



**KARNATAKA STATE AKKAMAHADEVI WOMEN UNIVERSITY  
VIJAYAPURA**

**Curriculum for  
Bachelor of Science (B.Sc.)  
Physics  
As a Major Subject  
Category I: General Degree and  
Category II: Deep Specialization**

**Syllabus for I and II Semesters**

**BoS meeting proceedings dated 12-06-2024**

**2024-25**

## Curriculum of B.Sc. in Physics for First &amp; Second Semester 2024 - 2025

Program Name: <b>B.Sc.</b>	<b>Semester: I</b>
Course Title: <b>Mechanics and Properties of Matter – Theory</b>	
Course Code: <b>24BSCPHT1.1</b>	No. of Credits: 04
Contact hours: <b>14 weeks × 4 hours per week = 56</b>	Duration of SEA /Exam: 03 hour
Formative Assessment Marks: 20	Summative Assessment Marks: 80
<b>Unit – 01:</b>	<b>14 hours</b>
<p><b>Frames of Reference:</b> Inertial frames, Galilean transformation equations (derivation), Invariance of Newton's Laws under Galilean Transformations, Invariance of the laws of conservation of momentum and energy under Galilean transformations, Non-inertial frames and fictitious force (in brief), rotating frame of reference, concept of the Coriolis force and Coriolis force derivation. <span style="float: right;">[07 hours]</span></p> <p><b>Newtonian Mechanics:</b> Mechanics of single particle and system of particles, Conservation of linear momentum, Angular momentum and energy (Derivations for both single particle and system of particles). Centre of mass and equation of motion, constrained motion, and degrees of freedom with examples. <span style="float: right;">[07 hours]</span></p>	
<b>Unit – 02:</b>	<b>14 hours</b>
<p><b>Conservation Laws: (a) Linear momentum:</b> Law of conservation of linear momentum for a system of two particles, Collision between two particles, Inelastic collision and elastic collision in one dimension in laboratory and center of mass frame of reference, conservation of momentum in case of variable mass: Example single stage rocket – expression for velocity (Taking weight into consideration). <span style="float: right;">[07 hours]</span></p> <p><b>(b) Angular momentum:</b> Definition of angular momentum its relation of angular velocity and torque. Conservation of angular momentum, central force, Kepler's Laws of planetary motion (With derivation).</p> <p><b>(c) Energy:</b> Conservation of energy as a basic principle, Illustration with derivation: S.H.M of a light spiral spring. <span style="float: right;">[07 hours]</span></p>	
<b>Unit – 03:</b>	<b>14 hours</b>
<p><b>Angular Motions:</b> Motion along a curved path: Expression for radial and transverse components of velocity and acceleration. <span style="float: right;">[03 hours]</span></p> <p><b>Elements of satellite motion:</b> Expression for orbital velocity, time period and escape velocity of a satellite. Derivation of expression for closed and open orbits, Geo-stationary satellite, Weightlessness, artificial Gravity in space station. <span style="float: right;">[04 hours]</span></p> <p><b>Dynamics of Rigid Bodies:</b> Rotation of rigid body, moment of inertia, torque, angular momentum, kinetic energy of rotation. Theorems of perpendicular and parallel axes with proof. Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross-section. Acceleration of a body rolling down on an inclined plane. <span style="float: right;">[07 hours]</span></p>	
<b>Unit – 04:</b>	<b>14 hours</b>
<p><b>Elasticity:</b> Introductory, Stress, Strain, Hooke's Law Moduli of elasticity for isotropic materials, relation between elastic constants (with derivation) Poisson ratio, expression for work done per unit volume in three type of strain (with derivation) Bending of beam: Neutral axis, expression for bending moment, theory of light single cantilever (wt. of the beam is not taken into account) Torsion: Torsional pendulum, Expression for couple per unit twist, Static torsion and Searle's double bar experiment. <span style="float: right;">[07 hours]</span></p> <p><b>Surface Tension:</b> Cohesive and adhesive forces, surface tension explanation on the basis of molecular theory, surface energy, angle of contact, pressure within a curved surface (with derivation) interfacial tension, Drop weight method with necessary theory. Factor affecting Surface tension. Theory of surface tension of mercury by Quincke's method.</p> <p><b>Viscosity:</b> Streamline and Turbulent motion: Derivation of Poiseuille's Equation, Stoke's law, effect of temperature on viscosity. Theory of rotation viscometer. <span style="float: right;">[07 hours]</span></p>	

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Program Name: <b>B.Sc.</b>	<b>Semester: I</b>
Course Title: <b>Mechanics and Properties of Matter – Practical</b>	
Course Code: <b>24BSCPH1.2</b>	No. of Credits: 04
Contact hours: <b>14 weeks × 4 hours per week = 56</b>	Duration of SEA /Exam: 03 hour
Formative Assessment Marks: 10	Summative Assessment Marks: 40
<b>Student should perform at least any TEN of the following experiments:</b>	
<ol style="list-style-type: none"> <li>1) Bar pendulum <math>L</math> versus <math>T</math> Graph.</li> <li>2) Bar pendulum <math>L^2</math> versus <math>LT^2</math> graph</li> <li>3) Spiral spring – determination of '<math>g</math>' and unknown mass.</li> <li>4) M.I of a fly- wheel by graphical method.</li> <li>5) Tensional pendulum – rigidity modulus.</li> <li>6) M.I of an irregular body.</li> <li>7) Verification of parallel axes theorem of M.I.</li> <li>8) Verification of perpendicular axes theorem of M.I.</li> <li>9) Y-by stretching and determination of unknown mass.</li> <li>10) Verification of Hook's law.</li> <li>11) Young's Modulus by uniform bending – load depression graphs.</li> <li>12) Young's Modulus of cantilever – load depression graph.</li> <li>13) Young's Modulus of by oscillation method –(graphical method)</li> <li>14) Rigidity modulus – static torsion.</li> <li>15) Searle's double bar determination of <math>Y</math>, <math>n</math> and <math>K</math>.</li> <li>16) Interfacial surface tension.</li> <li>17) Co-efficient of viscosity by Stokes' method.</li> <li>18) Detraction of critical pressure for streamline flow.</li> <li>19) Surface tension by drop weight method.</li> <li>20) Poisson ratio of rubber tube.</li> <li>21) Viscosity by Poiseuille's method.</li> </ol>	

# Curriculum of B.Sc. in Physics for First & Second Semester 2024 - 2025

## Reference Books:

- 1) Mathur D S, Elements of Properties of Matter, S Chand and Company (2007).
- 2) Mathur D S, Mechanics, S Chand and Company (2007).
- 3) Upadhyaya J C, Classical Mechanics, 2nd Edition, Himalaya Publishing House(2017).
- 4) Arora C L, and Hemne P S, Physics for Degree Students, Revised Edition, S Chand and Company (2012).
- 5) Halliday D, Resnick R, and Walker J, Principles of Physics, 9th Edition, Wiley India Pvt. Ltd. (2013).
- 6) Brij Lal, and Subrahmanyam N, Properties of Matter, 6th Edition, S Chand and Company (2002).
- 7) Shankara Narayana S R, Mechanics and Properties of Matter, 2nd Revised Edition, Sultan Chand and Sons (1998).
- 8) Arora C L, Refresher Course in B.Sc. Physics Vol. 1, Revised Edition, S Chand and Company (2008).
- 9) D. Chattopadhyay, P. C. Rakshit, An Advance Course in Practical Physics.
- 10) C. L. Arora, B.Sc. Practical Physics.
- 11) Geeta Sanon, B.Sc. Practical Physics.
- 12) Gupta Kumar, Practical Physics.
- 13) R. K. Shukla Anchal Srivastava, Practical Physics.
- 14) D. C. Tayal, University Practical Physics
- 15) Dr. S. P. Singh Vol – 01, Advance Practical Physics.
- 16) Dr. S. P. Singh Vol – 02, Advance Practical Physics.

## Formative Assessment and Summative Assessment for Practical:

- C1 and C2 are internal tests to be conducted during 7<sup>th</sup> and 14<sup>th</sup> weeks respectively of the semester. C3 is the semester-end examination conducted for 3 hours. The students will be evaluated on the basis of skill, comprehension and recording the results.
- The students has to compulsorily submit the practical record book for evaluation during the C1 and C2. For C3, the record book 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	Formative Assessment		Summative Assessment
	C1 Marks	C2 Marks	C3 Marks
Formula with proper units and explanation	5	5	5
Setting up the apparatus / circuit connections	5	5	5
Observation skill and tabulation	5	5	5
Calculation	5	5	5
Graph and accuracy of result	5	5	5
Record Book	5	5	5
Viva-voce	10	10	10
<b>Total</b>	40	40	<b>40</b>
<b>Reduced to</b>	<b>5</b>	<b>5</b>	

## Curriculum of B.Sc. in Physics for First &amp; Second Semester 2024 - 2025

Program Name: <b>B.Sc.</b>	<b>Semester: II</b>
Course Title: <b>Electrostatics, Electricity and Magnetism – Theory</b>	
Course Code: <b>24BSCPHT2.1</b>	No. of Credits: 04
Contact hours: 14 weeks × 4 hours per week = 56	Duration of SEA /Exam: 03 hour
Formative Assessment Marks: 20	Summative Assessment Marks: 80
<b>Unit – 01:</b>	<b>14 hours</b>
<p><b>Electric Charge:</b> Coulombs law – Forces between two point charges, forces between multiple charges. Superposition principle – Statement and explanation with illustration, illustration with specific configuration of three charges and four charges. Energy of system of charges, illustration with three charges and electric potential energy. Concept of electric field – due to point charge and group of charges, lines of forces, relation between electric intensity and electric potential. Gauss’ theorem in electrostatics (statement and explanation only). Illustration of Gauss’ law with examples. <b>[07 hours]</b></p> <p><b>Dielectrics:</b> Electric dipole and dipole moment – Electric potential and electric intensity due to dipole. Torque on electric dipole in external electric field, polar and non-polar molecules with examples and effect of external electric field on polar and non-polar molecules. Polarization of dielectric material, electric polarization vector, strength of dielectric material and dielectric breakdown. Electric displacement and Gauss’ law in dielectrics. Relation between three electric vectors (<math>\vec{E}, \vec{D}</math> and <math>\vec{P}</math>) no derivation. Effect of dielectric on capacitance (parallel plate capacitor only) <b>[07 hours]</b></p>	
<b>Unit – 02:</b>	<b>14 hours</b>
<p><b>Magnetostatics:</b> Magnetic field – definition and properties of magnetic field. Biot-Savart Law – examples; i) long straight conductor and current carrying circular loop on the axis. Ampere’s circuital law – field of solenoid, field of toroidal solenoid. Magnetic field lines and magnetic flux – Gauss’ law for magnetism. Problems. <b>[07 hours]</b></p> <p><b>Magnetic Materials:</b> Bohr magneton. Magnetization(<math>\vec{M}</math>), magnetic intensity (<math>\vec{H}</math>) and magnetic induction (<math>\vec{B}</math>). Relation between <math>\vec{M}, \vec{H}</math> &amp; <math>\vec{B}</math> (no derivations). Diamagnetic, paramagnetic and ferromagnetic – explanation with the help of susceptibility and permeability.</p> <p><b>Transient Currents:</b> Growth and decay of current in an inductive (LR) circuit. RL time constant. Charging and discharging of condenser through resistance. RC time constant. Physical meaning of time constant. <b>[07 hours]</b></p>	
<b>Unit – 03:</b>	<b>14 hours</b>
<p><b>Electromagnetism-I:</b> A review of basic laws of electricity and magnetism. Displacement current – conduction current and displacement current. Maxwell’s equations (integral and differential forms). Derivation of Maxwell’s equations. <b>[07 hours]</b></p> <p><b>Electromagnetism-II:</b> Equation of electromagnetic waves – refractive index of dielectric and velocity of electromagnetic waves in dielectric medium in terms of refractive index of the medium. Transverse nature of electromagnetic waves. Poynting theorem. Production and deduction of electromagnetic wave (Hertz experiment) <b>[07 hours]</b></p>	
<b>Unit – 04:</b>	<b>14 hours</b>
<p><b>Electricity:</b> Pure AC through R, L and C. AC through RL, RC and LC. LCR series and parallel resonant circuit. half power frequency, band width, Q-factor, power in electrical circuits, power factor. De Sauty’s bridge to determine C. Maxwell’s bridge determination of L. Anderson’s bridge to determine L or C. <b>[07 hours]</b></p> <p><b>AC Filters:</b> High pass and Low pass filters with LR and CR combinations, cutoff frequency, Band pass filter and band stop filter.</p> <p><b>Rectifiers:</b> Half wave, full wave and bridge full wave rectifier – ripple factor and efficiency. Rectifier filters – shunt capacitor filter, series inductor filter, L-section filter and pi-section filter. <b>[07 hours]</b></p>	

**Curriculum of B.Sc. in Physics for First & Second Semester 2024 - 2025**

Program Name: <b>B.Sc.</b>	Semester: <b>II</b>
Course Title: <b>Electrostatics, Electricity and Magnetism – Practical</b>	
Course Code: <b>24BSCPHL2.2</b>	No. of Credits: <b>04</b>
Contact hours: <b>14 weeks × 4 hours per week = 56</b>	Duration of SEA /Exam: <b>03 hour</b>
Formative Assessment Marks: <b>10</b>	Summative Assessment Marks: <b>40</b>
<b>Student should perform at least any TEN of the following experiments:</b>	
<ol style="list-style-type: none"> <li>1) RC Time Constant.</li> <li>2) RL Time Constant.</li> <li>3) RC Low Pass Filter – Determination of cut off frequency.</li> <li>4) RC High Pass Filter – Determination of cut off frequency.</li> <li>5) RL Low Pass Filter – Determination of cut off frequency.</li> <li>6) RL High Pass Filter – Determination of cut off frequency.</li> <li>7) Determination of self-inductance by AC and DC method.</li> <li>8) Series resonance circuit – Determination of resonance frequency, bandwidth and Q – factor.</li> <li>9) Series resonance circuit – Determination of resonance frequency, bandwidth and Q – factor.</li> <li>10) De Sauty’s bridge to determine the value of C.</li> <li>11) Maxwell’s bridge to determine the value of L.</li> <li>12) Anderson’s bridge to determine the value of L or C.</li> <li>13) Verification of maximum power transfer theorem and Thevenin’s theorem.</li> <li>14) Verification of maximum power transfer theorem and Norton’s theorem.</li> <li>15) Verification of maximum power transfer theorem and superposition theorem.</li> <li>16) Half wave and full wave rectifier without filter.</li> <li>17) Half wave and full wave rectifier with filter.</li> </ol>	

# Curriculum of B.Sc. in Physics for First & Second Semester 2024 - 2025

## Reference Books:

- 1) D. N. Vasudeva, Electricity and Magnetism.
- 2) K. K. Tewari, Electricity and Magnetism.
- 3) Brij Lal and Subrahmanyam N, A Text Book of Electricity and Magnetism.
- 4) Gaur R. K. and S. L. Gupta, Engineering Physics.
- 5) C. L. Arora, B.Sc. Practical Physics.
- 6) Geeta Sanon, B.Sc. Practical Physics.
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Record Book	5	5	5
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<b>Total</b>	40	40	<b>40</b>
<b>Reduced to</b>	5	5	

**Curriculum of B.Sc. in Physics for First & Second Semester 2024 - 2025****Question Paper Pattern**

Program Name: <b>B.Sc.</b>	Semester:
Course Title:	Course Code:
Maximum Marks: <b>80</b>	Time: <b>03 hour</b>
<b>Instructions:</b>	
i) Part – A: All Questions are compulsory. Each carrying TWO marks.	
ii) Part – B: Answer any SIX of the following. Each carrying TEN marks	
<b>Part – A</b>	
<b>Answer the following. Each question carries 2 marks. (2x5=20)</b>	
1)	
a.	
b.	
c.	
d.	
e.	
<b>Part – B</b>	
<b>Answer any SIX of the following.</b>	
<b>Each question carries 10 (6+4 or 7+3 =10) marks. (10x6=60)</b>	
2) a.	
b.	
3) a.	
b.	
4) a.	
b.	
5) a.	
b.	
6) a.	
b.	
7) a.	
b.	
8) a.	
b.	
9) a.	
b.	
<b>Note: In Part – B; from each unit two questions must be asked.</b>	