices and Circuits:Millman, Halkias&SatyabrataJit. (3rd Ed.) Tata McGraw Hill.
4. D: Solid State Physics : A. J. Dekker, Prentice Hall

Theory Course - SIUSPHY53: Atomic and Molecular Physics

Course Outcome: T.Y.B.Sc.

Each course of the program aims at developing certain skills, attitudes, and knowledge base of the students. Theoutline of Course Learning Outcomes is described below.

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome;
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create

Semester V

Course Code	Credits	Lectures/week	Course Name
SIUSPHY53	**2.5**	**4**	**Atomic and Molecular Physics**
	Unit1: Hydrogen Atom and Electron spin Unit2: Effect of magnetic field on atom Unit3: Molecular Spectra and instrumentation Unit4: Raman effect and spectroscopic instrumentation		

CO No.	Course Outcome of SIUSPHY53 Upon completion of this course, students will be able to	Cognitive Level	Affinity with PO/ PSO
CO1	Understand application of Quantum Mechanics to H-atom and apply the concept of Quantum Mechanics to vector atom model.	**U**	**PSO2**
CO2	Understand the effect of magnetic field on atom.	**U, Ap, An**	**PO2, PSO2**
CO3	Understand the molecular spectra and instrumentation involving molecular spectra.	**U, Ap**	**PO2, PSO2**
CO4	Study of Raman effect, spectroscopic instrumentation.	**U, Ap, An**	**PO2, PO3, PSO2**

Unit I: Hydrogen Atom and Electron spin **15 lecture**

1. Hydrogen atom: Schrödinger's equation for Hydrogen atom, Separation of variables, Quantum Numbers: Total quantum number, Orbital quantum number, Magnetic quantum number. Angular momentum, Electron probability density (Radial part).
2. Electron spin: The Stern-Gerlach experiment, Pauli's Exclusion Principle, Symmetric and Anti-symmetric wave functions.

Unit II: Effect of Magnetic Field on Atom **15 lecture**

1. Coupling scheme: Spin orbit coupling, Total angular momentum, Vector atom model, L-S and j-j coupling. Origin of spectral lines, Selection rules.
2. Effect of magnetic field on atom: Normal Zeeman Effect and its explanation (Classical and Quantum), The Lande g - factor, Anomalous Zeeman effect.

Unit III: Molecular Spectra and Spectroscopic Instrumentation **15 lecture**

1. Molecular spectra (Diatomic Molecules): Rotational energy levels, Rotational spectra, vibrational energy levels, Vibrational-Rotational spectra. Electronic Spectra of Diatomic molecules: The Born-Oppenheimer approximation, Intensity of vibrational-electronic spectra: The Franck-Condon principle.
2. Spectroscopic instrumentation :Infrared spectrometer & Microwave spectrometer

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Unit IV: Raman Effect and ESR **15 lecture**

1. Raman Spectra: Raman Effect, Quantum Theory of Raman Effect, Pure Rotational Raman spectra: Linear molecules, symmetric top molecules, Asymmetric top molecules, Vibrational Raman spectra, Raman activity of vibrations, Experimental set up of Raman Effect.
2. Electron spin resonance: Introduction, Principle of ESR, ESR spectrometer
3. Nuclear magnetic resonance: Introduction, principle and NMR instrumentation.

References:

1. B: Perspectives of Modern Physics : Arthur Beiser Page 8 of 18 McGraw Hill.
2. BM: Fundamentals of Molecular Spectroscopy : C. N. Banwell & E. M. McCash (TMH).(4th Ed.)
3. GA: Molecular structure and spectroscopy : G Aruldhas (2nd Ed) PHI learning Pvt Ltd.
4. Atomic Physics (Modern Physics): S.N.Ghoshal. S.Chand Publication (for problems on atomic Physics).

Theory Course - SIUSPHY54: Electrodynamics

Course Outcome: T.Y.B.Sc.

Each course of the program aims at developing certain skills, attitudes, and knowledge base of the students. Theoutline of Course Learning Outcomes is described below.

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome.

Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create

Semester V

Course Code	Credits	Lectures/week	Course Name
SIUSPHY54	**2.5**	**4**	**Electrodynamics**
	Unit I: Electrostatics Unit II: Polarization and Magnetostatics Unit III: Magnetism and Varying Fields Unit IV: Electromagnetic waves		

CO No.	Course Outcome of SIUSPHY54 Upon completion of this course, students will be able to	Cognitive Level	Affinity withPO/ PSO
CO1	Derive Gauss's law in differential and integral form, understand concept of electric potential.	**R, U, An**	**PO2, PSO1, PSO6, PSO8**
CO2	Solve Poisson's equation and Laplace's equation in electrostatics, method of images, uniqueness theorems. Understand relationship between electric field and conductors.	**U, Ap, An**	**PO2, PSO1, PSO6, PSO8**
CO3	Understand concept of dielectric substances, polarization of charges in dielectric substances, Gauss's law for dielectric substances.	**U, An,**	**PO2, PSO1, PSO6, PSO8**
CO4	Understand concept of electric currents and types of electric current, notion of magnetic field as rotational field, divergence and curl of magnetic field, Ampere's law in differential and integral form.	**U, Ap, An**	**PO2, PSO1, PSO6, PSO8**
CO5	Understand types of magnetic materials, magnetization, derive Ampere's law in magnetized materials, magnetic susceptibility and permeability.	**U, Ap, An**	**PO2, PSO1, PSO6, PSO8**
CO6	Derive Maxwell's equations in vacuum, understand electrodynamics before Maxwell, boundary conditions, Maxwell's equations inside matter.	**U, Ap, An**	**PO2, PSO1, PSO6, PSO8**
CO7	Derive work energy principle in electrodynamics, Newton's third law in electrodynamics.	**U, Ap, An**	**PO1, PO2, PSO1, PSO6, PSO8**
CO8	Derive electromagnetic wave equation, study propagation of electromagnetic waves, reflection and transmission of electromagnetic waves at the boundary of two dielectric media.	**U, Ap, An**	**PO1, PO2, PSO1, PSO6, PSO8**

UNIT I: Electrostatics **15 lectures**

1. Gauss's law: Field lines, Flux & Gauss' law, divergence of **E**, Applications of Gauss' law, curl of **E**.

2. Electric potential: Introduction to potential, Comments on potential, Poisson's equation and Laplace's equation, potential of a localized charge distribution. Review of conductors.

3. Uniqueness theorems & method of images: First Uniqueness theorem, the classic image problem-Infinite conducting plane and conducting sphere.

UNIT II: Polarization and Magnetostatics **15 lectures**

1. Dielectrics: Dielectrics, Induced Dipoles, Alignment of polar molecules, Polarization, Bound charges and their physical interpretation, Gauss' law in presence of dielectrics, A deceptive parallel, Susceptibility, Permittivity, Dielectric constant, Energy in dielectric systems.

2. Currents and Magnetic field: Straight-line currents, The Divergence and Curl of **B**, Applications of Ampere's Law in the case of a long straight wire and a long solenoid, Comparison of Magneto-statics, and Electrostatics.

UNIT III: Magnetism and Varying Fields 15 lectures

1. Bound currents & Magnetization: Diamagnetic substances, Paramagnets Ferro magnets, Magnetization, Bound currents and their physical interpretation, Ampere's law in magnetized materials, Magnetic susceptibility, and permeability.

2. Electrodynamics: Energy in magnetic fields, Electrodynamics before Maxwell, Maxwell's correction to Ampere's law, Maxwell's equations, Magnetic charge, Maxwell's equations in matter, Boundary conditions

UNIT IV: Electromagnetic waves 15 lectures

1. Conservation laws in electrodynamics: Continuity equation, Poynting's theorem, Newton's third law in electrodynamics.

2. Electromagnetic Waves: The wave equation for **E** and **B**, Monochromatic Plane waves, Energy and momentum in electromagnetic waves, Propagation in linear media, Reflection, and transmission of EM waves at normal incidence.

References:

DG: Introduction to Electrodynamics: David J. Griffiths (3rd Ed) Prentice Hall of India. Additional References:

1. Introduction to Electrodynamics: A. Z. Capria and P. V. Panat. Narosa Publishing House.
2. Engineering Electrodynamics: William Hayt Jr. & John H. Buck (TMH).
3. Electricity and Magnetism: Navin Wadhwani (PHI – 2010).

SEMESTER V – Practical Course

The T. Y. B. Sc. Syllabus integrates the regular practical work with a series of demonstration and skill experiments. During the teaching and examination of Physics laboratory work, simple modifications of experimental parameters may be attempted. Attention should be given to basic skills of experimentation which include:

i) Understanding relevant concepts.
ii) Planning of the experiments.
iii) Layout and adjustments of the equipment.
iv) Recording of observations and plotting of graphs.
v) Calculation of results and estimation of possible errors in the observation of results.

i) Regular Physics Experiments: A minimum of 8 experiments from each of the course are to be performed and reported in the journal.

ii) Skill Experiments: All the skills are compulsory and must be reported in the journal. Skills will be tested during the examination through viva or Practicals

The certified journal must contain a minimum of 16 regular experiments (8 from each group), with all Skills in semester V. A separate index and certificate in journal is must for each semester course. There will be two turns of three hours each for the examination of practical courses.

Practical Course – SIUSPHYP51

Course Outcome: T.Y.B.Sc.

Each course of the program aims at developing certain skills, attitudes, and knowledge base of the students. Theoutline of Course Learning Outcomes is described below:

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome:

Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create

Semester V

Course Code	**Credits**	**Lectures/week**	**Course Name**
SIUSPHYP51	**3**	**8**	**Practical Course - 51**
	Practicals of Course **SIUSPHY51** and Course **SIUSPHY52**		

CO No.	**Course Outcome of SIUSPHYP51 Upon completion of this course, students will be able to**	**Cognitive Level**	**Affinity with PO/ PSO**
CO1	Understand the relevant concept and planning of the experiment.	**U, Ap**	**PO3, PSO5, PSO6**
CO2	Prepare layout and adjustment of equipments.	**AP, An**	**PSO5, PSO6**
CO3	Record the observations and plotting of graphs	**An**	**PSO5, PSO6**
CO4	Calculate and obtain results and estimate the possible errors in the calculations.	**An, E**	**PO3, PSO5, PSO6**

1. Determination of ‘g’ by Kater’s pendulum.
2. Y by Koenig’s method
3. Stefan’s constant σ
4. Thermal conductivity of bad conductor by Lee’s disc
5. Goniometer
6. R.I of liquid using laser
7. Rydberg’s constant
8. Edser’s A pattern/step slit
9. Flat spiral spring: Determination of Young’s Modulus
10. Determination of e/m

Practical Course – SIUSPHY52

Course Outcome: T.Y.B.Sc.

Each course of the program aims at developing certain skills, attitudes, and knowledge base of the students. Theoutline of Course Learning Outcomes is described below.

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome:
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create

Semester V

Course Code	**Credits**	**Lectures/week**	**Course Name**	
SIUSPHYP52	**3**	**8**	**Practical Course - 52**	
	Practicals of Course **SIUSPHY53** and Course **SIUSPHY54**			
CO No.	**Course Outcome of SIUSPHYP52 Upon completion of this course, students will be able to**		**Cognitive Level**	**Affinity withPO/ PSO**
CO1	Understand the relevant concept and planning of the experiment.		**U, Ap**	**PO3, PSO5, PSO6**
CO2	Prepare layout and adjustment of equipments		**AP, An**	**PSO5, PSO6**
CO3	Record the observations and plotting of graphs		**An**	**PSO5, PSO6**
CO4	Calculate and obtain results and estimate the possible errors in the calculations.		**An, E**	**PO3, PSO5, PSO6**

1. Mutual inductance by BG
2. Hysteresis by magnetometer
3. Maxwell's bridge
4. Energy Band gap of Semi conductor
5. Schmitt Trigger using OPAMP (Non Inverting)
6. Low pass (first order active filter)
7. Wien bridge oscillator (OPAMP)
8. Counters mod 2,5 10
9. LM-317 as voltage regulator
10. LM 317 as current regulator

Skills :

1. Estimation of errors.
2. Soldering advanced circuit
3. Bread board circuit using IC's.
4. Optical Levelling of Spectrometer
5. Mounting of Grating for normal incidence
6. Use of electronic balance : radius of small ball bearing
7. Dual trace CRO : Phase shift measurement.
8. BG : C1 /C2 by comparing θ1 / θ2.

References :

1. Advanced course in Practical Physics : D. Chattopadhya, PC. Rakshit& B. Saha (8th Edition) Book & Allied Pvt. Ltd.
2. BSc Practical Physics : Harnam Singh. S. Chand & Co. Ltd. – 2001.
3. A Text book of Practical Physics : Samir Kumar Ghosh New Central Book Agency (4rd edition).
4. B Sc. Practical Physics : C. L. Arora (1st Edition) – 2001 S. Chand & Co. Ltd.

5. Practical Physics : C. L. Squires – (3rd Edition) Cambridge University Press.
6. University Practical Physics : D C Tayal. Himalaya Publication.
7. Advanced Practical Physics :Worsnop & Flint.

SEMESTER VI

Theory Course – SIUSPHY61: Classical Mechanics

Course Outcome: T.Y.B.Sc. Each course of the program aims at developing certain skills, attitudes, and knowledge base of the students. Theoutline of Course Learning Outcomes is described below.			
PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome: **Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create** **Semester VI**			
Course Code	**Credits**	**Lectures/week**	**Course Name**
SIUSPHY61	**2.5**	**4**	**Classical Mechanics**
	Unit1: Central Force Unit2: Lagrange's equations Unit3: Fluid Motion and Rigid body rotation Unit4: Non Linear Mechanics and chaos		

CO No.	**Course Outcome of SIUSPHY61** **Upon completion of this course, students will be able to**	**Cognitive Level**	**Affinity withPO/ PSO**
CO1	Understand the motion of a particle under the central force and apply it to systems of particles to study the behavior.	**U, AP, An**	**PSO1, PSO2, PSO8**
CO2	Find the Lagrangian of a complex system of particles and find the Hamiltonian and equation of motion.	**U, R, An, E, C**	**PSO2, PSO8, PO1, PO2**
CO3	Write the equation of motion and understand the symmetries of the system pertaining to conservation laws.	**U, An**	**PSO2, PSO8**
CO4	Study and understand the motion of fluids and continuous media system to find the equations of motion and identification of compressible, in-compressible, rotation of fluids.	**U, R, AP,AN**	**PSO2, PSO6, PSO5, PSO8**
CO5	Understand the motion of a rigid body based on its symmetry and applied force through the use of tensors.	**U, R, AP,AN**	**PSO2, PSO6**
CO6	Identify, understand and analyze a non-linear system through various mathematical tools.	**U, R**	**PSO2, PSO8**

UNIT I: Central Force **15 lectures**

1. Central force: (review), Motion under a central force, Central force inversely proportional to the square of the distance, Elliptical orbits. The Kepler's problem. Hyperbolic Orbits-The Rutherford problem – Scattering cross section.
2. Rotating Co-ordinate System: Moving co-ordinates system, Rotating co-ordinate systems, Laws of motion on the rotating earth, Foucault pendulum, Larmor's theorem (with proof).

UNIT II: Lagrange's equations **15 lectures**

1. Lagrange's equations: D'Alembert's principle, Generalized coordinates, Lagrange's equations using D'Alembert's principle, examples, Systems subject to constraints with examples of systems subject to constraints, Constants of motion and ignorable coordinates.

UNIT III: Fluid Motion and Rigid body rotation **15 lectures**

1. Fluid Motion: Kinematics of moving fluids, Equation of motion for an ideal fluid, Conservation laws for fluid motion, Steady flow.
2. The rotation of a Rigid body: Motion of a rigid body in space, Euler's equations of motion for a rigid body, Euler's angles, Heavy symmetrical top (without nutation).

UNIT IV: Non Linear Mechanics and chaos **15 lectures**

1. Logistic map: Logistic map, period doubling, chaos and periodic windows, logistic map analysis, Liaponov exponent.
2. Fractals: Introduction, countable and uncountable sets, Cantor set, fractal properties of Cantor set, Dimensions of self-similar fractals, Box dimension.

References:

KRS: Mechanics: Keith R. Symon. (AddisionWesely) 3rd Ed.

SHS : Nonlinear dynamics and Chaos : Steven H Strogatz (Second edition, CRC press)

BO: Classical Mechanics- : V. D. Barger and M. G. Olsson. a Modern perspective (Mc Graw Hill International 1995 Ed.)

G: Classical Mechanics: Herbert Goldstein, (Narosa 2nd Ed.)

Additional References:

1. Classical Mechanics: Herbert Goldstein (Narosa 2nd Ed.)
2. An Introduction to Mechanics: Daniel Kleppner& Robert KolenkowTata Mc Graw Hill (Indian Ed. 2007)
3. Chaotic Dynamics- an introduction. : Baker and Gollup.

Theory Course – SIUSPHY62: Electronics

Course Outcome: T.Y.B.Sc.

Each course of the program aims at developing certain skills, attitudes, and knowledge base of the students. Theoutline of Course Learning Outcomes is described below.

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome:
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create

Semester VI

Course Code	Credits	Lectures/week	Course Name
SIUSPHY62	**2.5**	**4**	**Electronics**
	Unit1: FET, MOSFET & Thyristors Unit2:DC Power Supply, Differential Amplifier & Multivibrators Unit3:Integrated Circuits (OPAMP and IC 555) Unit4:Digital Electronics and Introduction to Arduino		

CO No.	Course Outcome of SIUSPHY62 Upon completion of this course, students will be able to	Cognitive Level	Affinity with PO/ PSO
CO1	Understand construction and working of JFET, MOSFET, SCR, DIAC, TRIAC	**R, U, Ap, An**	**PO1, PSO3**
CO2	Understand construction and working of D.C. power supply and its properties	**R, U**	**PO1, PSO3**
CO3	Understanding working of differential amplifier using transistor.	**R, U**	**PO1, PSO3**
CO4	Understand construction and working of Transistorized multivibrator.	**R, U, Ap**	**PO1, PSO3**
CO5	Understand the applications of OP-AMP as active filter, astable multivibrator etc.	**R, U, Ap, An**	**PO1, PSO3**
CO6	Understand operation and working of 555 timer IC as monostable, astable, Ramp, PWM waveform generation	**R, U, Ap, An**	**PO1, PSO3**
CO7	Understand logical families. Compare and study TTL NAND, TTL NOR, CMOS NAND,CMOS NOR	**R, U, An**	**PO1, PSO3**
CO8	Understand the applications of JK flip flops in designing MOD-3,5,8,10 circuits	**R, U, Ap**	**PO1, PSO3**
CO9	Understand use of Arduino UNO board and write programs for interfacing LED, Switch, etc…	**U, Ap**	**PO4, PSO4**

UNIT I: FET, MOSFET & Thyristors **15 lectures**

1. Field effect transistors: JFET: Basic ideas, Drain curve, The transconductance curve, Biasing in the ohmic region and the active region, Trans- conductance, JFET common source amplifier, JFET analog switch, multiplexer, voltage controlled resistor, Current sourcing.
2. MOSFET: Depletion and enhancement mode, MOSFET operation and characteristics, digital switching.
3. Thyristors: SCR – Working, Equivalent circuit, important terms, I-V Characteristics, SCR as a switch, half wave rectifier and full wave rectifier. TRIAC: Construction, Operation, I-V Characteristics, Applications. DIAC-Construction, Operation, Characteristics and applications.

UNIT II: DC Power Supply, Differential Amplifier & Multivibrators 15 Lectures

1. Regulated DC power supply: Supply characteristics, series voltage regulator, Short circuit protection (current limit and fold back) Monolithic linear IC voltage Regulators. (LM 78XX, LM 79XX, LM 317).
2. Differential Amplifier using transistor: The Differential Amplifier, DC and AC analysis of a differential amplifier, Input characteristic-effect of input bias, offset current and input offset voltage on output, common mode gain, CMRR.
3. Transistor Multivibrators: Astable, Monostable and Bistable Multivibrators, Schmitt trigger.

UNIT III: Integrated Circuits (OPAMP and IC 555) 15 Lectures

1. Op Amp Applications: Log amplifier, Instrumentation amplifiers, Voltage controlled current sources (grounded load), First order Active filters, Astable using OP AMP, square wave and triangular wave generator using OP AMP, Wien-bridge oscillator using OP AMP.
2. 555 Timer: Block diagram, Monostable and Astable operation, Voltage Controlled Oscillator, Pulse Width modulator, Triggered linear ramp generator.

UNIT –IV: Digital Electronics and Introduction to Arduino 15 Lectures

1. Logic families: Standard TTL NAND, TTL NOR, Open collector gates, Three state TTL devices, MOS inverters, CMOS NAND and NOR gates, CMOS characteristics.
2. Applications of JK flip flop: Types of registers, 4-bit shift register (serial in-serial out), Asynchronous counters, 4-bit up-down counter, MOD-3, MOD-5, Decade counter, Shift register.
3. Introduction to Arduino Uno module: Installation and use of Arduino IDE, writing sketches, I/O functions, looping techniques and decision-making techniques using C language. Concept of I/O port, Basic Interfacing- LED, switches and 7 segment display with Arduino using suitable codes.

References:

1. MB: Electronic Principles: A. P. Malvino and D.J. Bates, (7th Ed.) – (TMH).
2. VKM: Principles of Electronics: V. K. Mehta and Rohit Mehta. S. ChandPublications. (11th Ed.)
3. KVR: Functional Electronics: K .V. Ramanan (TMH).
4. AM: Electronic Devices and Circuits: Allen Mottershed, PHI learning 2013 Ed
5. ML: Digital Principles and Applications: Malvino and Leach (4th Ed)(TMH).
6. MH: Integrated Electronics: Millman and Halkias, Mc Graw Hill International.
7. SM: Programming for Aurdino :simon monk

Theory Course: SIUSPHY63 (Nuclear Physics)

Course Outcome: T.Y.B.Sc. Each course of the program aims at developing certain skills, attitudes, and knowledge base of the students. Theoutline of Course Learning Outcomes is described below.			
PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome: **Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create** **Semester VI**			
Course Code	**Credits**	**Lectures/week**	**Course Name**
SIUSPHY63	**2.5**	**4**	**Nuclear Physics**
	Unit1: Radioactivity Unit2: Properties of Nucleus and Nuclear Models Unit3: Experimental Techniques/Nuclear Physics Tools Unit4: Nuclear energy and elementary particles.		

CO No.	**Course Outcome of SIUSPHY63** **Upon completion of this course, students will be able to**	**Cognitive Level**	**Affinity with PO/ PSO**
CO1	Understand the basic concepts of radioactivity, disintegration laws and apply these laws to Alpha, Beta, and Gamma decay process in various radioactive series.	**U, Ap**	**PSO2, PSO8**
CO2	Understand the properties of the nucleus and apply the properties of nucleus to study the meson theory	**U, R, An**	**PSO2, PSO8**
CO3	Understand the nucleus on the basis of various models viz. Liquid drop model, Shell model	**U, An**	**PSO2, PSO8**
CO4	Study the different experimental techniques for particle accelerator and particle detector with the help of experiment.	**U, R, Ap, An**	**PSO2, PSO6, PSO5, PSO8**
CO5	Understand the concept of Nuclear Energy: Fission and Fusion for various radioactive elements.	**U, R**	**PSO2, PSO6**
CO6	Understand the elementary particle and Quark Model	**U, R**	**PSO2, PSO8**

UNIT-I: Radioactivity **15 Lectures**

1. Radioactive decay: Concept of radioactivity/disintegration, Laws of disintegrations, Activity and its units, half life, Average (mean) life, Radioactive series,

2.Alpha decay : Basics of α decay processes, energetics of alpha decay, energy levels & decay schemes. Alpha decay paradox: Barrier Penetration, Gamow's theory of alpha decay and Geiger-

Nuttal law. Velocity and energy, passage of alpha particle through matter: Absorption of alpha particles, Range of alpha particles, Ionization and stopping power, Bragg's peak.
3.Beta decay: Types of beta decay, energy and kinematics of β decay, Continuous beta ray spectrum-Difficulties encountered to understand it, Pauli's neutrino hypothesis, properties of neutrino.
4.Gamma decay: Gamma ray emission & kinematics, internal conversion, nuclear isomerism.

UNIT -II: The properties of the Nucleus and Nuclear Models 15 Lectures

1. Properties of the nucleus: Constituents of nucleus, quantitative facts about nuclear mass, volume, size of the nucleus, radii, Rutherford scattering & measurement of nuclear size, Measurement of nuclear-radius by Hofstadter experiment, Nuclear force, properties of nuclear force, Meson theory of Nuclear Force, Yukawa potential, Binding energy, average binding energy and its variation with mass number, main features of binding energy per nucleon versus mass number curve.
2. Nuclear Models: Liquid drop model of nucleus (Qualitative), Weizsacher's semi-empirical mass formula, Mass parabolas - Prediction of stability against beta decay for members of an isobaric family, Stability limits against spontaneous fission. Shell Model: Qualitative predictions of shell model & Magic numbers.

UNIT-III: Accelerators and Detectors 15 Lectures

1. Particle Accelerators: (principle construction working, advantages, limitations of) Van de Graff accelerator, Tandem accelerator, Cyclotron, Synchrotron, and Idea of Large Hadron Collider.
2. Nuclear radiation Detectors: Principle, construction and working of gas filled detectors, Concept of average energy required for creating electron-ion pair, ionization chamber, proportional counter, Geiger-Muller (G.M.) Counter, Scintillation detectors, semi-conductor detectors, cloud and bubble chamber

UNIT-IV: Nuclear energy and elementary particles 15 Lectures

1. Nuclear energy: Introduction, Asymmetric fission - Mass yield, Emission of delayed neutrons, Nuclear energy release in fission, Nature of fission fragments, Energy released in the thermal neutron induced fission of ^{233}U and ^{239}Pu, Fission chain reaction, Nuclear reactors, Neutron cycle in a thermal nuclear reactor (Four Factor Formula), Fusion of lighter nuclei, Comparison of fission and fusion processes.
2. Elementary particles: Introduction, Classification of elementary particles, particles and anti-particles, Quantum numbers: spin, charge, isospin, lepton number, baryon number, strangeness, hypercharge, Gell-Mann-Nishijima relation, Conservation laws (linear & angular momentum, energy, charge, spin, isospin, strange mess, baryon number & lepton number, Quarks and Qualitative discussion of Quark model.

References:

1. AB: Concepts of Modern Physics: Arthur Beiser, Shobhit Mahajan, S Rai Choudhury(6th Ed.) (TMH). 2. P: Nuclear Physics: S.B. Patel (Wiley Eastern Ltd.).
3. K: Nuclear Physics: Irving Kaplan (2nd Ed.) (Addison Wesley).
4. G: Nuclear Physics: S. N. Ghoshal (S. Chand & Co.)
5. T: Nuclear Physics: D. C. Tayal (Himalayan Publishing House) 5thed.

Additional References

1. Modern Physics: Kenneth Krane (2nd Ed.) John Wiley & Sons.
2. Atomic & Nuclear Physics: A B Gupta & Dipak Ghosh Books & Allied (P) Ltd.
3. Introduction to Elementary Particles: David Griffiths, Second Revised Edition,Wiley- VCH
4. Nuclear Radiation Detectors by S. S. Kapoor and S. N. Ramamootry.

Theory Course –SIUSPHY64: Theory of Relativity

Course Outcome: T.Y.B.Sc.

Each course of the program aims at developing certain skills, attitudes, and knowledge base of the students. Theoutline of Course Learning Outcomes is described below.

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome:
Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create

Semester VI

Course Code	Credits	Lectures/week	Course Name
SIUSPHY64	2.5	4	Theory of Relativity
	Unit1: Special Theory of Relativity & Relativistic Kinematics Unit2: Relativistic Kinematics Unit3: Relativistic Dynamics Unit4: Relativity and Electromagnetism.		

CO No.	Course Outcome of SIUSPHY64 Upon completion of this course, students will be able to	Cognitive Level	Affinity with PO/ PSO
CO1	Understand the significance of Michelson Morley experiment and failure of the existing theories to explain the null result.	R, U	PO2, PSO2
CO2	Understand the importance of postulates of special theory of relativity, Lorentz transformation equations and how it changed the way we look at space and time, Common sense versus Einstein concept of Space and time.	U, Ap	PO2, PSO2, PSO8
CO3	Construct the Minkowski's space-time diagram, using the Lorentz space time transformation.	U,An,C	PO2, PSO2, PSO8

CO4	Understand the transformation equations for: Space and time, velocity, mass, momentum, force, Energy.	**U, Ap**	**PO2, PSO2, PSO8**
CO5	Solve problems based on length contraction, time dilation, velocity addition, Doppler effect, mass energy relation etc	**Ap, An**	**PO2, PSO2, PSO8**
CO6	Explain interdependence of Electric and magnetic field in relativity. Use force transformation to get the electric and magnetic field transformations	**R,U,Ap**	**PO2, PSO2, PSO8**

UNIT I: Special Theory of Relativity & Relativistic Kinematics 15 lectures

1. Experimental background of special theory of relativity : Galilean transformations, Newtonian relativity, Electromagnetism and Newtonian relativity. Attempts to locate absolute frame, Michelson- Morley experiment, attempts to preserve the concept of a preferred ether frame. Lorentz Fitzgerald contraction and ether drag hypothesis, Attempt to modify electrodynamics, postulates of the special theory of relativity.

2. Relativistic Kinematics: Simultaneity, Derivation of Lorentz transformation equations. Consequences of the Lorentz transformation equations-length contraction, time dilation and meson experiment. Observer in relativity.

UNIT II: Relativistic Kinematics 15 lectures

1. Relativistic Kinematics (continued): The relativistic addition of velocities and acceleration transformation equations, Aberration and Doppler effect in relativity, The common sense of special relativity.

2. The Geometric Representation of Space-Time: Space-Time Diagrams, Simultaneity, Length contraction and Time dilation, The time order and space separation of events, The twin paradox

UNIT III: Relativistic Dynamics 15 lectures

1. Relativistic Dynamics: Mechanics and Relativity, The need to redefine momentum, Relativistic momentum, Alternative views of mass in relativity, The relativistic force law and the dynamics of a single particle, The equivalence of mass and energy, The transformation properties of momentum, energy and mass.

UNIT IV: Relativity and Electromagnetism 15 Lectures

1. Relativity and Electromagnetism: Introduction, the interdependence of Electric and Magnetic fields, transformation for E and B, The field of a uniformly moving point charge, Force and fields near a current-carrying wire, Force between moving charges, invariance of Maxwell's equations. Principle of equivalence, general relativity and Gravitational red shift.

References

1. RR : Introduction to Special Relativity : Robert Resnick (Wiley Student Edition)
2. Special theory of Relativity : A. P. French

SEMESTER VI – Practical Course

The T. Y. B. Sc. Syllabus integrates the regular practical work with a series of demonstration and skillexperiments. During the teaching and examination of Physics laboratory work, simple modifications of experimental parameters may be attempted. Attention should be given to basic skills of experimentationwhich include:

1) Understanding relevant concepts.
2) Planning of the experiments.
3) Layout and adjustments of the equipments.
4) Recording of observations and plotting of graphs.
5) Calculation of results and estimation of possible errors in the observation of results.

i) Regular Physics Experiments: A minimum of 8 experiments from each of the practical course are to be performed and reported in the journal.

ii) Demonstration Experiments: The demonstration experiments are to be performed by the teacher in the laboratory and students should be encouraged to participate and take observation wherever possible.

Demonstration experiments are designed to bring about interest and excitement in Physics. Students are required to enter details of these'demo' experiments in their journal.

The certified journal must contain a minimum of 16 regular experiments (8 from each practical course), with minimum 6 demonstration experiments in semester VI. A separate index and certificate in journal is must for each semester course.

There will be two turns of three hours each for the examination of practical course.

Practical Course – SIUSPHYP61

Course Outcome: T.Y.B.Sc.

Each course of the program aims at developing certain skills, attitudes, and knowledge base of the students. Theoutline of Course Learning Outcomes is described below.

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome:

Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create

Semester VI

Course Code	Credits	Lectures/week	Course Name
SIUSPHYP61	**3**	**8**	**Practical Course - 61**
	Practicals of Course **SIUSPHY61** and Course **SIUSPHY62**		

CO No.	Course Outcome of SIUSPHYP61 Upon completion of this course, students will be able to	Cognitive Level	Affinity with PO/ PSO
CO1	Understand the relevant concept and planning of the experiment.	**U, Ap**	**PO3, PSO5, PSO6**

CO2	Prepare layout and adjustment of equipments	**AP, An**	**PSO5, PSO6**
CO3	Record the observations and plotting of graphs	**An**	**PSO5, PSO6**
CO4	Calculate and obtain results and estimate the possible errors in the calculations.	**An, E**	**PO3, PSO5, PSO6**

1. Quincke's method for surface tension of Mercury
2. Double refraction
3. FET characteristics
4. UJT characteristics
5. UJT as relaxation oscillator
6. SCR characteristics
7. Photodiode characteristics
8. Phototransistor characteristics
9. Diameter of Lycopodium powder
10. Frequency response of Common Source FETAmplifier

Practical Course – SIUSPHPY62

Course Outcome: T.Y.B.Sc.

Each course of the program aims at developing certain skills, attitudes, and knowledge base of the students. Theoutline of Course Learning Outcomes is described below.

PO- Program Outcome, PSO-Program Specific outcome; CO-Course Outcome:

Cognitive Level: R-Remember; U-Understanding; Ap-Apply; An-Analyze; E-Evaluate; C-Create

Semester VI

Course Code	**Credits**	**Lectures/week**	**Course Name**
SIUSPHYP62	**3**	**8**	**Practical Course - 62**
	Practicals of Course **SIUSPHY63** and Course **SIUSPHY64**		

CO No.	**Course Outcome of SIUSPHYP62 Upon completion of this course, students will be able to**	**Cognitive Level**	**Affinity with PO/ PSO**
CO1	Understand the relevant concept and planning of the experiment.	**U, Ap**	**PO3, PSO5, PSO6**
CO2	Prepare layout and adjustment of equipments	**AP, An**	**PSO5, PSO6**
CO3	Record the observations and plotting of graphs	**An**	**PSO5, PSO6**
CO4	Calculate and obtain results and estimate the possible errors in the calculations.	**An, E**	**PO3, PSO5, PSO6**

1. M/C using B.G.
2. Transistorized Astable multivibrator
3. Transistorized Bistable multivibrator
4. Transistorized Monostable multivibrator
5. Log amplifier using OPAMP
6. Hall effect
7. 555 timer as ramp generator.
8. Diode as a temperature sensor
9. Shift register

10. 555 monostable / astable

11 Write a program to blink (flash) the LEDs connected at the digital pins of one of the ports of Arduino with 1second delay in continuous loop using embedded C language. Modify the program to produce a running light effect.

12 Interface switches and LEDs to Arduino development board as input and output device respectively. Write an embedded C program to monitor the status of switch and display that on LED.

13 Interface a 7-segment display with Arduino development board as an output device. Write an embedded C program to count and display decimal numbers from 0 to 9 with suitable time delay.

Demonstration Experiments:

1. Data sheet reading for diodes, Transistor, Op amp and Optoelectronic devices.
2. Circuit designing – single stage amplifier, Transistor Multivibrator etc. and testing on breadboard.
3. Equation solver
4. Amplitude Modulation
5. Frequency Modulation
6. Michelson's interferometer.
7. Iodine absorption spectra.
8. Standing waves in liquid using Ultrasonic waves.
9. PC simulation of 8085.
10. Use of PC / μP to control real world parameters.
11. Seven segment display.
12. GM counter

References:

1. Advanced course in Practical Physics: D. Chattopadhya, PC. Rakshit& B. Saha (8th Edition)Book & Allied Pvt. Ltd.
2. BSc Practical Physics: Harnam Singh S. Chand & Co. Ltd. – 2001.
3. A Text book of Practical Physics: Samir Kumar Ghosh New Central Book Agency (4rd edition).
4. B Sc. Practical Physics: C. L. Arora (1st Edition) – 2001S. Chand & Co. Ltd.
5. Practical Physics: C. L. Squires – (3rd Edition) Cambridge University Press.
6. University Practical Physics: D C Tayal. Himalaya Publication.
7. Advanced Practical Physics: Worsnop & Flint.