



JSS Mahavidyapeetha
JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(Autonomous)
OOTY ROAD, MYSURU-25

DEPARTMENT OF PHYSICS

Syllabus for BSc Physics as per Modified NEP

- ◆ *Physics, Chemistry, Mathematics (PCM)*
- ◆ *Physics, Mathematics, Computer Science (PMCs)*
- ◆ *Physics, Mathematics, Electronics (PME)*

W.e.f
2026-27

**B.Sc. (Physics) Course pattern
2026-27**

Sl. No	Code	Course Title	HC/SC/OE	No of hours	L	T	P	Credit value
First Semester								
1	GPH101	Mechanics and Properties of Matter	HC	48	3	0	0	3
2	GPH102	Physics - Practical 1	HC	64	0	0	2	2
Second Semester								
3	GPH201	Heat and Thermodynamics	HC	48	3	0	0	3
4	GPH202	Physics - Practical 2	HC	64	0	0	2	2
Third Semester								
5	GPH301	Waves, Acoustics and Optics	HC	48	3	0	0	3
6	GPH302	Physics - Practical 3	HC	64	0	0	2	2
7	GPH313	Laser and Fiber Optics - Elective	SC	32	2	0	0	2
Fourth Semester								
8	GPH401	Electricity and Electromagnetism	HC	48	3	0	0	3
9	GPH402	Physics - Practical 4	HC	64	0	0	2	2
10	GPH413	Communication Systems -Elective	SC	32	2	0	0	2
11	GPH414	Physics - Skill [#]	SC	64	0	0	2	2
Fifth Semester								
12	GPH501	Classical Mechanics, Quantum Mechanics and Atomic Spectroscopy	HC	48	3	0	0	3
13	GPH502	Nuclear and Particle Physics	HC	48	3	0	0	3
14	GPH503	Physics - Practical 5	HC	64	0	0	2	2
15	GPH512	Physics - Skill [#]	SC	64	0	0	2	2
Sixth Semester								
16	GPH601	Relativity and Solid State Physics	HC	48	3	0	0	3
17	GPH602	Astrophysics and Molecular Spectroscopy	HC	32	2	0	0	2
18	GPH603	Physics - Practical 6	HC	64	0	0	2	2

*L-Lecture; T-Tutorial; P-Practical.

[#] Skill paper may be offered during 4th or 5th or 6th semesters.

Program Outcomes (POs) for Bachelor of Science

PO 1	Domain Knowledge - Acquire and apply knowledge of science in relevant areas
PO 2	Investigation & Research – Ability to formulate a hypothesis, augment research questions and identify & refer relevant sources for examining or inspecting technical issues as per their level of understanding and knowledge
PO 3	Impact of Science on Society – To prepare competent human resources and to develop scientific attitudes at local and global levels for social benefit
PO 4	Environment and Sustainability – Apply the knowledge gained for conserving the environment and to handle environmental issues with sustainable solutions
PO 5	Moral and Ethical Values – Imbibe moral values and professional ethics to maintain integrity in a professional scenario while being aware of cultural diversities
PO 6	Communication – Develop the caliber to convey various concepts of science effectively

List of BoS Members

Sl No	Category	Name & Designation	Address for Communication	Email & Mobile No.
1	Chairperson	Dr. L Vinaykumar. Assistant Professor & HOD	Department of Physics JSS College of Arts, Commerce & Science (A), Ooty road, Mysuru - 25	vinaykumarphy@gmail.com 9844583597
2	AC Nominee	Dr. Shanmukhappa B Kaginelli Professor	Department of Physics JSSAHER Mysuru	drsbkaginelli@gmail.com 9902244859
3	Nominee by the Vice Chancellor	Dr. S.Krishnaveni Professor	DOS in Physics, Manasagangothri, Mysuru.	sk@physics.uni-mysore.ac.in 9844023568
4	AC Nominee	Dr. P Mahadevaprasad Assistant Professor	Department of Physics JSS S&T University Mysuru	mahadevaprasad@jsstuniv.in 9880382634
5	Alumnus/ One Person from Industry/ Corporate Sector/Allied Area	Mr. T G Dharmaprakash Lecturer in Physics	GFGCW, Byrapura, T.Narasipura	prakashdharm65@gmail.com 9844717814
6	Expert	Mr. Purushothama.R Assistant Manager Skanray Technologies private limited	Healthcare division, #360, KIADB Industrial area, Hebbal, Mysure- 570018	purushothama.r@skanray.com 9980565981
7	Member	Smt. Lakshmi S Assistant Professor	Department of Physics JSS College of Arts, Commerce & Science (A), Ooty road, Mysuru – 25	lakkilash1987@gmail.com 8951521842

Course: B.Sc. Physics, Semester - 1

Course Code: GPH 101	Course Title: HC(1)- Mechanics and Properties of Matter (Theory)
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 (Theory)
Total Contact hours: 48 Hours (Theory)	Formative Assessment Marks: 20 (Theory)
Exam Duration: 03 Hours (Theory)	Semester-End Examination Marks: 80 (Theory)

Course Outcomes (COs)	
CO1	Gaining the knowledge on concepts of Frame of reference, Dynamics of Point Particles and theory of Rigid bodies.
CO2	Comprehending the conservation laws of Linear Momentum, Angular Momentum and Energy.
CO3	Apprehending the theory of elasticity, Fluid mechanics and surface tension.

Unit 1

Frames of Reference: Inertial and Non-inertial reference frames with examples. Uniform rectilinear motion in an inertial frame. Uniformly accelerated rectilinear motion-concept of fictitious force-illustration; plumb line accelerometer and a freely falling elevator. Qualitative discussion of centrifugal force, Coriolis force and earth as a non-inertial frame, Numerical problems. **[4 hours]**

Motion of a Point Particle: Point mass. The position vector $r(t)$ of a moving point particle and its Cartesian components. Velocity and acceleration as the vector derivatives. Derivation of planar vector of a constant magnitude. Radial and transverse components of velocity and acceleration for arbitrary planar motion, deduction of results for uniform circular motion centripetal force, Numerical problems. **[4 hours]**

Rigid Body Dynamics: Review of definitions, Moment of inertia, and radius of gyration. Review of statements of the theorems of the parallel and perpendicular axis. Relation between torque and angular acceleration. Expression for kinetic energy of a rigid body. Calculation of moment of inertia of rectangular lamina, circular lamina and of a solid cylinder. Theory of compound pendulum. Numerical problems. **[8 hours]**

Unit 2

Conservation of Linear Momentum: Conservation of the linear momentum for a system of two particles. Rocket motion in a uniform gravitational field (single stage rocket equation with and without gravity). Multistage rocket elementary ideas. Elastic and inelastic collisions – Elastic head-on collision and elastic oblique collision in a lab frame, reduced mass. Numerical problems. **[5 hours]**

Conservation of Angular Momentum: Review of angular momentum and Torque. Relation between angular momentum and torque. Law of conservation of angular momentum. Areal velocity derivation $dA/dt = 1/2 r^2 \dot{\theta}$. Central force: Physical insight into the nature of central forces. Kepler's laws of planetary motion- Derivations using Newton's laws. Numerical problems. **[6 hours]**

Conservation of Energy: Conservative force and non-conservative forces with examples. Conservation of energy in a conservative force field. Applications:(i) Vertical oscillations of a loaded light spiral spring (Derivation) and (ii) Calculation of escape velocity in the gravitational field of the earth (Derivation). Conditions for a geo-stationary satellite. Numerical problems. **[5 hours]**

Unit 3

Elasticity: Concepts of moduli of elasticity, Hooke's Law, and Poisson's ratio σ . Relation between the elastic constants q , k , η and σ , limiting values for σ . Work done in stretching. Elastic potential energy. Bending moment. Theory of light single cantilever. I-section girders. Torsion – calculation of couple per unit twist. The Torsional pendulum, Static torsion, Searle's double bar experiment. Numerical problems. **[7 hours]**

Fluid Mechanics: Ideal fluid, equation of continuity, Bernoulli's theorem and applications of Bernoulli's equation-curved flight of a spinning ball-Magnus effect, the lift on an aircraft wing. Streamline flow and turbulent flow. Critical velocity and Reynolds number. Viscosity-Variation of viscosity of liquids with temperature and pressure. Theory of rotation viscometer. Numerical problems. **[5 hours]**

Surface Tension: Surface Energy and Surface Tension-examples. Pressure inside curved liquid surface, excess of pressure inside a soap bubble. Angle of contact. Surface tension and interfacial tension by drop-weight method. Surface tension of mercury by Quince's method – Theory. Numerical problems. **[4 hours]**

Learning resources:

1. Halliday D, Resnick R, and Walker J, *Principles of Physics*, 9th Edition, Wiley India Pvt. Ltd. (2013).
2. Upadhyaya J C, *Classical Mechanics*, 2nd Edition, Himalaya Publishing House (2017).
3. Arora C L, and Hemne P S, *Physics for Degree Students*, Revised Edition, S Chand and Company (2012).
4. Charles Kittel, and Walter Knight, *Berkeley Physics Course, Mechanics Vol. 1*, 2nd Edition, Tata McGraw Hill (2011).
5. Arora C L, *Refresher Course in B.Sc. Physics Vol. 1*, Revised Edition, S Chand and Company (2008).
6. Mathur D S, *Elements of Properties of Matter*, S Chand and Company (2007).
7. Mathur D S, *Mechanics*, S Chand and Company (2007).
8. BrijLal, and Subrahmanyam N, *Properties of Matter*, 6th Edition, S Chand and Company (2002).
9. Shankara Narayana S R, *Mechanics and Properties of Matter*, 2nd Revised Edition, Sultan Chand and Sons (1998).

Course: B Sc. Physics, Semester - 1

Course Code: GPH 102	Course Title: HC(1) – LAB (Practical)
Course Credits: 02 (0:0:2)	Hours of Teaching/Week: 04 (Practical)
Total Contact Hours: 64 Hours (Practical)	Formative Assessment Marks: 10 (Practical)
Exam Duration: 03 Hours (Practical)	Semester-End Examination Marks: 40 (Practical)

LIST OF EXPERIMENTS

Any EIGHT of the following experiments:

1. Bar pendulum: Determination of the acceleration due to gravity and radius of gyration (graphical method).
2. Fly wheel: Determination of moment of inertia, mass and density.
3. Drop weight method: Determination of surface tension of liquid and interfacial tension between two liquids.
4. Young's modulus: Single cantilever method using travelling microscope
5. Searle's double bar: Determination of Young's modulus, rigidity modulus and Poisson's ratio.
6. Torsional pendulum: Determination of the rigidity modulus.
7. Determination of the Young's modulus by dynamic method (using graph).
8. Spiral spring: Determination of the acceleration due to gravity and unknown mass (graphical method).
9. Determination of radius of gyration and moment of inertia of a rectangular body in three different axes.
10. Stokes' method: Determination of coefficient of viscosity of viscous liquids.
11. Determination of rigidity modulus by the static-torsion method.
12. Verification of parallel and perpendicular axis theorems.
13. Determination of Young's modulus by the method of uniform bending.

Course: B.Sc. Physics, Semester - 2

Course Code: GPH 201	Course Title: HC(2)- Heat and Thermodynamics (Theory)
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 (Theory)
Total Contact Hours: 48 Hours (Theory)	Formative Assessment Marks: 20 (Theory)
Exam Duration: 03 Hours (Theory)	Semester-End Examination Marks: 80 (Theory)

Course Outcomes (COs)	
CO1	Comprehension of kinetic theory and radiation laws, Thermal conductivity and statistical physics.
CO2	Gaining the knowledge on the Concepts of Thermodynamics and Entropy.
CO3	Acquiring the knowledge on thermodynamics systems through derived thermodynamic relations, low temperature physics and vacuum technology.

Unit 1

Kinetic theory of gases: Maxwell's law of distribution of molecular velocity (no derivation); its interpretation. Degrees of freedom. Principle of equipartition of energy based on Kinetic theory of gases. Derivation of $U = \frac{3}{2} RT$. Mean free path, expression for mean free path, probability of a particle having mean free path. Real gases, Andrew's isothermals, Van der Waals equations – expression for critical constants, calculation of mean velocity, most probable velocity and RMS velocity. Numerical problems. **[8 hours]**

Thermal conductivity: Equation for the flow of heat through a solid bar. Determination of thermal conductivity of a bad conductor by Lee and Charlton method. Numerical problems. **[2 hours]**

Statistical physics: The Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac energy distribution formulae (no derivation). A qualitative comparison of the MB, BE and FD statistics and their applications. **[2 hours]**

Radiation: Planck's quantum theory of radiation. Induced and spontaneous emission of radiation. Derivation of Planck's law of radiation using Einstein's A and B coefficients. Deduction of Rayleigh-Jeans law, Stefan's law and Wein's displacement law from Planck's law. Numerical problems. **[4 hours]**

Unit 2

Thermodynamics: Review of basic concepts of heat and temperature - the zeroth law of thermodynamics. Differential form of the first law of thermodynamics, work done in an isothermal and adiabatic process for an ideal gas (Derivations). Second law of thermodynamics (Kelvin's & Clausius' statements and their equivalence), Reversible and irreversible processes with examples. Carnot theorem (statement and proof). Carnot cycle

and its efficiency (derivation). Carnot Engine. Refrigerator-Coefficient of performance. Thermodynamic scale of temperature and its identity with perfect gas scale. First order Phase Transitions with examples. Clausius-Clapeyron first latent heat equation. Numerical problems. **[10 hours]**

Entropy: The concept of entropy. Change of entropy in reversible and irreversible cycles. Entropy and non-available energy. Second law of thermodynamics in terms of entropy. Entropy of ideal gas, entropy of steam and mixtures. T-S diagram. Third law of thermodynamics - statement, significance and unattainability of absolute zero. Microscopic interpretation of entropy (Boltzmann relation). Numerical problems. **[6 hours]**

Unit 3

Thermodynamic potentials and Maxwell's thermodynamic relations: Internal Energy, Enthalpy, Helmholtz function, Gibbs function, relations among these functions, Gibbs-Helmholtz Equations. Derivation of Maxwell's thermodynamic Relations (using Thermodynamic Potentials). TdS equations for C_p and C_v . Heat Capacity equations. Derivation of $C_p - C_v = R$ using Maxwell's Relations. Internal Energy equations. Numerical problems. **[6 hours]**

Low temperature physics: Ideal gas and real gas. Van der Waals equation of state. Porous plug experiment and its theory. Joule-Thomson expansion, expression for the temperature of inversion, inversion curve. Relation between Boyle temperature, temperature of inversion and critical temperature of a gas. Principle of regenerative cooling. Liquefaction of air by Linde's method. Adiabatic demagnetization. Cryogenics and its applications (qualitative). Numerical problems. **[6 hours]**

Vacuum technology: Introduction with basic definitions and units, Exhaust pump and their characteristics, Measurement of low pressure, Pirani gauge. Numerical problems.

[4 hours]

Learning resources:

1. Halliday and Resnick: *Fundamentals of Physics*, 9th Edition, Wiley India, 2011.
2. Dittaman R. H. and Zemansky M. W.: *Heat and Thermodynamics*, 7th Edition, The McGraw-Hill companies, 2007.
3. Blundell S. J. and Blundell K. M.: *Concepts in Thermal Physics*, 2nd Edition, Oxford University Press, 2006.
4. Brijlal, N. Subramanyam P.S. Hemne: *Heat Thermodynamics and Statistical Physics*, 1st Edition. S Chand Publishing, 2007.
5. Gupta S C: *Thermodynamics*, 1st Edition, Pearson, 2005.
6. Arora C. L.: *Refresher Course in Physics Vol I*, S Chand publishing, 2011.
7. Shankara Narayana S. R.: *Heat and Thermodynamics*, 2nd Edition, Sulthan Chand and Sons, 1990.
8. Gaur R.K and S.L Gupta, *Engineering Physics*, Dhanpant Rai Publications, 8th Edition (2001).
9. Mark W. Zemansky, *Heat and Thermodynamics*, Tata McGraw Hill, 7th Edition (1997).

Course: B Sc. Physics, Semester - 2

Course Code: GPH 202	Course Title: HC(2) – LAB (Practical)
Course Credits: 02 (0:0:2)	Hours of Teaching/Week: 04 (Practical)
Total Contact Hours: 64 Hours (Practical)	Formative Assessment Marks: 10 (Practical)
Exam Duration: 03 Hours (Practical)	Semester-End Examination Marks: 40 (Practical)

LIST OF EXPERIMENTS

Any EIGHT of the following experiments:

1. Verification of Gaussian distribution and calculation of standard deviation-Monte Carlo experiment.
2. Specific heat by Newton's law of cooling-graphical method.
3. Determination of thermal conductivity of a bad conductor by Lee-Charlton method.
4. Coefficient of thermal conductivity of copper by Searle's apparatus.
5. Verification of Stefan's fourth power law using an electrical lamp.
6. Verification of Clausius-Clapeyron equation and determination of specific enthalpy.
7. Verification of Stefan-Boltzmann law using a meter bridge or a potentiometer.
8. Determination of Stefan's constant.
9. Determination of the value of the mechanical equivalent of heat (J) by electrical method.
10. Determination of boiling point of a liquid by using a platinum resistance thermometer.
11. Dice experiment – To determine decay constant and verify Randomicity.
12. Determination of temperature coefficient of resistance of a platinum resistance thermometer.
13. Determination of Solar constant.
14. Mechanical Equivalent of Heat by Callender and Barne's method.

Course: B.Sc. Physics, Semester - 3

Course Code: GPH 301	Course Title: HC(3)- Waves, Acoustics and Optics (Theory)
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 (Theory)
Total Contact Hours: 48 Hours (Theory)	Formative Assessment Marks: 20 (Theory)
Exam Duration: 03 Hours (Theory)	Semester-End Examination Marks: 80 (Theory)

Course Outcomes (COs)	
CO1	Analyze the frequency of vibration of a stretched string, understand harmonics and longitudinal vibrations in rods
CO2	Explain and derive the theory of Fresnel's biprism, Newton's rings, thin film interference, differentiate between Fresnel and Fraunhofer diffraction and explain the principle of rectilinear propagation of light using wave theory
CO3	Explain the working of retarding plates and analyze the production and analysis of linearly, circularly, and elliptically polarized light.

Unit 1

Waves: Plane and spherical Waves. Longitudinal and transverse waves. Characteristics of wave motion. Differential equation of wave motion. Relation between amplitude and intensity. Group and phase velocity, relation between group and phase velocity. Expression for velocity of progressive waves in a medium-Newton's formula, Laplace's correction. Expression for frequency of vibration of a stretched string – harmonics, longitudinal vibrations in a rod. Kundt's tube experiment. Numerical problems.

[8 hours]

Simple harmonic motion: Superposition of two perpendicular simple harmonic motions of equal frequency- Lissajous' figures. Equation for damped vibrations. Forced vibration- solution in exponential form. Resonance-expression for amplitude and phase at resonance. Numerical problems.

[5 hours]

Analysis of complex waves: Fourier theorem. Evaluation of Fourier co-efficient. Analysis of square wave and saw tooth wave.

[3hours]

Unit 2

Acoustics: Noise and music, limits of human audibility, intensity and loudness, bel and decibel, the acoustics of halls, absorption coefficient, Reverberation and reverberation time, Sabine's reverberation formula (derivation), Factors affecting acoustics in buildings, requisites for good acoustics. Ultrasonics: properties, production of ultrasonic waves- piezoelectric method, detection of ultrasonic waves. Determination of velocity of ultrasonic waves in liquids-acoustic grating. Applications of Ultrasonics. Numerical problems.

[8 hours]

Velocity of light: Kerr cell, Kerr effect. Determination of velocity of light by Kerr cell method. Numerical problems. [2 hours]

Interference: Review of basic concepts, coherent sources. Interference by division of wave front – theory of Fresnel’s biprism, Interference by division of amplitude-thin films of uniform thickness – anti reflective coatings, Newton’s rings. Interference at a wedge. Michelson’s interferometer - Measurement of λ and $d\lambda$. Numerical problems. [6 hours]

Unit 3

Diffraction: Fresnel and Fraunhofer diffraction. Explanation of rectilinear propagation of light. Theory of the zone plate. Comparison with a convex lens. Fresnel diffraction at a straight edge. Fraunhofer diffraction at a single slit. Transmission grating-theory for the case of normal incidence, Resolving power and dispersive power of plane grating. Numerical problems. [8 hours]

Polarization: Double refraction in uniaxial crystals. Huygen’s theory. Positive and negative crystal. Principal refractive indices. Huygen’s constructions of O and E wave fronts in a uniaxial crystal – (i) optic axis in the plane of incidence and parallel to the crystal surface at normal incidence, (ii) optic axis in the plane of incidence and perpendicular to the crystal surface at normal incidence. Retarding plates. Production and analysis of linearly, Circularly and elliptically polarized light. Optical activity, Fresnel’s theory of rotatory polarization. Interference of polarized light-expression for resultant intensity, calculation of thickness of wedge-shaped crystal plate (negative and positive), calculation of fringe width. Numerical problems. [8 hours]

Learning resources:

1. Halliday, D., Resnick, R., & Walker, J. (2014). *Fundamentals of physics* (10th ed.). Wiley. United States.
2. Subrahmanyam, N., & Lal, B. (2018). *Waves and oscillations* (2nd ed.). Vikas Publishing House. India.
3. Mittal, P. K., & Anand, J. D. (2007). *A textbook of sound*. Har-Anand Publications. India.
4. Kalsi, H. S. (2012). *Electronic instrumentation* (3rd ed.). McGraw-Hill Education India. India.
5. Bhattacharya, A. B., & Bhattacharya, R. (2020). *Undergraduate physics: Volume I. The Info Library*. India.
6. Subrahmanyam, N., Lal, B., & Avadhanulu, M. N. (2006). *A textbook of optics* (24th rev. ed.). S. Chand & Company Ltd. India.
7. Khanna, D. R., Gulati, H. R., & Kumar, A. (2021). *Fundamentals of optics* (15th ed.). R. Chand & Co. India.
8. Murugesan. R., & Sivaprasath, K. (2010). *Optics and spectroscopy* (17th rev. ed.). S. Chand & Company Ltd. India.

Course: B Sc. Physics, Semester -3

Course Code: GPH 313	Course Title: SC(1) - Lasers and Fiber optics (Theory)
Course Credits: 02 (2:0:0)	Hours of Teaching/Week: 02 (Theory)
Total Contact Hours: 32 Hours (Theory)	Formative Assessment Marks: 10 (Theory)
Exam Duration: 02 Hours (Theory)	Semester-End Examination Marks: 40 (Theory)

Course Outcomes (COs)	
CO1	Explain the properties of laser radiation including coherence, modes, and line broadening. Analyze laser operation including pumping mechanisms, gain, and optical resonators. Explain the construction and working of different types of lasers and semiconductor laser diodes
CO2	Apply principles of waveguides and optical fibers to analyze light propagation and numerical aperture, Analyze dispersion, losses, and performance parameters in optical fiber communication systems.

Unit 1

Laser basics: Coherence properties of laser light, temporal coherence, monochromaticity, spatial coherence, directionality, line width, brightness, divergence, line shape broadening, focusing properties of laser radiation, laser modes, axial and transverse, mode selection, single mode operation, selection of laser emission line. Numerical problems.

Laser oscillator: Pumping schemes, gain, threshold conditions; optical resonators. Numerical problems.

Types of lasers: Construction and principles of working of Nd-YAG, CO₂ and dye lasers and semiconductor laser.

Laser diodes: Lasing conditions and gain in a semiconductor, selective amplification and coherence, materials for laser diodes, quantum well lasers, surface emitting lasers, characterization and modulation of lasers. Numerical problems. [16 Hours]

Unit 2

Fiber optics and dielectric wave guides: Waveguide – slab wave guide, modes, V number, modal material and waveguide dispersions. Numerical problems.

Optical fiber: Types, functions, light propagation, optical power, velocity of propagation, critical angle, acceptance angle, numerical aperture, mode of propagation. Numerical problems.

Index profile: Single mode step-index optical fiber, multimode step-index fiber, graded index fiber; advantages and disadvantages. Numerical problems.

Energy losses in optical fiber: Bit rate, dispersion, optical fiber communication, and optical bandwidth, absorption and scattering, opto coupler. [16 Hours]

Learning resources:

1. Kinsler, L. E., Frey, A. R., Coppens, A. B., & Sanders, J. V. (2000). *Fundamentals of acoustics* (4th ed.). Wiley. United States.
2. Wilson, J., & Hawkes, J. F. B. (1998). *Optoelectronics: An Introduction* (3rd ed.). Prentice Hall. United Kingdom.
3. Singh, J. (1996). *Optoelectronics: An introduction to materials and devices*. McGraw-Hill. United States.
4. Bhattacharya, P. (1997). *Semiconductor optoelectronic devices* (2nd ed.). Prentice Hall. United States.
5. Nambiar, K. R. (2004). *Lasers: Principles, types and applications*. New Age International. India.
6. Ghatak, A. K., & Thyagarajan, K. (2017). *An introduction to fiber optics* (Reprint ed.). Cambridge University Press. India.

Course: B Sc. Physics, Semester -3

Course Code: GPH 302	Course Title: HC(1) – LAB (Practical)
Course Credits: 02 (0:0:2)	Hours of Teaching/Week: 04 (Practical)
Total Contact Hours: 64 Hours (Practical)	Formative Assessment Marks: 10 (Practical)
Exam Duration: 03 Hours (Practical)	Semester-End Examination Marks: 40 (Practical)

LIST OF EXPERIMENTS

Any EIGHT of the following experiments:

1. Kundt's tube experiment – velocity of sound in air at room temperature.
2. Study of stationary wave on a stretched string – Determination of speed of the transverse waves over the Sonometer wire.
3. Newton's rings – Determination of radius of curvature of a plano convex lens.
4. Air wedge – Determination of thickness of a thin paper/diameter of a thin wire.
5. Helmholtz resonator – Determination of frequency of a tuning fork.
6. Diffraction grating – Determination of grating constant and wave length (minimum deviation method).
7. Diffraction at a straight wire –Determination of diameter of a wire.
8. Cauchy's constants using Spectrometer.
9. Polarization – Determination of unknown concentration of sugar solution by graphical method using a polarimeter.
10. Determination of refractive indices of calcite and quartz crystal using spectrometer and sodium light.
11. To determine dispersive power and resolving power of a plane diffraction grating.
12. To determine wavelength of sodium light using Fresnel biprism.

Course: B.Sc. Physics, Semester - 4

Course Code: GPH 401	Course Title: HC(4)- Electricity and Electromagnetism (Theory)
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 (Theory)
Total Contact Hours: 48 Hours (Theory)	Formative Assessment Marks: 20 (Theory)
Exam Duration: 03 Hours (Theory)	Semester-End Examination Marks: 80 (Theory)

Course Outcomes (COs)	
CO1	Describe the construction, working principle, and applications of the attracted disc electrometer and galvanometers, Apply KVL and KCL to analyze simple electrical circuits
CO2	Explain and distinguish between series and parallel resonance, and determine half-power frequencies, bandwidth, and quality factor
CO3	Derive and interpret Maxwell's equations in free space and isotropic dielectrics, and explain their physical significance.

Unit 1

Electrostatics: Mechanical force and electric pressure on a charged surface. The path traced by a charged particle in an electric field. The attracted disc electrometer-construction, theory and applications. Numerical problems. **[4 hours]**

Galvanometers: Moving coil galvanometer-construction, theory, damping correction, current sensitivity and charge sensitivity. Helmholtz galvanometer – Theory. Numerical Problems. **[4 hours]**

Thermo-electricity: Seebeck, Peltier and Thomson effects. Thermodynamic theory of thermoelectric effect. The law of intermediate metals and the law of intermediate temperatures. Thermocouple. Numerical Problems. **[4 hours]**

Network Theorems: Mesh analysis circuits using Kirchhoff's voltage law and Kirchhoff's current law. Statement and proof of Thevenin's theorem and Norton's theorem. Numerical problems. **[4 hours]**

Unit 2

Alternating current: R.M.S. values. Response of LR, CR and LCR circuits to sinusoidal voltages (discussion using the 'j' symbols). Series and parallel resonance-half-power frequencies, band-width and Q-factor. Power in electrical circuits- power factor. Maximum power transfer theorem for ac circuits. Numerical problems. **[8 hours]**

Applications of ac circuits: ac bridges – Anderson’s bridge, Maxwell’s bridge, de-Sauty bridge, Robinson’s bridge. Numerical problems. [4 hours]

Electrical measurement: CRO–construction & working. Measurement of voltage, frequency and phase using a CRO. [2 hours]

Filters: High-pass and low-pass filters with RC combination. Expression for cut-off frequency. Numerical problems. [2 hours]

Unit 3

Electromagnetism: Scalar and vector fields. The gradient of a scalar field. The divergence and curl of a vector field. The physical significance of gradient, divergence and curl. statement and physical significance of Gauss and Stokes theorems. Numerical Problems. [4 hours]

Electromagnetic theory: Review of basic concepts. Equation of continuity, Maxwell’s modification of Ampere circuital law- displacement current. Setting up of Maxwell’s field equations. Maxwell’s field equations in free space, Poynting vector (definition). Wave equation for the field vectors in free space and in isotropic dielectric. Energy density of electromagnetic wave and Poynting Theorem (Proof). Plane monochromatic electromagnetic waves – transverse nature. Helmholtz equation. Characteristic impedance of free space. Numerical Problems. [10 hours]

Production of Electromagnetic waves: Accelerated charges and Oscillating dipole. Hertz’s experiment. Radiation loss - Synchrotron radiation. [2 hours]

Learning resources:

1. Halliday, D., Resnick, R., & Walker, J. (2014). *Fundamentals of physics* (10th ed.). Wiley. United States.
2. Laud, B. B. (2010). *Electromagnetics* (2nd ed.). New Age International. India.
3. Griffiths, D. J. (2023). *Introduction to electrodynamics* (5th ed.). Cambridge University Press. United Kingdom.
4. Hayt, W. H., & Buck, J. A. (2018). *Engineering electromagnetics* (9th ed.). McGraw-Hill Education. United States.
5. Mehta, V. K., & Mehta, R. (2020). *Principles of electronics* (12th ed., Low Priced Student Edition). S. Chand & Company Pvt. Ltd. India.
6. Subrahmanyam, N., & Lal, B. (1999). *Electricity and magnetism* (9th ed.). Ratan Prakashan Mandir. India.
7. Bhattacharya, A. B., & Bhattacharya, R. (2008). *Undergraduate physics: Volume II*. New Central Book Agency, India.
8. Vasudeva, D. N. (2022). *Fundamentals of magnetism and electricity*. S. Chand & Company, India.
9. Tewari, K. K. (2007). *Electricity and magnetism* (Rev. ed.). S. Chand and Company, India.
10. Brij Lal, & Subrahmanyam, N. (2016). *A textbook of electricity and magnetism* (19th ed.). Ratan Prakashan Mandir, India.

Course: B Sc. Physics, Semester - 4

Course Code: GPH 413	Course Title: SC(2) - Communication systems (Theory)
Course Credits: 02 (2:0:0)	Hours of Teaching/Week: 02 (Theory)
Total Contact Hours: 32 Hours (Theory)	Formative Assessment Marks: 10 (Theory)
Exam Duration: 02 Hours (Theory)	Semester-End Examination Marks: 40 (Theory)

Course Outcomes (COs)	
CO1	Explain the concepts of signal, noise, and signal-to-noise ratio in communication systems. Analyze the working principles of microphones, loudspeakers, and electro-acoustic transducers.
CO2	Apply modulation techniques and analyze amplitude modulation and its parameters. Analyze radio communication systems including ionospheric propagation and super heterodyne receivers. Explain demodulation techniques, amplifiers, and modern communication systems such as microwave and satellite communication.

Unit 1

Signal & Noise: Distinction between signal and noise. Signal to noise ratio and its importance in communication.

Electro-acoustic transducers: Microphone types- Carbon, Moving coil, condenser and ribbon microphones, sensitivity, directivity, phasing and testing.

Loudspeakers: Direct radiator dynamic type, expression for efficiency, radiated output power, horn loudspeaker, cutoff frequency, measurement of acoustic power and pressure response of a speaker. Numerical problems. **[16 Hours]**

Unit 2

Radio communication: Role of ionosphere in radio communication, need for modulation, amplitude modulation, modulation index, side bands, band width and the power of AM wave, frequency modulation (definition), difference between AM and FM, block diagram of super heterodyne AM receiver.

Demodulation: Detection and demodulation of FM signal using Foster Seeley discrimination.

Amplifiers used in communication: Classes and types of amplifiers, AF, IF and RF amplifier.

Other Communication Systems: Principles of Microwave and satellite communication, wire telephone, simplex and duplex systems. **[16 Hours]**

Learning resources:

1. Dennis Roddy and John Coolen, J. (2008). *Electronic communications (4th ed.)*. Pearson Education. New Delhi, India.
2. Wayne Tomaal, (2004). *Electronic communications systems: Fundamentals through advanced (5th ed.)*. Pearson Education. New Delhi, India.
3. Kennedy, G., Davis, B., & Prasanna, S. R. M. (2011). *Kennedy's electronic communication systems (5th ed.)*. McGraw-Hill Education. India.
4. Desphande Etal. *Communication electronics Tata Mc graw Hill, New Delhi, India*.

Course: B Sc. Physics, Semester - 4

Course Code: GPH 402	Course Title: HC(1) – LAB (Practical)
Course Credits: 02 (0:0:2)	Hours of Teaching/Week: 04 (Practical)
Total Contact Hours: 64 Hours (Practical)	Formative Assessment Marks: 10 (Practical)
Exam Duration: 03 Hours (Practical)	Semester-End Examination Marks: 40 (Practical)

LIST OF EXPERIMENTS

Any EIGHT of the following experiments:

1. Anderson's Bridge – Determination of the self-inductance of the coil.
2. Maxwell's Bridge – Determination of the self-inductance of the coil.
3. De-Sauty bridge – Verification of laws of combination of capacitances.
4. Variation of thermo-emf across two junctions of a thermocouple with temperature.
5. High resistance by leakage.
6. B_H using Helmholtz double coil galvanometer and potentiometer.
7. Capacity of a condenser using a BG.
8. LCR series circuit – Determination of L & Q factor.
9. Voltage triangle – Measurement of phase difference.
10. RC Low and High pass filters – Determination of the cut-off frequency.
11. LCR parallel circuit – Determination of L & Q factor.
12. To study the variation of X_C with f and determination of C.
13. CRO- determination of voltage and frequency.

Course: B Sc. Physics, Semester - 4

Course Code: GPH 414 (IV Semester) GPH 512 (V Semester)	Course Title: SC(2) – Compulsory/Practical skill (Practical)
Course Credits: 02 (0:0:2)	Hours of Teaching/Week: 04 (Practical)
Total Contact Hours: 64 Hours (Practical)	Formative Assessment Marks: 10 (Practical)
Exam Duration: 03 Hours (Practical)	Semester-End Examination Marks: 40 (Practical)

LIST OF EXPERIMENTS

Any EIGHT of the following experiments:

1. To determine the Wavelength of LASER light using plane diffraction grating
2. Diffraction of LASER by thin wire.
3. Divergence of LASER beam
4. Diffraction hallows experiment to determine the size the particle
5. Measurement of Numerical Aperture of optical fiber.
6. To determine refractive index of the material of a prism
7. Opto-coupler experiment.
8. Verification of inverse square law using Photodiode.
9. Attenuation coefficient of optical fiber
10. PN junction diode characteristics.
11. Zener diode characteristics
12. Zener diode as voltage regulator.
13. Young's Modulus by Cornu's method
14. LED Characteristics – determine wavelength of light emitted (for 3 colours)
15. Spectral characteristics and Areal characteristics of Solar Cell.
16. To determine the responsivity and quantum efficiency of Photodiode.

Note: This paper may be offered during 4th or 5th or 6th semester.

Course: B.Sc. Physics, Semester – 5

Course Code: GPH 501	Course Title: HC(4)- Classical Mechanics, Quantum Mechanics and Atomic Spectroscopy (Theory)
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 (Theory)
Total Contact Hours: 48 Hours (Theory)	Formative Assessment Marks: 20 (Theory)
Exam Duration: 03 Hours (Theory)	Semester-End Examination Marks: 80 (Theory)

Course Outcomes (COs)	
CO1	Explain the concepts of Lagrangian and Hamiltonian mechanics, including constraints and equations of motion. Apply analytical mechanics to solve physical systems such as simple pendulum and Atwood's machine
CO2	Analyse quantum mechanical principles including wave-particle duality, uncertainty principle, and Schrödinger equation. Apply the Schrödinger equation to simple systems and interpret eigenvalues, eigen functions, and zero-point energy.
CO3	Evaluate atomic models, electron properties, and spectral phenomena such as Zeeman and Stark effects.

Unit 1

Lagrangian formulation: Constraints, Holonomic constraints, non-holonomic constraints, Scleronomic and Rheonomic constraints. Generalized coordinates, degrees of freedom, Principle of virtual work, D'Alembert's principle, Lagrange equations. Newton's equation of motion from Lagrange equations, simple pendulum, Atwood's machine, numerical problems.

Variational principle: Hamilton's principle, Deduction of Hamilton's principle, Lagrange's equation of motion from Hamilton's principle.

Hamiltonian Mechanics: The Hamiltonian of a system, Hamilton's equations of motion, Hamilton's equations from variational principle, Canonical transformations, Poisson Brackets, fundamental properties and equations of motion in Poisson Brackets.

[16 Hours]

Unit 2

Introduction to Quantum Mechanics: Matter waves, de Broglie hypothesis of matter waves, Group and Phase velocities and relation between them, Experimental evidence for matter waves: Davisson- Germer experiment, G.P Thomson's experiment and its significance, numerical problems.

Elementary proof of Heisenberg's relation between momentum and position, energy and time, angular momentum and angular position, illustration of uncertainty principle by Gamma ray microscope thought experiment. Consequence of the uncertainty relation (electron cannot exist in nucleus).

Wave function and its admissibility, Born's interpretation of the wave function, Normalization and orthogonality of wave functions, Schrödinger time dependent and independent equations. Eigen values and Eigen functions, Application of Schrödinger equation for i) Free particle in one dimensional box of infinite height, ii) Simple harmonic oscillator (Qualitative), Concept of zero - point energy, numerical problems.

[16 Hours]

Unit 3

Electron: Properties of electron, determination of e/m of an electron by Thomson method, determination of the charge of the electron by Millikan's oil-drop method, numerical problems.

Atomic spectra: A qualitative account of Sommerfeld relativistic atomic model, excitation and ionization potentials – Frank - Hertz experiment, vector model of an atom - electron spin and space quantization, quantum numbers associated with vector atom model. Magnetic moment of an electron due to its orbital motion, evaluation of Bohr magneton, Stern-Gerlach experiment with necessary theory. Spin-orbit interaction and the fine structure of spectral lines. Pauli's exclusion principle, electronic configuration of atoms, LS and JJ coupling for multi electron system, numerical problems.

Zeeman effect: Zeeman effect and its types, experimental study of normal Zeeman effect, classical theory of normal Zeeman effect (expression for Zeeman effect). Stark effect and Paschen back effect (qualitative), numerical problems.

[16 Hours]

Learning resources:

1. *Classical Mechanics*, H.Goldstein, C.P. Poole, J.L. Safko, 3rd Edn. 2002, Pearson Education.
2. *Classical Mechanics*, G. Aruldas, 2008, Prentice-Hall of India Private limited, New Delhi.
3. *Classical Mechanics*, Takwale and Puranik-1989, Tata McGraw Hill, new Delhi
4. *Concepts of Modern Physics*, Arthur Beiser, McGraw-Hill, 2009.9
5. *Quantum Physics*, Berkeley Physics Course Vol. 4. E.H. Wichman, Tata McGraw-Hill Co., 2008.
6. *P M Mathews and K Venkatesan, A Textbook of Quantum Mechanics*, Tata McGraw Hill publication, ISBN: 9780070146174.
7. *Ajoy Ghatak, S. Lokanathan, Quantum Mechanics: Theory and Applications*, Springer Publication, ISBN 978-1-4020-2130-5.
8. *Modern Physics*; R. Murugesan & K. Sivaprasath; S. Chand Publishing.
9. *G Aruldas, Quantum Mechanics*, Phi Learning Private Ltd., ISBN: 97881203363.

10. Gupta, Kumar & Sharma, *Quantum Mechanics*, Jai Prakash Nath Publications.
11. *Physics for Degree Students B.Sc., Third Year*, C.L. Arora and P.S. Hemne, 1st edition, S. Chand & Company Pvt. Ltd., 2014.
12. *Modern Physics*, R. Murugesan, Kiruthiga Sivaprakash, Revised Edition, 2009, S. Chand & Company Ltd.
13. *Atomic & Molecular spectra: Laser*, Raj Kumar, Revised Edition, 2008, Kedar Nath Ram Nath Publishers, Meerut.
14. *Atomic Physics*, S.N. Ghoshal, Revised Edition, 2013, S. Chand & Company Ltd.
15. *Concepts of Atomic Physics*, S.P. Kuila, First Edition, 2018, New Central Book Agency (P) Ltd.
16. *Classical Mechanics*, Dr. J.C. Upadhyaya, Himalaya publishing house.
17. *Concepts of Modern Physics*, Arthur Beiser, Seventh Edition, 2015, Shobhit Mahajan, S. Rai Choudhury, 2002, McGraw-Hill.

Course: B.Sc. Physics, Semester - 5

Course Code: GPH 502	Course Title: HC(6)- Nuclear and Particle physics (Theory)
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 (Theory)
Total Contact Hours: 48 Hours (Theory)	Formative Assessment Marks: 20 (Theory)
Exam Duration: 03 Hours (Theory)	Semester-End Examination Marks: 80 (Theory)

Course Outcomes (COs)	
CO1	Explain nuclear properties, binding energy, radioactivity, and fundamental nuclear forces. Apply principles of radioactive decay and nuclear reactions to solve numerical problems.
CO2	Analyze the working of radiation detectors, particle accelerators, and interaction of radiation with matter. Evaluate nuclear models, mass spectrographs, and their role in understanding nuclear structure.
CO3	Analyze nuclear fission, fusion, cosmic rays, and elementary particles in the context of energy and fundamental interactions.

Unit 1

Properties of Nuclei: Constituents of nucleus and their intrinsic properties, Nuclear mass, density, charge and size. Binding energy curve and its significance. Nuclear force and its characteristics, numerical problems.

Radioactivity decay: Radioactivity, half-life, mean life, relation between half-life and mean life, theory of successive disintegration, (condition for secular and transient equilibrium), Alpha decay, expression for alpha disintegration energy, experimental determination of range and energy of alpha particle, Geiger-Nutt all law, β -decay (β^+ and β^- decay), electron capture, neutrino hypothesis, Gamma decay, internal conversion, nuclear isomerism and auger transition, numerical problems.

Detectors: GM Counter (construction, working and its characteristics), Basic principle of Scintillation detector, construction and working of photo-multiplier tube (PMT), Principle of semiconductor detector, numerical problems.

[16 Hours]

Unit 2

Accelerators: Construction, Working and Theory of LINAC, Cyclotron and Betatron, Numerical problems.

Interaction of Nuclear radiation with matter: γ -ray interaction through matter, photoelectric effect, Compton scattering, pair-production, energy loss due to ionization

(qualitative description of Bethe Bloch formula), energy loss of electrons introduction of Cerenkov radiation.

Mass spectrographs: Construction, Working and Theory of Dempster's and Aston's mass spectrograph. Numerical problems.

Nuclear Models: Liquid-drop model, Semi-empirical mass formula, Salient features of Shell model and magic numbers. Numerical problems.

[16Hours]

Unit 3

Nuclear reactions: Q-values Threshold energy of an endoergic reaction. Reactions induced by proton, deuteron and α -particles, numerical problems.

Nuclear Fission & Fusion: Estimation of the fission energy on the basis of the liquid-drop model, four-factor formula, nuclear reactors - Pressurized Heavy Water Reactor, Thermo-nuclear reactions-sources of stellar energy (C-N cycle and P-P cycle), Electric and magnetic confinement of plasma-Tokamak, nuclear waste management, radiation dose, numerical problems.

Cosmic Rays: Discovery, Primary and secondary cosmic rays- their composition, Cosmic ray showers, Origin of cosmic rays, elements of Cascade theory, Geomagnetic, Latitude and Altitude effects.

Elementary particles: Particles and anti- particles. Classification of particles Mention of the basic interactions in nature and conservation laws a qualitative introduction to quarks (quark model).

[16 Hours]

Learning resources:

1. *Concepts of Nuclear physics* by Bernard L. Cohen. (Tata McGraw Hill, 1998).
2. *Introduction to the physics of Nuclei & particles*, R.A. Dunlap. Thomson Asia, 2004.
3. *Introduction to High Energy Physics*, D.H. Perkins, Cambridge Univ. Press
4. *Basic ideas and concepts in Nuclear Physics - An Introductory Approach* by K. Heyde (Institute of Physics (IOP) Publishing, 2004).
5. *Radiation detection and measurement*, G.F. Knoll, John Wiley & Sons, 2000.
6. *Physics and Engineering of Radiation Detection*, Syed Naeem Ahmed (Academic Press, Elsevier, 2007).
7. *Atomic and Molecular spectra and Lasers*: Saxena A K, 1stEdn.,CBS publishers and distributors (2009)
8. *Nuclear Physics: Kaplan I*, 2ndEdn., Narosa Publishing House(2002)'
9. *Fundamentals of Modern physics*: Duggal and Chabra, 8th edition S. Chand Publishing. 1997
10. *Nuclear physics*: D C Tayal, 5th edition Himalaya Publishing house 2008
11. *Modern Physics*, R. Murugesan and K. Shivaprasath S; Chand Publishing, 2025.

Course: B.Sc. Physics, Semester - 5

Course Code: GPH 503	Course Title: HC(5) – LAB (Practical)
Course Credits: 02 (0:0:2)	Hours of Teaching/Week: 04 (Practical)
Total Contact Hours: 64 Hours (Practical)	Formative Assessment Marks: 10 (Practical)
Exam Duration: 03 Hours (Practical)	Semester-End Examination Marks: 40 (Practical)

LIST OF EXPERIMENTS

Any EIGHT of the following Experiments Practical Content

1. Determination of 'g', the acceleration due to gravity, at a given place, by simple pendulum (L v/s T^2).
2. Determination of acceleration of gravity by Flywheel.
3. Determination of acceleration due to gravity by Stoke's method
4. To study the characteristics of solar cell- To determine FF and efficiency.
5. Spectral characteristics and Areal characteristics of Solar Cell.
6. Determination of wavelength of laser using diffraction grating.
7. To determine the diameter of the given wire by LASER diffraction.
8. To determine the ionization potential of Xenon.
9. Construct and verify Cockcroft-Walton voltage multiplier.
10. To determine specific charge (e/m) of an electron by Thomson method.
11. Study the characteristics of Geiger-Muller Tube.
12. Verification of inverse square law for gamma rays using GM counter.
13. Determination of range of electrons in Aluminum using GM Counter.
14. Absorption coefficient of beta rays in Aluminum foil using GM counter.
15. Attenuation of gamma rays in lead foil using Cs-137 source and GM counter.

Course: B.Sc. Physics, Semester - 6

Course Code: GPH 601	Course Title: HC(7)- Relativity and Solid state physics (Theory)
Course Credits: 03 (3:0:0)	Hours of Teaching/Week: 03 (Theory)
Total Contact Hours: 48 Hours (Theory)	Formative Assessment Marks: 20 (Theory)
Exam Duration: 03 Hours (Theory)	Semester-End Examination Marks: 80 (Theory)

Course Outcomes (COs)	
CO1	Explain the fundamental concepts of special theory of relativity including Lorentz transformations, time dilation, and mass–energy relation. Apply principles of superconductivity.
CO2	Free electron theory to analyze electrical and thermal properties of materials. Analyze dielectric properties, polarization mechanisms, and related applications such as piezoelectric effect and ultrasonic wave generation.
CO3	Apply concepts of crystal structure and X-ray physics including Bragg’s law, Miller indices, and Compton effect to solve problems. Evaluate magnetic properties and specific heat theories of solids using classical and quantum models.

Unit 1

Special theory of relativity: Michelson–Morley experiment and discussion of negative results, basic postulates of relativity, Lorentz transformation, Lorentz–Fitz Gerald length contraction, Einstein time dilation, velocity addition theorem, relativity of simultaneity, variation of mass with velocity, Einstein mass–energy relation, energy–momentum relation. Numerical problems.

Superconductivity: Elementary Ideas, Isotopic Effect, Meissner Effect, Persistent Current, Critical Magnetic Field, Type I and Type II Superconductors, BCS Theory (Qualitative), applications. Numerical problems. **[16 Hours]**

Unit 2

Free electron theory of metals: Classical free electron model (Drude–Lorentz model), expression for electrical and thermal conductivity, Wiedemann–Franz law, failure of classical free electron theory. Quantum free electron theory (Assumptions), statement of number of available energy states between E and $E+dE$, Fermi energy and Fermi level, expression for Fermi energy at absolute zero and $\langle E \rangle = \frac{3}{5} E_{F_0}$, Numerical problems.

Dielectrics: Dielectric material and its properties, static dielectric constant, polarizability (electronic, ionic and orientational polarizability – qualitative), calculation of Lorentz field (derivation), Clausius–Masotti relation, dielectric loss, piezoelectric effect, application of Piezoelectric effect (Production of Ultrasonic Waves), Methods of determining dielectric constant of solids and liquids. Numerical problems. **[16Hours]**

Unit 3

Crystal structure and X-rays: Crystal, space lattice, translational vectors, basis of crystal structure (definition only), primitive and non-primitive cells, a brief mention of crystal systems, Miller indices, expression for inter planar spacing, continuous X-ray spectra, Duane–Hunt limit, characteristic X-ray spectra, Moseley’s law and its significance, Bragg’s law, Bragg’s spectrometer (construction and working), Compton effect – expression for Compton shift, numerical problems.

Magnetism: Magnetic intensity (H), magnetic induction (B), magnetization (M), permeability (μ), susceptibility (χ), classification of magnetic materials, classical theory of dia and paramagnetism (Langevin theory), Curie’s Law, Curie–Weiss Law, ferromagnetic domain (qualitative), hysteresis curve (B–H curve) and its significance, hard and soft magnetic materials, numerical problems.

Specific heat of Solids: Dulong and Petit’s Law (statement only) and its limitations, Einstein’s theory of specific heat, Debye’s theory of specific heat, numerical problems.

[16 Hours]

Learning resources:

1. *Modern Physics*, R. Murugesan and K. Shivaprasath S; Chand Publishing
2. *Gravity: An Introduction to Einstein’s General Relativity*; James B. Hartle; Cambridge University Press
3. *A First Course in General Relativity*; Bernard Schutz; Cambridge University Press
4. *Introduction to General Relativity: A Course for Undergraduate Students of Physics*; James B. Hartle; Cambridge University Press
5. *Feynman Lectures Volume 1 – Chapters on Special Relativity*; Addison-Wesley
6. *Solid State Physics*; S. O. Pillai; New Age International Publishers
7. *Solid State Physics (Theory, Applications and Problems)*; S. L. Kakani & C. Hemarajani; Sultan Chand & Sons
8. *Solid State Physics*; Adrianus J. Dekker; Macmillan Publishers / Red Globe Press (Palgrave Macmillan)
9. *Introduction to Solid State Physics*; Charles Kittel; John Wiley & Sons;
10. *Solid State Physics*; Vijay Kumar & Bhupinder K. Gupta; S. Chand Publishing
11. *Solid State Physics*; P. K. Palanisamy; Scitech Publications
12. *Solid State Physics*; S. L. Kakani & C. Hemarajani; Sultan Chand & Sons

Course: B.Sc. Physics, Semester - 6

Course Code: GPH 602	Course Title: HC(8)- Astrophysics and Molecular spectroscopy (Theory)
Course Credits: 02 (2:0:0)	Hours of Teaching/Week: 02 (Theory)
Total Contact Hours: 32 Hours (Theory)	Formative Assessment Marks: 10 (Theory)
Exam Duration: 02 Hours (Theory)	Semester-End Examination Marks: 40 (Theory)

Course Outcomes (COs)	
CO1	Explain stellar properties, magnitudes, distances, and basic astrophysical parameters. Analyze stellar evolution processes including H–R diagram, energy generation, and end stages of stars. Apply concepts of stellar pressure, temperature, and mass–luminosity relation to solve numerical problems.
CO2	Explain molecular spectroscopy concepts including rotational, vibrational, and Raman spectra. Analyze spectroscopic phenomena such as Raman effect, fluorescence, and phosphorescence with their applications.

Unit 1

Stellar Properties: Introduction, Stellar parallax, Units of stellar distance, Definition of absolute magnitude, Apparent brightness, Apparent magnitude, Absolute magnitude, Bolometric magnitude, Expression for radius of a star, numerical problems.

Stellar Classification and Evolution: Hertzsprung–Russell (H–R) diagram, Gravitational P.E. of a star, Virial theorem (statement), Birth of stars, Source of stellar energy (P–P cycle, C–N cycle), Red giant phase, White dwarf, Chandrasekhar mass limit, Supernova, Neutron star, Maximum mass of neutron star, Pulsars, Black holes, numerical problems.

Stellar pressure and temperature: Pressure gradient inside a star, Reformulating ideal gas equation, Core pressure of a star, Core temperature of a star, Average temperature of a star, Surface temperature and color of a star, Photon diffusion time, Mass–luminosity relation, Shift for main sequence of stars, Expression for lifetime of a star, numerical problems.

[16 hours]

Unit 2

Molecular Spectroscopy: Types of molecules based on their moment of inertia, types of molecular motions and energies, Salient features of molecular spectra, theory of pure rotational spectra, qualitative discussion on non-rigid rotator and centrifugal distortion, theory of vibrating molecule as simple harmonic oscillator (energy levels and spectra), theory of rotational-vibrational spectra of molecule, Fluorescence and Phosphorescence, Raman Effect, Stokes and anti-stokes lines, quantum theory of Raman Effect, experimental study of Raman effect, applications of Raman effect, numerical problems.

[16 hours]

Learning resources:

1. *An Introduction to Astrophysics*; Baidyanath Basu, Tanuka Chattopadhyay, Sudhindra Nath Biswas; PHI Learning
2. *The Structure of the Universe*; Jayant Vishnu Narlikar; Oxford University Press
3. *Astrophysics: A New Approach*; S. K. Saha; Narosa Publishing House
4. *What Are the Stars?*; Ganesan Srinivasan; Universities Press
5. *Introduction to Cosmology*; Jayant Vishnu Narlikar; Jones and Bartlett Publishers
6. *An Introduction to Modern Astrophysics*; Bradley W. Carroll & Dale A. Ostlie; Cambridge University Press
7. *Molecular Structure and Spectroscopy*; G. Aruldas; Prentice Hall of India
8. *Spectroscopy (Atomic and Molecular)*; Gurdeep R. Chatwal & Sham K. Anand; Himalaya Publishing House
9. *Molecular Spectroscopy*; V. K. Jain; Narosa Publishing House
10. *Fundamentals of Molecular Spectroscopy*; C. N. Banwell & E. M. Mc Cash; McGraw Hill Education

Course: B.Sc. Physics, Semester - 6

Course Code: GPH 603	Course Title: HC(6) – LAB (Practical)
Course Credits: 02 (0:0:2)	Hours of Teaching/Week: 04 (Practical)
Total Contact Hours: 64 Hours (Practical)	Formative Assessment Marks: 10 (Practical)
Exam Duration: 03 Hours (Practical)	Semester-End Examination Marks: 40 (Practical)

LIST OF EXPERIMENTS

Any **Eight** of following Experiments

1. To determine Planck's constant using Photocell.
2. To determine Planck's constant using LED.
3. Hall Effect in semiconductor: determination of mobility, hall coefficient.
4. Energy gap of semiconductor.
5. Temperature coefficient of resistance of a Thermistor.
6. Fermi Energy of Copper.
7. To determine Boltzmann constant using PN junction.
8. To study the variation of a resistance of semiconductor using LDR
9. Analysis of powder X-ray diffraction spectra (calculation of lattice parameter).
10. Specific Heat of Solid by Electrical Method
11. Determination of Dielectric Constant of polar liquid/Solid.
12. Determination of particle size from XRD pattern using Debye-Scherrer formula.
13. Determination of particle size from XRD pattern using Williamson Hall Plot.
14. Analysis of single crystal X-ray diffraction spectra (I v/s 2θ).
16. Analysis of Stellar Spectra.
17. Analysis of HBr Spectra.

I, II III, IV, V & VI Semester Physics (Major – DSC)
Question Paper Pattern

Max Marks : 80

Time : 3 Hours

Part –A

Answer any TWO of the following

2 X 10 =20

(3 Long answer questions with Two/ three sub questions. Each questions carrying 10 marks)

Part –B

Answer any TWO of the following

2 X 10 =20

(3 Long answer questions with Two/ three sub questions. Each questions carrying 10 marks)

Part –C

Answer any TWO of the following

2 X 10 =20

(3 Long answer questions with Two/ three sub questions. Each questions carrying 10 marks)

Part –D

Answer any FOUR of the following

4 X 5 =20

(6 Numerical Problems of 5 marks each, Two from each unit to be asked)

IV, V & VI Semester Physics (Elective)
Question Paper Pattern

Max Marks : 40

Time : 2 Hours

Part –A

Answer any TWO of the following

2 X 8 =16

(3 Long answer questions with two sub questions. Each question carrying 8 Marks)

Part –B

Answer any TWO of the following

2 X 8 =16

(3 Long answer questions with two sub questions. Each question carrying 8 marks)

Part –C

Answer any TWO of the following

4 X 2 = 8

(3 Numerical Problems of 4 marks at least one from each part)

Scheme of valuation for practical (Major & compulsory practical/skill paper)

C1 and C2 are internal tests to be conducted during 8th and 16th Weeks respectively of the semester. C3 is the semester-end examination conducted for 3 hours. The student will be evaluated on the basis of skill, comprehension and recording the results.

The student has to compulsorily submit the practical record for evaluation during C1 and C2. For C3, the record has to be certified by the Head of the Department.

The student is evaluated for 40 marks in C1, C2 and C3 as per the following scheme:

Component	Marks (C1)	Marks (C2)	Marks (C3)
Formula with proper units and explanation	5	5	5
Setting up the apparatus / circuit connections	5	5	10
Observations and data recording	5	5	10
Graph / diagrams	5	5	5
Calculations and results	5	5	5
Record book	5	5	--
Viva	10	10	5
Total	40	40	40
Reduced to	5	5	

Note: While evaluating the practical examination strict accuracy of the results should not be the sole criterion, as the experimental observations are subject to inherent errors and uncertainties. Greater emphasis should be given to the procedure, understanding and method of analysis.

Panel of Examiners recommended by Board of Studies in Physics (2026-27)

Dr. Vinaykumar. L JSS College of Arts, Commerce & Science (Autonomous), Ooty Road,Mysuru-25	Prof. Madhusudhan G J Associate Professor, Govt. First grade college, Bengaluru
Dr. T.N.Mahadeva Prasad Govt. First Grade College Gundulpete	Mr. Dhanushchandraguru H M Sharadavilas College, Mysuru
Prof. Nagesh babu Yuvaraja college Mysuru	Sri.M.Mallikarjunaswamy JSS College for Women, Chamarajanagar.
Ms. Geethanjali Sharadavilas college, Mysuru	Smt.N.Bharathi MMK & SDM College, Mysuru
Dr.Tippeswamy Government first grade college K.R.Nagara	Mr. Niranjan KSOU, Mysuru
Smt. Sowmya. B JSS College for Women, Saraswathipuram Mysuru	Mr. Gowtham G K Shivagangothri, Davangere University, Davangere
Sri. Umesh JSS College for Women, Saraswathipuram, Mysuru	Mr. Karthik G JSS College of Arts, Commerce & Science (Autonomous), BN Road, Mysuru-25
Sri. Jagadish.B JSS College of Arts, Commerce & Science (Autonomous), BN Road, Mysuru	Mr. Prathap Sharadavilas College, Mysuru
Dr. Prasanna G D Shivagangothri, Davangere University, Davangere	Dr. Khaleel Ahmed Govt. Science College, Hassan
Sri. Sadashivaiah Yuvaraja college Mysuru	Mr. Girish L N Maharani's science college for women Mysuru
Dr. Manjunatha. B.C. Yuvaraja college Mysuru	Smt. Lakshmi S JSS College of Arts, Commerce & Science (Autonomous), BN Road, Mysuru-25
Mr. Yashwanth D B JSS College for Women, Saraswathipuram, Mysore	Smt. Shwetha Yuvaraja college, Mysuru
Smt. Asharani T S JSS college for women Chamarajanagar	Mr. Ravitheja R JSS College, Nanjangud
Smt. Harshitha D B JSS college for women Chamarajanagar	Ms. Sofia Teresian First Grade College Mysuru
Smt. Thejakshi Govt. college for Boys , Mandya	Smt. Roopadevi Govt. First Grade College for Women's, Chamarajanagar

Kum. Manjuladevi.M Marimallappa college, Mysuru	Smt. Mahalakshmi Govt. College for boys, Mandya
Mr. Dharmaprakash GFGCW, Byrapura T.N.Pura	Mr. Elizer vishwas St. Philomenea's college, Mysuru
Dr. Madhusudhana R MIT, Mysuru	Dr. Mahadevaprasad P SJCE, Mysuru
Smt. Shwetha U S JSS College of Arts, Commerce & Science (Autonomous), BN Road, Mysuru-25	Smt. Thejaswini Yuvaraja college, Mysuru
Smt. Milana Nagaraju Yuvaraja college, Mysuru	Ms. Krupashree P Yuvaraj's science college Mysuru
Ms.Priyanka Yuvaraj's science college Mysuru	Kum. Shwetha S Maharani's Science college for women Mysuru
Smt. Nanadana C JSS College for Women, Saraswathipuram Mysuru	Kum. Manjula Govt. First Grade College for Women's, Chamarajanagar

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE (AUTONOMOUS)
OOTY ROAD, MYSURU-25

DEPARTMENT OF PHYSICS

PROCEEDINGS OF THE MEETING OF BOARD OF STUDIES FOR THE PROGRAMMES BSc IN PHYSICS-CHEMISTRY-MATHEMATICS, PHYSICS-MATHEMATICS-COMPUTER SCIENCE AND PHYSICS-MATHEMATICS-ELECTRONICS, HELD ON AUGUST 2026 AT 10.30 AM IN THE CHAMBER OF THE CHAIRMAN, DEPARTMENT OF PHYSICS, JSS COLLEGE, OOTY ROAD, MYSURU-25

MEMBERS PRESENT	SIGNATURE
Dr. Vinaykumar. L Asst. Professor & HOD Department of Physics JSS College, Ooty Road, Mysuru-25 Chairman	
Dr. S. Krishnaveni Professor and Chairperson DOS in Physics, Manasagangothri University of Mysore VC Nominee	
Dr. Shanmukhappa B Kaginelli Professor Department of Physics JSSAHER, Mysuru AC Nominee	
Dr. P Mahadevaprasad Assistant Professor Department of Physics JSS S&T University, Mysuru AC Nominee	
Mr. R Purushothama Assistant Manager Skanray Technologies private limited Healthcare division, #360, KIADB Industrial area, Hebbal, Mysure-570018 Expert	
Mr. T G Dharmaprakash Lecturer in Physics GFGCW, Byrapura, T.Narasipura Alumini	
Smt. Lakshmi S Assistant Professor, Department of Physics JSS College, Ooty Road, Mysuru-25 Senior faculty	

At the outset, the Chairman, BOS in Physics, welcomed the members to the meeting of BOS and briefed about the agenda to be discussed. The following agenda was placed by the Chairman which was discussed and resolved as follows:

Agenda 1: To frame/ revise, discuss and approve the Scheme/ Syllabus under modified NEP for the programmes: BSc in PCM, PMCs, PME from the academic year 2026-27 onwards.

The Chairman appraised the members about the three year modified NEP implementation for degree students as per University of Mysore norms and a draft revised/ modified Scheme/ Syllabus/panel of examiners was presented and placed before the Board for their opinion and approval.

Resolution: The BOS discussed about various aspects of the modified NEP and also suggested that as per the guidelines of University of Mysore and Government of Karnataka, the modified NEP programme can be implemented for the academic year 2026-27.

Agenda 2: To prepare the Panel of Examiners for the examinations for the year 2026-27.

The Chairman presented the proposed Panel of Examiners to I to VI Semester examinations of 2026-27.

Resolution: After incorporating of certain changes suggested by the members, the Panel of Examiners was approved and also new members can be included with the permission of Chair if missed.

Agenda 3: Approval of Reference Books

The Chairman presented the proposed list of Reference Books to the Members.

Resolution: After incorporating of certain changes suggested by the members, the list of Reference Books was approved.

Agenda 4: Any other matter with the permission of the Chairman

--NIL--

Finally the meeting was concluded with the Chairman thanking the Members for their active participation in the deliberations of the meeting.

Chairman