



College of Arts,
Science &
Commerce (Autonomous)

RISE WITH EDUCATION

NAAC REACCREDITED - 'A' GRADE

SIES COLLEGE OF ARTS, SCIENCE AND COMMERCE

(Autonomous)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus under NEP effective from June 2023

Offered By: Department of Physics

**Program Name: BSc
Syllabus for SEM I and SEM II**

Class: FYBSc

Course: FYBSc Physics (DSC)

Choice Based Credit System (CBCS) with effect from academic year
2023–2024 under NEP

Syllabus for B.Sc. Physics (Theory & Practical)**As per credit-based system.****First Year B.Sc. 2023–2024**

The syllabus in Physics as per credit-based system for the First Year BSc. The course will be implemented from the academic year 2023–2024.

Preamble:

The systematic and planned curricula from these courses shall motivate and encourage learners to understand basic concepts of Physics.

Course code	Title	Credits
Semester I		
SIUPYCC111	Electricity, Electronics and Electrostatics-Magnetostatics	3
SIUPYCCP111	Practical I	1
		Total = 04
Semester II		
SIUPYCC121	Mechanics, Optics and Modern Physics	3
SIUPYCCP121	Practical II	1
		Total = 04

Scheme of examination For Core Physics:**1. Theory:****(A) Internal Examination: 25 marks**

Sr No.	Particulars	Marks
1.	One Class Test/online examination to be conducted in the given semester	10
2.	Assignment based on the curriculum and active participation in routine class instructional deliveries to be assessed by the teacher concerned	15

(B) Semester End Examination: 50 marks

The theory paper shall be two-hour duration.

Each paper shall consist of **Three** questions. All questions are compulsory and will have internal option.

Q – I is from Unit – I

Q – II is from Unit – II

Q - III is from Unit – III

2. Practical:

(A) There will not be any internal examination for practical. The semester end examination of the practical course will be conducted as per the following scheme:

Sr No.	Particulars of External Practical Examination	Marks
1	Laboratory Work	15
2	Journal	05
3	Viva	05
	Total	25

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

PSO No.	DETAILS
PSO1	Understand the basic concepts and the fundamentals of mechanics, properties of matter, current electricity, and electrodynamics
PSO2	Understand the basics of quantum mechanics, relativistic physics, nuclear physics, optics, Atomic Physics, solid state physics, statistical physics and thermodynamics, mathematical physics & biophysics
PSO3	Understand and apply the concepts of electronics in the designing of different analog & digital circuits and in instrumentation
PSO4	Understand the basics of computer programming, assembly language & numerical analysis
PSO5	Apply and verify theoretical concepts through laboratory experiment
PSO6	Applications of theoretical concepts
PSO7	To familiarize with current and recent scientific and technological developments
PSO8	To enrich knowledge through problem-solving, hands-on activities, study visits & projects.

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 I			
Course Code	Credits	Lectures/week	Course Name
SIUPYCC111	3	3	Electricity, Electronics & Electrostatics-Magnetostatics
	Unit1: Electricity Unit2: Electronics Unit3: Electrostatics-Magnetostatics		
Course Outcome No	Course Outcome of SIUPYCC111 Upon completion of this course, students will be able to	Cognitive Level	Affinity with PO/ PSO
CO1	Discuss and derive the growth and decay of current in LR, CR, and LCR circuit	U, R, Ap, An	PSO1, PSO3, PSO8
CO2	Discuss the basic circuit laws	U, R, Ap	PSO1, PSO8
CO3	Describe AC bridge concept with examples	U, R, Ap, An	PSO1, PSO8
CO4	Categorizing digital and analogue circuits. Converting from one number system to another, Understanding logic gates with help of truth table, Apply Boolean laws of logic expression.	Ap, An, C	PSO3, PSO6
CO5	Testing and verifying binary arithmetic with the help of logic circuits.	An, Ap	PSO3, PSO8
CO6	Gauss's law and its applications to determine electric fields.	U, R, Ap, An	PSO2, PSO8
CO7	To discuss and determine the electrostatic potential and potential energy in different systems.	U, R, Ap, An	PSO2, PSO8
CO8	To discuss and determine magnetic fields in different configurations.	U, R, Ap, An	PSO2, PSO8

SEMESTER-I

UNIT -I Electricity

15 Lectures

1. Transient response of circuits: Growth and decay of current in LR circuit, charging and discharging of CR circuit.
2. AC Circuits: Kirchhoff's laws for AC circuits, Complex reactance and impedance, Series LCR Circuit: Resonance, Power dissipation, Quality Factor and Band width (No derivation).
3. AC Bridges: General AC bridge, Maxwell inductance bridge and LC bridge, de-Sauty's bridge, Wien Bridge.

UNIT -II Electronics

15 Lectures

1. Digital Circuits: Difference between Analog and Digital circuits. Binary numbers. Decimal to Binary and Binary to Decimal conversion, Octal and Hexadecimal number system. NAND and NOR Gates as Universal Gates. XOR Gate and application as Parity checker.
2. Boolean algebra: De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra.
3. Arithmetic Circuits: Binary Addition, Binary Subtraction, Half and Full Adders.

UNIT -III Electrostatics-Magnetostatics

15 Lectures

1. The Electric Field: Introduction, Coulomb's Law, The Electric Field, Continuous charge Distribution, Electric flux, Gauss' theorem and its applications - sphere, cylinder, plane sheet, screening of electric field by a conductor. Electric field due to a dipole.
2. Work and Energy in Electrostatics: The work done to move a charge, the energy of a point charge distribution.

3. Magnetostatics: Biot - Savart's law and applications - Magnetic field due to a coil, Ampere's law and applications- Magnetic field due to straight conductor, coil, Helmholtz coil and solenoid.

Note: A good number of numerical examples are expected to be covered during the prescribed lectures.

References:

1. D. Chattopadhyay, P C Rakshit, Electricity and Magnetism 7th Ed. New Central Book agency.
2. B.L. Theraja and A.K. Theraja, A Textbook of Electrical Technology Vol. I, S. Chand Publication
3. Boylestad and Nashelsky, Electronic devices and Circuit Theory: 7th edition, Prentice Hall of India.
4. V K Mehta and R Mehta Electronics Principals, Multicolored Revised 11th Ed. Reprint in 2012, S Chand Publications.

Additional references:

1. A B Bhattacharya, Electronics Principles and Applications, Central publisher.
2. A P Malvino, Digital Principles and Applications: Tata McGraw Hill.
3. Tokhiem, Digital electronics, 4thed, McGraw Hill International Edition.
4. D.J. Griffiths, Introduction to Electrodynamics, 4th Edition, PHI 2013.

SEMESTER-I

Course Code	Title	Credits
SIUPYCCP111	Practical I	1

Practical				
Course Code	Credits	Lectures/week	Course Name	
SIUPYCCP111	1	2	Practical I	
CO. No.	DETAILS		Cognitive Level	Affinity with PO/ PSO
CO1	To understand and practice experimental skills while doing Physics experiment		U, R, Ap	PSO3, PSO5, PSO6
CO2	Use of apparatus and their use without fear.		U, R, Ap	PSO3, PSO5, PSO6
CO3	Correlating theoretical concepts through experiments		U, R, An, E	PSO5, PSO8

List of experiments:

1. LR Circuit: To determine the value of given inductance and phase angle.
2. CR Circuit: To determine value of given capacitor and Phase angle.
3. LCR Series Resonance.
4. Frequency of AC mains
5. Characteristics of LDR
6. Charging and Discharging of Capacitor
7. NAND Gate as a Universal Building Block
8. NOR Gate as a Universal Building Block
9. De Morgan's Theorems
10. Load regulation of a Bridge Rectifier

A minimum of 8 experiments from the list should be completed in the first semester. All these experiments are to be reported in the journal to be eligible for practical examination.

References:

Advanced practical physics for students ,B.L. Wornosop & H.T. Flint, Methuen & Co, London, 9th edition.

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 II**

Course Code	Credits	Lectures/week	Course Name	
SIUPYCC121	3	3	Mechanics, Optics and Modern Physics	
	Unit 1: Mechanics Unit 2: Optics Unit 3: Modern Physics			
CO No.	Course Outcome of SIUPYCC121 Upon completion of this course, students will be able to		Cognitive Level	Affinity with PO/ PSO
CO1	Apply basic ideas of simple pendulum to compound pendulum.		U, Ap, An	PSO6, PSO8
CO2	Study superposition of harmonic oscillation with necessary derivations.		U, R, Ap, An	PSO1, PSO5, PSO8
CO3	To Derive relation between elastic constants, torque per unit twist. Study bending of beams with relevant derivations.		U, R, An	PSO5, PSO6
CO4	Derive lens maker equation and study different types of magnification.		U, R, Ap, An	PSO2, PSO8
CO5	Derive equivalent focal length of lens combination. Study construction and working of different types of eye pieces.		U, R, Ap	PSO2, PSO8
CO6	Examine different types of inherent defects in lenses.		U, R, Ap, An	PSO2, PSO8
CO7	Describe the phenomenon of interference of light.		U, R, Ap, An	PSO2, PSO8
CO8	Outline the origin of quantum theory.		U, R, Ap, An	PSO2, PSO8
CO9	Description of production of X-rays and its properties.		U, R, Ap, An	PSO2, PSO8

SEMESTER-II

UNIT I Mechanics

15 Lectures

1. Compound Pendulum: S H M & Simple pendulum (review), Compound Pendulum- Expression for period, maximum and minimum time period, centres of suspension and oscillation, reversible compound pendulum.
2. Superposition of Harmonic oscillations: Superposition of Collinear Harmonic oscillations (review), Superposition of two perpendicular Simple Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures with equal / unequal frequencies and their uses.
3. Elasticity: Elastic constants, Relation between elastic constants (No derivation), twisting torque on a cylinder or wire, limiting values of Poisson's constant.
4. Bending of beams: Bending Moment, Cantilever and beam supported at two ends and loaded at the centre.

UNIT II: Optics

15 lectures

1. Lenses: Lens Maker's Formula, Newton's lens equation, magnification-lateral, longitudinal and angular.
2. Combination of lenses: Equivalent focal length of two thin lenses lateral, Thick lenses, cardinal points, Ramsden and Huygens eyepiece.
3. Lens defects: Aberration, Spherical Aberration, Reduction of Spherical Aberration, Chromatic aberration, and condition for achromatic aberration.
4. Interference of light: Interference phenomenon, Interference in thin films, Fringes in Wedge shaped films, Newton's Rings (Reflective).

UNIT III: Modern Physics

15 lectures

1. Origin of Quantum theory: Black body (definition), Black body radiation, Wien's displacement law, Matter waves, wave particle duality, Heisenberg's uncertainty principle. G.P Thomson experiment, Davisson-Germer Experiment.

2. X-Rays: X-Ray production and properties. Continuous and characteristic X-Ray spectra, X-Ray Diffraction, Bragg's Law, Applications of X-Rays.
3. Compton Effect: Compton Effect and expression for Compton shift, Pair production and annihilation, Photons and Gravity, Gravitational Red Shift.

Note: A good number of numerical examples are expected to be covered during the prescribed lectures.

References:

1. C. L Arora and Dr P.S. Hemne, Physics for degree students S. Chand Publications
2. Hans and Puri, Mechanics, 2nd Ed. Tata McGraw Hill
3. Halliday, Resnick and Walker, Fundamental of Physics (extended) – (6th Ed.), John Wiley and Sons.
1. H. C. Verma, Concepts of Physics – (Part–I), 2002 Ed. Bharati Bhavan Publishers.
2. Brij Lal & Subrahmayam, Textbook of Optics, S. Chand & Co, First multi coloured edition, 2009.
3. Arthur Beiser, Concepts of Modern Physics, McGraw Hill 7 Co, 6th edition, 2003.

Additional References:

1. Thornton and Marion, Classical Dynamics – (5th Edition)
2. D S Mathur, Element of Properties of Matter, S Chand & Co., 2008 (10th Edition)

SEMESTER-II

Course Code	Title	Credits
SIUPYCCP121	Practical II	1

Practical				
Course Code	Credits	Lectures/week	Course Name	
SIUPYCC121	1	2	Practical II	
CO. No.	DETAILS		Cognitive Level	Affinity with PO/ PSO
CO1	To understand and practice experimental skills while doing Physics experiment		U, R, Ap	PSO3, PSO5, PSO6
CO2	Use of apparatus and their use without fear.		U, R, Ap	PSO3, PSO5, PSO6
CO3	Correlating theoretical concepts through experiments		U, R, An, E	PSO5, PSO8

List of experiments:

1. Y by Vibration
2. Torsional Pendulum
3. Bar Pendulum
4. Resonance Pendulum
5. Spectrometer: Determination of Angle of Prism
6. Spectrometer: R. I. prism
7. Combination of Lenses.
8. Newton's Ring Experiment: Determination of radius of curvature of lens
9. Wedge Shaped Film
10. CRO: Phase shift. Time and frequency measurement
11. Planck's constant using LED.

Minimum 8 experiments from the list should be completed in the second semester. All these experiments are to be reported in the journal to be eligible for practical examination.

References:

Advanced practical physics for students ,B.L. Wornsop & H.T. Flint, Methuen & Co, London, 9th edition.