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UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/55/2024-25

Dated: 20.07.2024

Notification

Sub:-Syllabus and Scheme of Examinations of Physics (UG) programme (I & II Semester) from the Academic year 2024-25.

Ref:-1. Decision of Board of Studies in Physics (CB) meeting held on 06-06-2024.
2. Decision of the Faculty of Science & Technology meeting held on 19-06-2024.
3. Decision of the Academic Council meeting held on 28-06- 2024.

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The Board of Studies in Physics (CB) which met on 06-06-2024 has resolved to recommend & approved the Syllabus and Scheme of examinations of Physics (UG) programme (I & II Semester) with effect from the Academic year 2024-25.

The Faculty of Science & Technology and Academic Council at their meetings held on 19-06-2024 and 28-06-2024 respectively has also approved the above said Syllabus and Scheme of examinations hence it is hereby notified.

The Syllabus and Scheme of Examinations content may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

Registrar

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University of Mysore
Mysore

To;

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS in Physics, Manasagangothri, Mysore.
4. The Dean, Faculty of Science & Technology, DOS in Mathematics, MGM.
5. The Director, Distance Education Programme, Moulya Bhavan, Manasagangothri, Mysore.
6. The Director, PMEB, Manasagangothri, Mysore.
7. Director, College Development Council, Manasagangothri, Mysore.
8. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
9. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
10. Office Copy.

Curriculum

of

BSc in Physics

1st & 2nd Semesters

2024-25

University of Mysore, Mysuru

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I Semester B.Sc Physics Syllabus

PHY101 (DSC): Mechanics and Properties of Matter

Course Duration: 16 Weeks with 3 hours of instruction per Week.

Part A: 16 hours

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 $\vec{r}(t)$ 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 axes. 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]

Part B: 16 hours

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]

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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 $^{dA}/_{dt} = {}^{1}/_{2}\, r^2\, \dot{\theta}\, \hat{n}$. 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]

Part C: 16 hours

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 Quincke's method – Theory. Numerical problems. [4 hours]

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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).
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5. Arora C L, Refresher Course in B.Sc. Physics Vol. 1, Revised Edition, S Chand and Company (2008).
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10. Tewari K K, Electricity and Magnetism, S Chand and Company (2007).
11. Brij Lal, and Subrahmanyam N, A Text Book of Electricity and Magnetism, 19th Edition, Ratan Prakashan Mandir (2016).
12. Gaur R.K and S.L Gupta, Engineering Physics, Dhanpant Rai Publications, 8th Edition (2001).

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I Semester B.Sc Physics Practicals

PHY102 (DSC): Physics Practicals 1

Course Duration: 16 Weeks with 4 hours of lab work per Week.

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 axis.
10. Stokes' method: Determination of coefficient of viscosity of viscous liquids.
11. Determination of rigidity modulus by the static-torsion method.
12. Determination of Young's modulus by the method of uniform bending.

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II Semester B.Sc Physics Syllabus

PHY 201 (DSC): Heat and Thermodynamics

Course Duration: 16 Weeks with 3 hours of instruction per Week.

Part A: 16 hours

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 = 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]

Part B: 16 hours

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.

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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 nonavailable 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]

Part C: 16 hours

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]

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5. Gupta S C: Thermodynamics, 1st Edition, Pearson, 2005.
6. Satya Prakash: Optics and Atomic Physics, 11th Edition, Ratan Prakashan Mandir, 1994.
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II Semester B.Sc Physics Practicals

PHY202 (DSC): Physics Practicals 2

Course Duration: 16 Weeks with 4 hours of lab work per Week.

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 Clausius–Clapeyron equation and determination of specific enthalpy.
6. Verification of Stefan-Boltzmann law using a meter bridge or a potentiometer.
7. Determination of Solar constant.
8. Determination of the value of the mechanical equivalent of heat(J) by electrical method
9. Determination of boiling point of a liquid by using a platinum resistance thermometer.
10. Dice experiment-Randomocity verification.
11. Determination of temperature coefficient of resistance of a platinum resistance thermometer.
12. Mechanical Equivalent of Heat by Callender and Barne's method.

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I & II Semester Physics 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 sub questions each (5+5/6+4)). Each question carrying 10 Marks to be asked from PART A.)

PART – B

Answer any TWO of the following **2 x 10 = 20**

(3 Long answer questions with two sub questions each (5+5/6+4)). Each question carrying 10 Marks to be asked from PART B.)

PART – C

Answer any TWO of the following **2 x 10 = 20**

(3 Long answer questions with two sub questions each (5+5/6+4)). Each question carrying 10 Marks to be asked from PART C.)

PART – D

Answer any FOUR of the following **2 x 10 = 20**

(6 Numerical problems of 5 marks each, 2 from each PART to be asked)

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Scheme of Valuation for Practicals

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	5
Taking readings and tabulating	5	5	10
Calculations	5	5	5
Graph and accuracy of result	5	5	5
Record	5	5	--
Viva	10	10	10
Total	**40**	**40**	**40**
Reduced to	**5**	**5**	

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