Course Number & Title: **PH1100L: General Physics Lab-1**	
L-T-P-C: 0-0-3-3	
Kind of Proposal (New Course / Revision of Existing Course(s)):	
Offered as (Compulsory ~~/ Elective~~):	
Offered to: BTech	
Offered in (Odd/ Even / Any): Odd	
Offered by (Name of Department/ Center): Physics	
Tentative Pre-Requisite: (*Not always required, if JAM syllabus is sufficient pre-requisite. You can give name of the topics of the courses that the student needs to know before the course starts*)	
Preamble / Objectives (Optional):	
Course Content/ Syllabus: List of Experiments: Determination of g by Compound pendulum, Surface tension of a liquid by Jaeger's Method, Magnetic field along the axis of a coil, Resonance and Q factor of a LCR circuit, Hall Effect in an extrinsic semiconductor, Newton's ring, Plane Transmission Grating, Linear Air track, Error analysis.	
Books (In case of compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References" The books should be compatible to the syllabus.	
Texts: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)	
1.	Taylor, John R. *"Error analysis."* Univ. Science Books, Sausalito, California 20 (1997).
2.	Ghatak, Ajoy. *Contemporary Optics.* Springer Science & Business Media, 2012
3.	Mahajan, A. and Rangawala, A. *Electricity and Magnetism*. Mc. Gras Hill (2017).
4.	Mathur D.S. *Elements of Properties of Matter.* S. Chand (2010).

Course Number & Title: **PH 1130: Classical Mechanics**	
L-T-P-C: 2-1-0-6	
Kind of Proposal (New Course / Revision of Existing Course(s)):	
Offered as (Compulsory ~~/ Elective~~):	
Offered to: BTech	

Offered in (Odd/ Even / Any): Odd
Offered by (Name of Department/ Center): Physics
Tentative Pre-Requisite: (*Not always required, if JAM syllabus is sufficient pre-requisite. You can give name of the topics of the courses that the student needs to know before the course starts*)
Preamble / Objectives (Optional):
Course Content/ Syllabus: **Review of kinematics**: Position, velocity, acceleration vectors in rectilinear, plane polar, cylindrical and spherical polar coordinate systems. Review of Newtonian mechanics in rectilinear coordinate system; Motion in plane polar coordinates; forces and equations of motion, simple harmonic motion. System of particles, center of mass, center of mass coordinates, conservation of momentum; Work-energy theorem, conservation laws; non-conservative forces. **Rigid body dynamics**: Angular momentum and fixed axis of rotation; dynamics of fixed axis rotation, work-energy theorem and rotational motion; Moment of Inertia tensor; Euler angles; Euler equations. **Lagrangian and Hamiltonian mechanics:** Degrees of freedom, Constraints and constraint forces, D'Alembert's principle, Generalized coordinates, Principle of least action; Lagrange's equations of motion, Generalized momentum, Ignorable coordinates; symmetry and conservation theorems; Concept of phase space, Hamilton's equations of motion and applications, Poisson Brackets. **Central Force problem**: Central force as a one-body problem; planetary motion; Equation of orbit. **Oscillations:** Small oscillations in a bound system, stability, normal modes, damped oscillations, driven damped oscillations, resonance. **Special Theory of Relativity**: Postulates of special theory of relativity; Lorentz transformation; Time dilation; Doppler effect; Length contraction; Twin paradox; Relativistic addition of velocities; Mass and energy; Energy Momentum relationships.
Books (In case of compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References" The books should be compatible to the syllabus.
Texts: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)
1. John Taylor, *Classical mechanics* (University Science Books, 2005)
2. D. Kleppner and R. Kolenkow, *An Introduction to Mechanics,* 2nd Ed. Cambride University Press (2014).
References: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)
1 Resnick, Robert. *Introduction to special relativity*. John Wiley & Sons, 1991.
2 Goldstein H. *Classical mechanics.* Pearson Education India; 2011
3 L.D. Landau and E.M. Lifshitz, *Mechanics*, Elsevier (2005).
4 Takwale R and Puranik P, *Introduction to Classical Mechanics,* (McGraw Hill Education, 1st Ed., 2017).

Detailed Course Content It will not be included in the Courses of Study Booklet					
Sl. No.(or week No. or Module no.)	Topics: Subtopics	Probable Book where the content is probably to be taught	Number of Lectures (in hours)	Included in GATE/NET (Yes-No)	Whether this subtopic was included/replaced with respect to the existing syllabus
1	**Review of kinematics**: Position, velocity, acceleration vectors in rectilinear, plane polar, cylindrical and spherical polar coordinate systems. Review of Newtonian mechanics in rectilinear coordinate system; Motion in plane polar coordinates; forces and equations of motion, simple harmonic motion. System of particles, center of mass, center of mass coordinates, conservation of momentum; Work-energy theorem, conservation laws; non-conservative forces.		3		
2	**Rigid body dynamics**: Angular momentum and fixed axis of rotation; dynamics of fixed axis rotation, work-energy theorem and rotational motion; Moment of Inertia tensor; Euler angles; Euler equations		3		
3	**Lagrangian and Hamiltonian mechanics:** Degrees of freedom, Constraints and constraint forces, D'Alembert's principle, Generalized coordinates, Principle of least action; Lagrange's equations of motion, Generalized momentum, Ignorable coordinates; symmetry and conservation theorems; Concept of phase space,		11		

	Hamilton's equations of motion and applications, Poisson Brackets.				
4	**Central Force problem**: Central force as a one-body problem; planetary motion; Equation of orbit.		3		
5	**Oscillations:** Small oscillations in a bound system, stability, normal modes, damped oscillations, driven damped oscillations, resonance.		3		
6	**Special Theory of Relativity**: Postulates of special theory of relativity; Lorentz transformation; Time dilation; Doppler effect; Length contraction; Twin paradox; Relativistic addition of velocities; Mass and energy; Energy Momentum relationships.		5		
	Total Number of Lectures =		28		

Course Number & Title: **PH1230: Electrodynamics**
L-T-P-C: 3-1-0-8
Kind of Proposal (New Course / Revision of Existing Course(s)):
Offered as (Compulsory ~~/ Elective~~):
Offered to: BTech
Offered in (Odd/ Even / Any): Even
Offered by (Name of Department/ Center): Physics
Tentative Pre-Requisite: (*Not always required, if JAM syllabus is sufficient pre-requisite. You can give name of the topics of the courses that the student needs to know before the course starts*)
Preamble / Objectives (Optional):
Course Content/ Syllabus: **Essential mathematical tools:** Review of Stokes and Gauss' divergence theorem, Curvilinear coordinates, Gradient, divergence, and curl in curvilinear coordinates; Dirac Delta function. **Electrostatics:** Gauss law in integral and differential forms; Scalar potential, potential due to charge distributions, and Laplace/Poisson equation; Work and energy; Uniqueness theorem, Dirichlet and Neumann boundary conditions;

Image charge problems, point charge in front of an infinite grounded conducting plane, point charge in front of a grounded conducting sphere and conducting infinite plane. **Solutions of Laplace Equation:** Separating variables in Cartesian, spherical, and cylindrical coordinates and general solution (Legendre polynomials, Bessel functions). Multipole expansion. **Dielectrics:** Polarization, Surface and volume-bound charges; Gauss' law in dielectrics, Displacement vector ; Boundary value problem with linear dielectric; Image charge problem with dielectric; Forces on dielectrics; Magnetism: Review of Biot-Savart's law, Lorentz Force. vector potential, and forces on magnetic dipoles; Magnetic materials, Bound currents, Boundary value problems. Magnetic field in conductors. **Steady current and electromagnetic fields:** Review of Ohm's law, Faraday's law, Lenz's law, and Electromotive force; Ampere's law and Displacement current; Maxwell's equations in vacuum and media; Gauge transformation and gauge conditions; Poynting vector and Poynting theorem; Plane waves, Polarization of EM field; Propagation in nonconducting and conducting media. Reflection and refraction with normal and oblique incidence, Fresnel relations, Brewster's angle. **Dipole radiation:** Radiation, dipole radiation from oscillating electric dipole, Retarded potential, Intensity distribution of radiating dipole.

Books (In case of compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References" The books should be compatible to the syllabus.

Texts: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)

1.	Griffiths, David J. *Introduction to electrodynamics.* Cambridge University Press, 2023.
2.	Sadiku MN, Kulkarni SV. Principles of electromagnetics. New Delhi, India: oxford university Press; 2015 Sep

References: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)

Detailed Course Content
It will not be included in the Courses of Study Booklet

Sl. No.(or week No. or Module no.)	Topics: Subtopics	Probable Book where the content is probably to be taught	Number of Lectures (in hours)	Included in GATE/NET (Yes-No)	Whether this subtopic was included/replaced with respect to the existing syllabus
1	**Essential mathematical tools:** Review of Stokes and Gauss' divergence theorem, Curvilinear coordinates, Gradient, divergence, and curl in curvilinear coordinates; Dirac Delta function.		3		
2	**Electrostatics:** Gauss law in integral and differential forms; Scalar potential, potential due to charge distributions, and Laplace/Poisson equation; Work and energy; Uniqueness theorem, Dirichlet and Neumann boundary conditions; Image charge problems, point charge in front of an infinite grounded conducting plane, point charge in front of a grounded conducting sphere and conducting infinite plane		7		
3	**Solutions of Laplace Equation:** Separating variables in Cartesian, spherical, and cylindrical coordinates and general solution (Legendre polynomials, Bessel functions). Multipole expansion.		5		
4	**Dielectrics:** Polarization, Surface and volume-bound charges; Gauss' law in dielectrics, Displacement vector ; Boundary value problem with linear		11		

	dielectric; Image charge problem with dielectric; Forces on dielectrics; Magnetism: Review of Biot-Savart's law, Lorentz Force. vector potential, and forces on magnetic dipoles; Magnetic materials, Bound currents, Boundary value problems. Magnetic field in conductors.				
5	**Steady current and electromagnetic fields:** Review of Ohm's law, Faraday's law, Lenz's law, and Electromotive force; Ampere's law and Displacement current; Maxwell's equations in vacuum and media; Gauge transformation and gauge conditions; Poynting vector and Poynting theorem; Plane waves, Polarization of EM field; Propagation in nonconducting and conducting media.		10		
6	Reflection and refraction with normal and oblique incidence, Fresnel relations, Brewster's angle.		4		
7	**Dipole radiation:** Radiation, dipole radiation from oscillating electric dipole, Retarded potential, Intensity distribution of radiating dipole		2		
	Total Number of Lectures =		42		