B.Sc. PHYSICS SYLLABUS

SCHEME OF INSTRUCTION UNDER CBCS

(w.e.f. from academic year 2025-2026)

Year	Semester	Paper [Theory and Practical]	Instructions Hrs/week	Number of Credits	Marks
1st Year	I Sem	Paper – I : Mechanics and Waves	4	4	100
		Practicals – I : Mechanics and Waves Lab	3	1	50
	II Sem	Paper – II: Optics	4	4	100
		Practicals – II : Optics Lab	3	1	50
2nd Year	III Sem	Paper – III : Thermal Physics	4	4	100
		Practicals – III : Thermal Physics lab	3	1	50
	IV Sem	Paper – IV : Electricity & Magnetism	4	4	100
		Practicals – IV : Electricity & Magnetism lab	3	1	50
3rd Year	V Sem	Paper –V : Modern Physics	4	4	100
		Practical's – V: Modern Physics lab	3	1	50
	VI Sem (DSE)	Paper – VI (A): Electronics (Elective)	4	4	100
		Practicals VI (A): Electronics (Elective)	3	1	50
		Paper – VI (B): Applied Optics (Elective)	4	4	100
		Practicals -VI (B): Applied Optics lab (Elective)	3	1	25
		Paper – VI (C): Computational Physics (Elective)	4	4	100
		Practical VI (C): Computational Physics lab (Elective)	3	1	25
				Total Credits	30

Multi Disciplinary Courses (MDC-1):

1) Semester-V- Radiation Physics

Skill Enhancement Courses (SEC):

1) SEC-1-Semester-V– Communications Skills/Professional Development Skills/ Entrepreneurship& Starts up
2) SEC-2 - Semester-VI– Professional Development Skills /Communications Skills/Entrepreneurship& Starts up
3) SEC-3 - Semester-V-Fundamentals of AI Tools/Ability Skills (Competitive Mathematics)
4) SEC-4 - Semester-VI- Biomedical instrumentation

Value Added Course (VAC) :

1) VAC-1-Semester-V-Paper-1: Environmental Science (EVS)/ Cyber Security & Cyber laws
2) VAC-2-Semester-VI-Paper-2: Cyber Security & Cyber laws/Environmental Science (EVS)

Project work /Internship:

1) Semester-VI- (Electronic Products making Skill (EPMS))

24/07/2025

SSR DEGREE COLLEGE

IE - 30
SEE - 70

Under Graduate Courses (Under CBCS 2025–2026 onwards)

B.Sc PHYSICS I Year, SEMESTER – I

Paper–I: Mechanics and Waves

w.e.f academic year (2025-26) (CBCS)

Total: 56 Hrs (4hrs/week)

UNIT–I

1. Co-ordinate systems: (5)

Introduction, Cartesian, Spherical, Cylindrical and polar co-ordinates systems (Basics), Scalar and vetor fields, basis vectors, transformation equations, expressions for displacement vector, components of velocity and acceleration in different coordinate systems, operator del in different coordinate systems.

2. Mechanics of Particles and rigid bodies: (7)

Newton's Laws of motion and applications, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions.

Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equations, Applications of Euler's equations, precession of a top, Gyroscope.

UNIT–II

3. Central Forces: (6)

Central forces-definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law.

4. Special theory of Relativity: (6)

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation equations, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism

UNIT–III

5. Waves: (12)

Fundamentals of Waves -Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance.

Longitudinal vibrations in bars- wave equation and its general solution, Special cases: i) Bar fixed at both ends, ii) Bar fixed at the midpoint, iii) Bar free at both ends, iv) Bar fixed at one end, Transverse vibrations in a bar - wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

UNIT – IV

6. Oscillations (12)

Simple harmonic oscillator and solution of the differential equation-Physical characteristics of SHM, torsion pendulum measurements of rigidity modulus, compound pendulum, measurement of 'g', combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures.

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance.

Note: Problems should be solved at the end of every chapter of all units.

24/07/2025

Suggested Books

1) Berkeley Physics Course.Vol.1,**Mechanics** by C.Kittel,W.Knight,M.A.Ruderman-*Tata-McGrawhill Company Edition2008.*
2) **Fundamentals of Physics**.Halliday/Resnick/Walker *Wiley India Edition2007.*
3) **Vector Analysis**–Murray RSpiegel-2nd edition-Schaum'sOutlines,Mc GrawHill Education
4) **Mathematical Physics**-SatyaPrakash- Sultan Chand&Sons
5) **First Year Physics**-*Telugu Academy.*
6) **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill.*
7) **Fundamentals of Physics** by Alan Giambattistaetal *Tata-Mc Graw Hill Company* Edition, 2008.
8) **University Physics** byYoung and Freeman,*Pearson Education,Edition2005.*
9) **Sears and Zemansky's University Physics** by Hugh D.Young, Roger A.Freedman *Pearson Education Eleventh Edition.*
10) **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow.*The McGraw Hill Companies.*
11) **Mechanics**.Hans & Puri.*TMHPublications.*
12) **Engineering Physics**. R.K.Gaur & S.L. Gupta. *Dhanpat Rai Publications.*
13) **The Feymman Lectures inPhysics,Vol.-1**,RPFeymman,RBLighton and MSands, BI Publications, **Mechanics**-P.K.Srivastava-NewAge International.

B.Sc Physics -I year, Semester - I
Paper–I::Mechanics & Waves Practical lab

50 Marks

No. of hours per week: 3

1) Simple pendulum – Theory of errors
2) Study of a compound pendulum-determination of 'g'and 'k'.
3) Determination of Young modulus by uniform bending of a wooden/ metal bar method.
4) Determination of moment of inertia of a flywheel.
5) Determination of rigidity modulus by torsion pendulum.
6) Determine of Viscosity of a fluid by poissuele method.
7) Determination of oscillations of a given spring constant and frequency by using combination of springs-series and parallel.
8) Study of Oscillations under bifilar suspension-Verification of axis theorems.
9) Verification of laws using Sonometer.

*Note: Minimum of **six** experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.*

Suggested Books

1) D.P.Khandelwal,"A laboratory manual for under graduate classes" (Vani Publishing House, New Delhi).
2) S.P.Singh,"Advanced Practical Physics"(Pragati Prakashan, Meerut).
3) Worsnop and Flint-Advanced Practical physics for students.
4) "Practical Physics"R.KShukla,Anchal Srivastava.

24/07/2025

SSR DEGREE COLLEGE

Under Graduate Courses (Under CBCS 2025–2026 onwards)

IE - 30
SEE - 70

B.Sc PHYSICS I Year, SEMESTER – II

PAPER–II: OPTICS

w.e.f academic year (2025-26) (CBCS)

Total: 56 Hrs (4hrs/week)

UNIT-I:

Interference: Principle of super position-coherence-temporal coherence and spatial coherence-conditions for Interference of light.

Interference by division of wave front: Fresnel's biprism-determination of wave length of light. Determination of thickness of a transparent material using Young's double slit experiment-change of phase on reflection-Lloyd's mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law), Determination of diameter of wire using wedge shaped. Determination of wave length of monochromatic light - Michelson Interferometer-types of fringes-Determination of wavelength of monochromatic light using Newton's rings (both transmitted & reflected light).

UNIT-II

Diffraction:

Introduction-Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction-Diffraction due to single slit and circular aperture-Limit of resolution- Fraunhofer diffraction due to double slit-Fraunhofer diffraction pattern with N slits (diffraction grating). Resolving Power of grating-Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction-Fresnel's half period zones-area of the half period zones -zone plate-Comparison of zone plate with convex lens-Phase reversal zone plate-diffraction at a straight edge -difference between interference and diffraction.

UNIT III:

Polarization:

Introduction, Methods of Polarization, Polarization by reflection, refraction, double refraction, selective absorption , scattering of light-Brewster's law-Malus law-Nicol prism, polarizer and analyzer-Refraction of plane wave incident on negative and positive crystals (Huygen's explanation) - Quarter wave plate, Half wave plate-Babinet's compensator, optical activity, analysis of light by Laurent's half shade polarimeter.

UNIT IV:

Lasers and Fiber Optics:

Lasers: Introduction, Laser principle, Stimulated emission, spontaneous emission, Laser principle, population inversion and characteristics of lasers, Types of Lasers, Ruby laser-He-Ne Laser, Semiconductor Laser, Relationship among Einstein coefficients, Applications of Lasers.

Fiber Optics: Introduction, structure of optical fiber, total internal reflection, types of optical fibers, Single mode and multi mode, step index and graded index fiber and their characteristics, Acceptance angle and expression for numerical aperture Applications of fibers.

NOTE: *Problems should be solved at the end of every chapter of all units*

24/07/2025

Suggested books:

1) **Optics** by Ajoy Ghatak. *The McGraw-Hill companies.*
2) **Optics** by Subramanian and Brijlal. *S.Chand & Co.*
3) **Fundamentals of Physics**. Halliday/Resnick/Walker.*C.Wiley India Edition 2007.*
4) **Optics and Spectroscopy**. R.Murugeshan and Kiruthiga Siva Prasath .*S.Chand & Co.*
5) **Second Year Physics**–*Telugu Academy.*
6) **Modern Engineering Physics** by A.S. Vasudeva.*S.Chand & C o. Publications.*
7) **Feyman's Lectures on Physics**Vol.1, 2, 3 & 4.*Narosa Publications.*
8) **Fundamentals of Optics** by Jenkins A.Francis and White E.Harvey, *McGrawHill Inc.*
9) K.Ghatak, "**Physical Optics'**
10) D.P.Khandelwal,**Optical and Atomic Physics'**(Himalaya Publishing House,Bombay,1988)
11) Jenkins and White: **'Fundamental of Optics'**(McGraw-Hill)
12) Smith and Thomson: **'Optics'** (John Wiley and sons).

B.Sc.(Physics)-I year, Semester – II

50 Marks

Paper–II: Optics practical lab

No. of hours per week: 3

1) Determination of thickness of a wire using wedge method.
2) Determination of wave length of light using Biprism.
3) Determination of Radius of curvature of a given convex lens by forming Newton's rings.
4) Resolving power of grating.
5) Study of optical rotation-polarimeter.
6) Dispersive power of a prism.
7) Determination of wavelength of light using diffraction grating minimum deviation method.
8) Wave length of light using diffraction grating-normal incidence method.
9) Resolving power of a telescope.
10) Wave length of Laser light using diffraction grating.

Note: *Minimum of **six** experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.*

24/07/2025

B.Sc. ELECTRONICS SYLLABUS

SCHEME OF INSTRUCTIONS UNDER CBCS (w.e.f. 2025-26 academic year onwards)

Year	Semester	Title of the Paper [Theory and Practical]	Instructions Hrs/week	Number of Credits	Marks
1st Year	I Sem	Paper - I : Circuit Analysis	4	4	100
		Practical - I : Circuit Analysis Lab	3	1	50
	II Sem	Paper - II : Electronic Devices	4	4	100
		Practical - II : Electronic Devices Lab	3	1	50
2nd Year	III Sem	Paper - III : Analog Circuits	4	4	100
		Practical - III : Analog Circuits Lab	3	1	50
	IV Sem	Paper - IV : Linear Integrated circuits and Analog Modulation	4	4	100
		Practical - IV : Linear Integrated Circuits and Analog modulation Lab	3	1	50
3rd Year	V Sem	Paper - V : Digital Electronics	4	4	100
		Practical -V : Digital Electronics Lab	3	1	50
	VI Sem (DSE)	Paper – VI (A) : Microprocessor and Applications	4	4	100
		Practical : Paper – VI (A) : Microprocessor and Applications Lab	3	1	50
		Paper – VI (B): Microcontroller and Applications	4	4	100
		Practical-VI (B) : Microcontroller and Applications Lab	3	1	50
		Paper –VI (C) : Electronic Communication Systems	4	4	100
		Practical – VI (C) : Electronic Communication Systems Lab	3	1	50
				Total Credits:	**30**

Multi Disciplinary Courses (MDC-1):

1) Semester-V- Digital System Design using VHDL

Skill Enhancement Courses (SEC):

1) SEC-1-Semester-V–Communications Skills/Professional Development Skills/ Entrepreneurship & Starts up
2) SEC-2-Semester-V– Professional Development Skills /Communications Skills/Entrepreneurship & Starts up
3) SEC-3 - Semester-VI-Fundamentals of AI Tools/Ability Skills (Competitive Mathematics)
4) SEC-4 - Semester-VI- Basic Instrumentation.

Value Added Course (VAC) :

1) VAC-1-Semester-V-**Paper-1: Environmental Science (EVS)/ Cyber Security & Cyber laws**
2) VAC-2-Semester-VI-**Paper-2: Cyber Security & Cyber laws/Environmental Science (EVS)**

Project work /Internship:

2) Semester-VI- (Electronic Products making Skill (EPMS))

24/07/2025

SSR DEGREE COLLEGE

Under Graduate Courses (Under CBCS 2025–2026 onwards

B.Sc ELECTRONICS I Year SEMESTER – I

Paper–I: CIRCUIT ANALYSIS

w.e.f academic year (2025-26) (CBCS)

IE - 30
SEE - 70

Total: 56 Hrs (4hrs/week)

UNIT - I

AC Fundamentals: The sine wave - average and RMS values - The J Operator - Polar and Rectangular forms of complex numbers - Phasor Diagram - Complex impedance and admittance.

Kirchhoff's Current and Voltage Laws: Concept of voltage and current sources - KVL and KCL application to simple circuits (AC and DC) consisting of resistors and sources - Node voltage analysis and Mesh analysis.

UNIT-II

Network Theorems (DC and AC): Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum power transfer Theorem, Reciprocity Theorem, Milliman's Theorem, Application to simple Networks, 2-port networks, T and π networks and their interconversions.

UNIT-III

RC and RL Circuits: Transient Response of RL and RC Circuits with step input, Time constants. Frequency response of RC and RL circuits, Types of filters - Low pass filter and High pass filter frequency response, passive differentiating circuit and passive integrating circuit.

UNIT-IV

Resonance: RLC Series and parallel resonance circuits - Resonant frequency - Q Factor - Bandwidth Selectivity.

Cathode Ray Oscilloscope: Cathode Ray Tube (CRT) and its working, electron gun focusing, Horizontal and vertical deflection, deflection sensitivity, florescent screen. Applications - Measurement of Time period, Frequency, Phase and amplitude. Lissajaus figures.

Reference Books:

1) Basic Electronics-Bernard Grob10th edition (TMH).
2) Circuit Analysis-P.Gnanasivam Pearson Education.
3) Circuit and Networks-A. Sudhakar& S. Pallri (TMH).
4) Pulse, digital & switching waveforms-Milliman & Taub.
5) Networks, Lines and Fields-John Ryder (PHI).
6) Network theory-Smarajit Ghosh (PHI).

24/07/2025

B.Sc Electronics I Year, Semester – I: 50 Marks

Paper – I: Circuit Analysis Practical Lab

No. of hours per week: 3

1) Measurement of peak voltage, frequency using CRO.
2) Measurement of phase using CRO.
3) Thevenin's theorem and Norton's theorem-verification.
4) Maximum power transfer theorem- verification.
5) CR circuit – Frequency response - (Low pass and High pass)
6) CR and LR circuits -Differentiation and integration -tracing of waveforms.
7) LCR-Series resonance circuit-frequency response-Determination of f_o, Q and band width.
8) Simulation: i) verification of KVL and KCL.
   ii) Study of network theorems. iii) Study of frequency response (LR).

Note: Student has to perform minimum of Six experiments.

Reference Books:

1) Lab manual for Electronic Devices and Circuits- 4th Edition, By David A Bell-PHI.
2) Basic Electronics- A Text Lab Manual –Zbar, Malvino, Miller.

SSR DEGREE COLLEGE

Under Graduate Courses (Under CBCS 2025–2026 onwards)

B.Sc ELECTRONICS I Year, SEMESTER – II

Paper–II: ELECTRONIC DEVICES

w.e.f academic year (2025-26) (CBCS)

IE - 30
SEE - 70

Total: 56 Hrs (4hrs/week)

UNIT-I

PN Junction: Formation of PN junction, Depletion region, Junction capacitance, Diode equation (no derivation) Effect of temperature on reverse saturation current, V-I characteristics and simple applications of i) Junction diode, ii) Zener diode, iii) Tunnel diode and iv) Varactor diode.

UNIT-II

Bipolar Junction Transistor(BJT) : PNP and NPN transistors, current components in BJT, BJT static characteristics (Input and Output), Early effect, CB, CC, CE configurations of transistor and bias conditions (cut off, active, and saturation regions), CE configuration as two port network, h–parameter model and its equivalent circuit. Determination of h-parameters from the characteristics, Load line analysis (AC and DC). Transistor Biasing – Fixed and self-bias.

UNIT-III

Field Effect Transistor (FET): Construction and working of JFET, output and transfer characteristics of FET, Determination of FET parameters. Application of FET as amplifier and Voltage variable resistor. Advantages of FET over BJT.

MOSFET: Construction and working of enhancement and depletion modes, output and transfer characteristics Application of MOSFET as a switch.

Uni Junction Transistor (UJT): Construction and working of UJT and its Characteristics. Intrinsic stand-off ratio, Application of UJT as a relaxation oscillator.

UNIT-IV

Silicon Controlled Rectifier (SCR): Construction and working of SCR. Two transistor representation, Characteristics of SCR. Application of SCR for power control.

Photo electronic Devices: Construction and Characteristics of Light Dependent Resistor (LDR), Photo voltaic Cell (Solar Cell), Photo diode, Photo transistor and Light Emitting Diode (LED).

Reference Books:

1) Electronic Devices and circuits-Millman and Halkias,(TMH)
2) Physics of Semiconductor Devices, Telugu Academy, Hyderabad
3) Principles of Electronics-V.K.Mehta & Rohit Mehta
4) Electronic Devices and Circuits-Allen Moltershed (PHI)
5) Basic Electronics and Linear Circuits-Bharghava.U
6) Electronic Devices and Circuits-Y.N.Bapat
7) Electronic Devices and Circuits-Mithal.
8) Experiments in Electronics-S.V.Subramanyam.

24/07/2025

50 Marks

B.Sc. Electronics I Year, Semester – II

Paper – II: Electronic Devices Practical Lab

No. of hours per week: 3

1) To draw volt- ampere characteristics of Junction diode and determine the cut – in voltage, forward and reverse resistances.
2) Zener diode V – I Characteristics – Determination of Zener breakdown voltage.
3) Voltage regulator (line and load) using Zener diode.
4) BJT input and output characteristics (CE configuration) and determination of 'h' parameters.
5) FET – Characteristics and determination of FET parameters.
6) UJT characteristics – determination of intrinsic standoff ratio.
7) UJT as relaxation oscillator.
8) Characteristics of LDR/Photo diode/Photo transistor/Solar cell.

Note: Student has to perform minimum of Six experiments.

Reference Books:

1) Lab manual for Electronic Devices and Circuits – 4th Edition.By David A Bell – PHI.