SRI ADICHUNCHANAGIRI FIRST GRADE COLLEGE C R PATNA
Department of Physics
LESSON PLAN FOR THE ACADEMIC YEAR 2018-19
(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc Paper Name-Mechanic, Properties of Matter and Electrostatics
CLASS –I SEM Total Hours-64hours

NAME OF THE FACULITIES-HJA, BS, HCP ,ANA
Duration –JUNE to OCT

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1.	**Frames of reference:** Inertial reference frames with examples. Uniform rectilinearmotion in an inertial frame|Galilean transformation equation. The Galilean principle of relativity. Motion in a non-inertial reference frame uniformlyaccelerated rectilinear motion-concept of fictitious force-illustration; plumb liner accelerometer and a freely falling elevator. Qualitative discussion of centrifugal force, Coriolis force and earth as a non-inertial frame, Numerical problems	5	Black board/ Group discussion
2	**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	Black board/ Group discussion
3	**Rigid body dynamics:** Review of de_nitions, Moment of inertia and radius of gyration. Review of statements of the theorems of the parallel and perpendicular axes. Expression for kinetic energy of a rigid body Calculation of moment of inertia of thin uniform rod, rectangular lamina, circular lamina, and solid cylinder. Theory of compound pendulum. Numerical problems	6	Black board/ Group discussion
4	**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	6	Black board/ Group discussion
5	**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 r2 n^. Central force: Physical insight into the nature of central forces. Kepler's laws of planetary motion|derivation using Newton's law of gravitation. Numerical problems.	5	Black board/ Group discussion
6	**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 and (ii)		

	Calculation of escape velocity in the gravitational field of the earth. Conditions for a geo-stationary satellite. Numerical problems.	**6**	Black board/ Group discussion
7	**Fluid Mechanics:** Viscosity|Basic concepts, Variation of viscosity of liquids with temperature and pressure. Theory of rotation viscometer.	**3**	Black board/ Group discussion
8	**Surface Tension:** Basic concepts. Pressure inside curved liquid surface, examples.Surface tension and interfacial tension by drop-weight method. Surface tension of mercury by Quincke's method|Theory Numerical problems	**3**	Black board/ Group discussion
9	**Elasticity:** Concepts of moduli of elasticity, Hooke's Law and Poisson's ratio Relation between the elastic constants q, k, n and limiting values for 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.	**5**	Black board/ Group discussion
10	**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	**6**	Black board/ Group discussion
11	**Galvanometers:** Moving coil galvanometer construction, theory, damping correction, current sensitivity and charge sensitivity. Helmholtz galvanometer Theory. Numerical problems.	**6**	Black board/ Group discussion

SRI ADICHUNCHANAGIRI FIRST GRADE COLLEGE C R PATNA
Department of Physics
LESSON PLAN FOR THE ACADEMIC YEAR 2018-19
(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc Paper Name-Heat thermodynamics and Sound
CLASS –II SEM Total Hours-64hours

NAME OF THE FACULITIES-HJA, BS, HCP ,ANA
Duration –DEC to APRIL

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1	**Kinetic theory:** 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=2RT. Mean free path,Probability of a particle having mean free path. Real gases, Andrew's isothermal,Van der Waals equation expression for critical constants, calculation of mean velocity, most probable velocity and RMS velocity. Numerical problems	**8**	Black board/ Group discussion
2	**Thermal conductivity:** Equation for the ow of heat through a solid bar.Determination of thermal conductivity of a bad conductor by Lee and Charltonmethod. Numerical problems.	**3**	Black board/ Group discussion
3	**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 Wien's displacement law from Planck's law. Numerical problems.	**6**	Black board/ Group discussion
4	**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 betweenBoyle temperature, temperature of inversion and critical temperature of a gas. Principle of regenerative cooling. Liquefaction of air by Linde's method. Adiabatic demagnetization. Numerical problems.	**8**	Black board/ Group discussion
5	**Thermodynamics:** Review of basic concepts, Carnot's theorem, thermodynamic scale of temperature and its identity with perfect gas scale. Clausius-Clapeyron first Latent heat equation, effect pressure on melting point of a solid, effect of pressure on boiling point of a liquid. Numerical problems.	**7**	Black board/ Group discussion
6	**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, concept of absolute zero and the third law of thermodynamics. Numerical problems.	**7**	Black board/ Group discussion
7	**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, Tds equations for Cp and Cv, Heat capacity equations. Numerical problems.	**8**	Black board/ Group discussion
8	**Sound:** Waves in one dimension Differential equation of wave motion , Expression for velocity of progressive waves in a medium, Laplace's Correction to Newton's formula. Expression for frequency of vibration of a stretched string| harmonics, Longitudinal vibrations in a rod. Kundt's tube experiment, Numerical problems.	**7**	Black board/ Group discussion
9	**Analysis of complex waves:** The Fourier series|evaluation of Fourier coefficients, Example of the square wave, saw tooth wave.	**4**	Black board/ Group discussion
10	**Superposition of simple harmonic motion:** motion Lissajous' figures. Equation for damped vibrations. Forced vibration, solution in exponential form, Resonance, Expression for amplitude and phase at resonance. Numerical problems.	**6**	Black board/ Group discussion

SRI ADICHUNCHANAGIRI FIRST GRADE COLLEGE C R PATNA
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LESSON PLAN FOR THE ACADEMIC YEAR 2019-20
(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc Paper Name-Mechanic, Properties of Matter and Electrostatics
CLASS –I SEM Total Hours-64hours

NAME OF THE FACULITIES-HJA, BS, HCP ,ANA
Duration –JULY to NOV

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1.	**Frames of reference:** Inertial reference frames with examples. Uniform rectilinearmotion in an inertial frame|Galilean transformation equation. The Galilean principle of relativity. Motion in a non-inertial reference frame uniformlyaccelerated 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	5	Black board/ Group discussion
2	**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	Black board/ Group discussion
3	**Rigid body dynamics:** Review of de_nitions, Moment of inertia and radius of gyration. Review of statements of the theorems of the parallel and perpendicular axes. Expression for kinetic energy of a rigid body Calculation of moment of inertia of thin uniform rod, rectangular lamina, circular lamina, and solid cylinder. Theory of compound pendulum. Numerical problems	6	Black board/ Group discussion
4	**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	6	Black board/ Group discussion
5	**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 r2 n^. Central force: Physical insight into the nature of central forces. Kepler's laws of planetary motion|derivation using Newton's law of gravitation. Numerical problems.	5	Black board/ Group discussion
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	conservative force field. Applications: (i) Vertical oscillations of a loaded light spiral spring and (ii) Calculation of escape velocity in the gravitational field of the earth. Conditions for a geo-stationary satellite. Numerical problems.	**6**	Black board/ Group discussion
7	**Fluid Mechanics:** Viscosity|Basic concepts, Variation of viscosity of liquids with temperature and pressure. Theory of rotation viscometer.	**3**	Black board/ Group discussion
8	**Surface Tension:** Basic concepts. Pressure inside curved liquid surface, examples.Surface tension and interfacial tension by drop-weight method. Surface tension of mercury by Quincke's method|Theory Numerical problems	**3**	Black board/ Group discussion
9	**Elasticity:** Concepts of moduli of elasticity, Hooke's Law and Poisson's ratio Relation between the elastic constants q, k, n and limiting values for 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.	**5**	Black board/ Group discussion
10	**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	**6**	Black board/ Group discussion
11	**Galvanometers:** Moving coil galvanometer construction, theory, damping correction, current sensitivity and charge sensitivity. Helmholtz galvanometer Theory. Numerical problems.	**6**	Black board/ Group discussion

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(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc Paper Name-Heat thermodynamics and Sound
CLASS –II SEM Total Hours-64hours

NAME OF THE FACULITIES-HJA, BS, HCP ,ANA
Duration –DEC to APRIL

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1	**Kinetic theory:** 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=2RT. Mean free path,Probability of a particle having mean free path. Real gases, Andrew's isothermal,Van der Waals equation expression for critical constants, calculation of mean velocity, most probable velocity and RMS velocity. Numerical problems	8	Black board/ Group discussion
2	**Thermal conductivity:** Equation for the ow of heat through a solid bar.Determination of thermal conductivity of a bad conductor by Lee and Charltonmethod. Numerical problems.	3	Black board/ Group discussion
3	**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 Wien's displacement law from Planck's law. Numerical problems.	6	Black board/ Group discussion
4	**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 betweenBoyle temperature, temperature of inversion and critical temperature of a gas. Principle of regenerative cooling. Liquefaction of air by Linde's method. Adiabatic demagnetization. Numerical problems.	8	Black board/ Group discussion
5	**Thermodynamics:** Review of basic concepts, Carnot's theorem, thermodynamic scale of temperature and its identity with perfect gas scale. Clausius-Clapeyron first Latent heat equation, effect pressure on melting point of a solid, effect of pressure on boiling point of a liquid. Numerical problems.	7	Black board/ Group discussion
6	**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, concept of absolute zero and the third law of thermodynamics.	7	Black board/ Group discussion

	Numerical problems.		
7	**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, Tds equations for Cp and Cv, Heat capacity equations. Numerical problems.	**8**	Black board/ Group discussion
8	**Sound:** Waves in one dimension Differential equation of wave motion , Expression for velocity of progressive waves in a medium, Laplace's Correction to Newton's formula. Expression for frequency of vibration of a stretched string| harmonics, Longitudinal vibrations in a rod. Kundt's tube experiment, Numerical problems.	**7**	Black board/ Group discussion
9	**Analysis of complex waves:** The Fourier series|evaluation of Fourier coefficients, Example of the square wave, saw tooth wave.	**4**	Black board/ Group discussion
10	**Superposition of simple harmonic motion:** motion Lissajous' figures. Equation for damped vibrations. Forced vibration, solution in exponential form, Resonance, Expression for amplitude and phase at resonance. Numerical problems.	**6**	Black board/ Group discussion

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LESSON PLAN FOR THE ACADEMIC YEAR 2019-20
(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc Paper Name-ELECTRICITY and ELECTROMAGNETISM
CLASS –III SEM Total Hours-64hours

NAME OF THE FACULITIES-HJA, BS, HCP ,ANA
Duration – JULY TO NOV

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1	**Thermoelectricity:**The Thermocouple. Seebeck, Peltier and Thomson effects.Thermodynamic theory of thermoelectric effect. Neutral temperature.Temperature of inversion, The law of intermediate metals, and the law of intermediate temperatures. Numerical problems	6	Black board/ Group discussion
2	**Network Theorems:**Mesh analysis circuits using KVL and KCL. Statement and proof of Thevenin's theorem, Norton's theorem, and Superposition theorem.Applications to DC circuits. Numerical problems.	9	Black board/ Group discussion
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 theorems of Gauss and Stokes. Numerical problems.	5	Black board/ Group discussion
4	**Electromagnetic theory:**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. Accelerated charges and oscillating dipole. Hertz's experiment. Radiation loss|Synchrotron radiation. Numerical problems.	12	Black board/ Group discussion
5	**CRO:**Construction and working. Measurement of voltage, frequency and phase using a CRO.	3	Black board/ Group discussion
6	**DC currents:**Growth and decay of Current in RL, RC, and RLC Circuits, Numerical problems.	6	Black board/ Group discussion
7	**Alternating current:**Average, Peak, and RMS values. Response of LR, CR, and LCR circuits to sinusoidal voltages (discussion using the `j' symbols). Series Resonance and parallel resonance|half-power frequencies, bandwidth and Q-	11	Black board/ Group discussion

	factor. Power in electrical circuits|power factor. Maximum power transfer theorem for ac circuits (statement and proof). Numerical problems.		
8	**Applications of ac Circuits:** i) ac bridges|Anderson's bridge, Maxwell's bridge, de Sauty bridge, Robinson's bridge. Numerical problems.	**6**	Black board/ Group discussion
9	Frequency filters: ii) Frequency filters|High-pass and low-pass filters with LC, LR, and CR combinations.Expression for cut-off frequency. Band pass filters. Numerical problems including designing the filters.	**6**	Black board/ Group discussion

SRI ADICHUNCHANAGIRI FIRST GRADE COLLEGE, C R PATNA
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LESSON PLAN FOR THE ACADEMIC YEAR 2019-20
(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc Paper Name-OPTICS and SPECTROSCOPY
CLASS –IVSEM Total Hours-64hours

NAME OF THE FACULITIES-HJA, BS, HCP ,ANA
Duration – DEC TO APRIL

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1	**Interference:** Concept of coherent sources. Interference by division of wave front|Theory of Fresnel's biprism, Interference by division of amplitude|Thin films of uniform thickness, anti-reective coatings, Newton's rings. Interference at a wedge. Michelson's interferometer.Measurement of λ and dλ. Numerical problems.	8	Black board/ Group discussion
2	**Diffraction:** Fresnel and Fraunhofer diffraction. Explanation of rectilinear propagation of light. Theory of the zoneplate.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	Black board/ Group discussion
3	**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, Rotatory polarization. Use of biquartz. Elementary idea of Babinet compensator, Interference of polarized light-Expression for resultant intensity, calculation of thickness of wedge shaped	11	Black board/ Group discussion

	crystal plate(negative and positive), calculation of fringe width. Numericalproblems.		
4	**Lasers:** Properties, Metastable state. Spontaneous emission, stimulated emission, population inversion. Three level laser. The He-Ne laser, Ruby laser. Laser applications: Nuclear fusion, medical, communications, and industrial applications.	**5**	Black board/ Group discussion
5	**The Electron:** Determination of e/m of an electron by Thomson's method. Determination of charge of an electron by Millikan's oil drop method. Numerical problems.	**4**	Black board/ Group discussion
6	**Atomic Spectra:** A qualitative account of Summerfield relativistic atom model. Excitation and Ionization potentials Franck-Hertz experiment. Vector model of atom. Electron spin. Space quantization. Magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment. Spin-orbit interaction and the fine structure of spectral lines. Quantum number and selection rules. Pauli's exclusion principle. Electronic configuration of atoms. Valance electron. Brief mention of LS and JJ coupling for multi-electron atoms.	**12**	Black board/ Group discussion
7	**Zeeman effect:** Normal and anomalous effects, Experimental details of normal Zeeman effect, explanation of normal Zeeman effect on the basis of classical model, expression for the Zeeman shift. Numerical problems.	**4**	Black board/ Group discussion
8	**Molecular spectra and The Raman effect:** Rotation, vibration and electronic spectra of molecules, associated quantum numbers and selection rules. Theory of pure rotation spectra. Theory of rotational-vibration spectra. Raman effect Salient features, experimental setup to study Raman effect. Quantum Theory of Raman effect; Intensity and polarization of Raman lines; Applications.Fluorescence and phosphorescence. Numerical problems.	**12**	Black board/ Group discussion

SRI ADICHUNCHANAGIRI FIRST GRADE COLLEGE C R PATNA
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LESSON PLAN FOR THE ACADEMIC YEAR 2020-21
(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc Paper Name-Mechanic, Properties of Matter and Electrostatics
CLASS –I SEM Total Hours-64hours

NAME OF THE FACULITIES-HJA, BS, HCP ,ANA
Duration –JULY to NOV

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1.	**Frames of reference:** Inertial reference frames with examples. Uniform rectilinearmotion in an inertial frame|Galilean transformation equation. The Galilean principle of relativity. Motion in a non-inertial reference frame uniformlyaccelerated 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	5	Black board/ Group discussion
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8	**Surface Tension:** Basic concepts. Pressure inside curved liquid surface, examples.Surface tension and interfacial tension by drop-weight method. Surface tension of mercury by Quincke's method|Theory Numerical problems	**3**	Black board/ Group discussion
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Programme-BSc Paper Name-Heat thermodynamics and Sound
CLASS –II SEM Total Hours-64hours

NAME OF THE FACULITIES-HJA, BS, HCP ,ANA
Duration –DEC to APRIL

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
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Programme-BSc Paper Name-ELECTRICITY and ELECTROMAGNETISM
CLASS –III SEM Total Hours-64hours

NAME OF THE FACULITIES-HJA, BS, HCP ,ANA
Duration – JULY TO NOV

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
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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 theorems of Gauss and Stokes. Numerical problems.	5	Black board/ Group discussion
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5	**CRO:**Construction and working. Measurement of voltage, frequency and phase using a CRO.	3	Black board/ Group discussion
6	**DC currents:**Growth and decay of Current in RL, RC, and RLC Circuits, Numerical problems.	6	Black board/ Group discussion
7	**Alternating current:**Average, Peak, and RMS values. Response of LR, CR, and LCR circuits to sinusoidal voltages (discussion using the `j' symbols). Series Resonance and parallel resonance|half-power frequencies, bandwidth and Q-	11	Black board/ Group discussion

	factor. Power in electrical circuits|power factor. Maximum power transfer theorem for ac circuits (statement and proof). Numerical problems.		
8	**Applications of ac Circuits:** i) ac bridges|Anderson's bridge, Maxwell's bridge, de Sauty bridge, Robinson's bridge. Numerical problems.	**6**	Black board/ Group discussion
9	Frequency filters: ii) Frequency filters|High-pass and low-pass filters with LC, LR, and CR combinations.Expression for cut-off frequency. Band pass filters. Numerical problems including designing the filters.	**6**	Black board/ Group discussion

SRI ADICHUNCHANAGIRI FIRST GRADE COLLEGE, C R PATNA
Department of Physics
LESSON PLAN FOR THE ACADEMIC YEAR 2020-2021
(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc Paper Name-OPTICS and SPECTROSCOPY
CLASS –IVSEM Total Hours-64hours

NAME OF THE FACULITIES-HJA, BS, HCP ,ANA
Duration – DEC TO APRIL

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1	**Interference:** Concept of coherent sources. Interference by division of wave front|Theory of Fresnel's biprism, Interference by division of amplitude|Thin films of uniform thickness, anti-reective coatings, Newton's rings. Interference at a wedge. Michelson's interferometer.Measurement of λ and dλ. Numerical problems.	8	Black board/ Group discussion
2	**Diffraction:** Fresnel and Fraunhofer diffraction. Explanation of rectilinear propagation of light. Theory of the zoneplate.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	Black board/ Group discussion
3	**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, Rotatory polarization. Use of biquartz. Elementary idea of Babinet compensator, Interference of polarized light-Expression for resultant intensity, calculation of thickness of wedge shaped	11	Black board/ Group discussion

	crystal plate(negative and positive), calculation of fringe width. Numericalproblems.		
4	**Lasers:** Properties, Metastable state. Spontaneous emission, stimulated emission, population inversion. Three level laser. The He-Ne laser, Ruby laser. Laser applications: Nuclear fusion, medical, communications, and industrial applications.	**5**	Black board/ Group discussion
5	**The Electron:** Determination of e/m of an electron by Thomson's method. Determination of charge of an electron by Millikan's oil drop method. Numerical problems.	**4**	Black board/ Group discussion
6	**Atomic Spectra:** A qualitative account of Summerfield relativistic atom model. Excitation and Ionization potentials Franck-Hertz experiment. Vector model of atom. Electron spin. Space quantization. Magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment. Spin-orbit interaction and the fine structure of spectral lines. Quantum number and selection rules. Pauli's exclusion principle. Electronic configuration of atoms. Valance electron. Brief mention of LS and JJ coupling for multi-electron atoms.	**12**	Black board/ Group discussion
7	**Zeeman effect:** Normal and anomalous effects, Experimental details of normal Zeeman effect, explanation of normal Zeeman effect on the basis of classical model, expression for the Zeeman shift. Numerical problems.	**4**	Black board/ Group discussion
8	**Molecular spectra and The Raman effect:** Rotation, vibration and electronic spectra of molecules, associated quantum numbers and selection rules. Theory of pure rotation spectra. Theory of rotational-vibration spectra. Raman effect Salient features, experimental setup to study Raman effect. Quantum Theory of Raman effect; Intensity and polarization of Raman lines; Applications.Fluorescence and phosphorescence. Numerical problems.	**12**	Black board/ Group discussion

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LESSON PLAN FOR THE ACADEMIC YEAR 2020-21

(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-III BSc Paper Name-NUCLEAR and THEORETICAL PHYSICS
CLASS –VSEM Total Hours-48hours

NAME OF THE FACULITIES - HJA, BS, HCP ,ANA
Duration – SEP to FEB

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1	**Special theory of relativity:** Michelson-Morley experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz transformations (no derivation).Lorentz contraction. Time dilation. Relativistic transformation of velocity,Relativistic addition of velocities. Variation of mass with velocity. Rest mass.Massless particles. Mass energy equivalence, E = mc2. The energy-momentum relation. The principle of equivalence.	8	Black board/ Group discussion
2	**Cosmic rays and particle physics:** Cosmic ray discovery; Primary and secondary cosmic rays|their composition. Cosmic ray showers. Origin of cosmic rays, Mention of the basic interactions in nature; Particles and anti-particles.Types of interaction between elementary particles, Classification of particles. Conservation laws. A qualitative introduction to quarks (quark model). Numerical problems.	4	Black board/ Group discussion
3	**Mass spectrographs:** Theory of Dempster and Aston mass spectrograph. Numerical problems.	2	Black board/ Group discussion
4	**Nuclear detectors:** Bubble chamber. GM counter. Principle of semiconductor detector.	2	Black board/ Group discussion
5	**The nucleus:** Properties of nucleus. Discovery of neutron. The proton neutron hypothesis. Nuclear forces and their characteristics. Yukawa's theory (qualitative).	2	Black board/ Group discussion
6	**Radioactive decay:** Successive disintegration, Radioactive equilibrium, Range and energy of alpha-particle and their measurements. Theory of alpha-decay(qualitative). Geiger-Nuttal law. Beta Decay|Pauli's neutrino hypothesis, K electron capture, internal conversion. Nuclear isomerism. Mirror nuclei. Numerical problems.	4	Black board/ Group discussion
7	**Accelerators:** Cockroft-Walton voltage multiplier, Cyclotron, and Betatron.Numerical problems.	3	Black board/ Group discussion

8	**Nuclear reactions:** Q-values. Threshold energy of an endoergic reaction. Reactions induced by proton, deuteron and particles. Numerical problems.	**2**	Black board/ Group discussion
9	**Nuclear models:** Liquid-drop model. Semi-empirical mass formula. Shell model, and magic numbers. Numerical problems.	**2**	Black board/ Group discussion
10	**Nuclear fission, and fusion:** Estimation of the _ssion energy on the basis of the liquid drop model, The four-factor formula, Thermo-nuclear reactions sources of stellar energy. The C-N cycle, Numerical problems.	**3**	Black board/ Group discussion
11	**Matter waves:** Failure of classical mechanics in the microscopic domain. Black body radiation, Hydrogen atom, Specific heats of solids, Fine structure of spectral lines, Particle and wave nature in classical mechanics. Dual nature of light and Matter, de Broglie's concept of matter waves, Expression for de Broglie's wave, Phase and group velocity. Experiments of Thomson and of Davisson and Germer. Heisenberg's uncertainty principle, Examples of position-momentum uncertainty|the gamma ray microscope (thought experiment). Numerical problems.	**7**	Black board/ Group discussion
12	**Schrödinger's equation:** Eigenvalues, eigenfunctions; Eigenvalue equation,Dynamical variables as operators, Hermitian operators. Postulates of quantum mechanics. Setting up the time-independent Schrodinger equation and timedependent Schrodinger equation. The notion of probability and Born's interpretation of the wave function. Solution of the time-independent Schrodinger equation for particle in one-dimensional infinite potential|calculation of its energy eigenvalues. Harmonic oscillator|mention of energy eigenvalues and eigen zero-point energy. Numerical problems.	**9**	Black board/ Group discussion

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LESSON PLAN FOR THE ACADEMIC YEAR 2020-21
(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc Paper Name-(SEC) Lasers and Fibre Optics
CLASS –VSEM
NAME OF THE FACULITIES - HJA, BS, HCP ,ANA Total Hours-32hours
DURATION: SEP TO FEB

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
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.	5	Black board/ Group discussion
2	**Laser oscillator:** Pumping schemes, Gain{threshold conditions; Optical resonators.	3	Black board/ Group discussion
3	**Types of lasers:** Construction and principles of working of Nd-YAG, CO2 and dye lasers and semiconductor laser.	4	Black board/ Group discussion
4	**Laser diodes:** Lasing conditions and gain in a semiconductor, selective ampli-cation and coherence, Materials for laser diodes, quantum well lasers, surface emitting lasers, characterization and modulation of lasers.	4	Black board/ Group discussion
5	**Fibre optics and dielectric wave guides:** Wave Guide|Slab wave guide, Modes, V number, Modal material and waveguide dispersions, Numerical problems.	3	Black board/ Group discussion
6	**Optical fibre:** Types, functions, light propagation, optical power, velocity of propagation, critical angle, acceptance angle, numerical aperture, mode of propagation. Numerical problems.	3	Black board/ Group discussion
7	**Index profile:** Single mode step-index optical fibre, multimode step-index fibre, graded index fibre ; advantages and disadvantages. Numerical problems.	4	Black board/ Group discussion
8	**Energy losses in optical fibre:** Bit rate, dispersion optical _bre communication, and optical bandwidth, Absorption and scattering, optocoupler.	6	Black board/ Group discussion

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LESSON PLAN FOR THE ACADEMIC YEAR 2020-21
(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc **Paper Name- Solid State Physics**
CLASS –VI SEM
NAME OF THE FACULITIES - HJA, BS, HCP ,ANA

DURATION- APRIL TO JULY Total Hours-48hours

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1	**Semiconductors:** Concept of bands in solids. Intrinsic and extrinsic semiconductors. Depletion region, drift velocity, expression for electron and hole concentration in intrinsic semiconductor under thermal equilibrium. Derivation of the expression for electrical conductivity of intrinsic semiconductors; electron and hole mobilities; Expression for the energy gap; Hall e_ect in semiconductors. Numerical problems.	6	Black board/ Group discussion
2	**Semiconductor devices:** Diode current equation, IV characteristics, Bridge rectifier, Expression for ripple factor and efficiency. Filters|Zener breakdown and avalanche breakdown. Phenomenon of photoconductivity, photovoltaic cells, LED, FET. Numerical problems.	4	Black board/ Group discussion
3	**Transistors:** Type and configuration, h parameters; Methods of transistor biasing|voltage divider bias; Fixing operating point, drawing load line. Effect of temperature on the operating point.	2	Black board/ Group discussion
4	**Amplifier:** Two stage transistor RC coupled amplifier, mathematical analysis, frequency response curve, half power frequency bandwidth.	2	Black board/ Group discussion
5	**Oscillators:** The feedback concept|positive and negative feedback. Mention of the Barkhausen criterion. Hartley oscillator.	2	Black board/ Group discussion
6	**Statistical physics:** Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac energy distribution formulae (no derivation). A qualitative comparison of the three distribution formulae.	2	Black board/ Group discussion
7	**Dielectric properties:** Dielectric materials; their properties. Method of determining dielectric constant for solids and liquids.	2	Black board/ Group discussion
8	**Thermal properties of solids:** Dulong and Petit's law; its limitations. Einstein's theory of specific heat. Debye's theory of specific heat. Numerical Problems.	3	Black board/ Group discussion

9	**Electrical properties of metals:** Band theory of solids review, Free electron theory of metals classical theory and quantum theory. Expression for electrical conductivity Ohm's law, Wiedemann-Franz law. Statement of number of the available energy states between E and E+dE. Expression for the Fermi energy. Hall effect and magneto resistance in metals. Expression for Hall coefficient in metals. Numerical problems.	**6**	Black board/ Group discussion
10	**Logic gates:** Construction of AND, OR, and NOT logic gates using Diodes and transistors (two input). Symbols and discussion of truth table using Boolean expressions for NOR, NAND, and XOR logic gates. Half adder and full adder.	**3**	Black board/ Group discussion
11	**Superconductivity:** Elementary ideas and experimental facts. Meissner effect. Magnetic properties of type-I and type-II superconductors, Critical magnetic field. Influence of external agents on superconductivity, Cooper pairs, BCS theory (qualitative). Applications of superconductivity. Introduction to high temperature superconductors.	**4**	Black board/ Group discussion
12	**Liquid crystals:** Symmetry, structure, and classification of liquid crystals; polymorphism in thermo tropics.	**2**	Black board/ Group discussion
13	**X-rays:** Brag's law and the Bragg spectrometer. A brief mention of the different types of crystals. Miller indices, structure of NaCl and KCl crystals. Continuous X-ray spectrum and its origin, Duane and Hunt limit. Characteristic X-ray spectra and its origin. Mosley law and its significance. Compton effect Expression for Compton shift, Compton wavelength, Verification of change in wavelength;Reason for non-observance of Compton effect in visible light. Numerical problems.	**10**	Black board/ Group discussion

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LESSON PLAN FOR THE ACADEMIC YEAR 2020-21

(ANNEXURE-1.2) Criterion 01 (Metric -1.1.1)

Programme-BSc

Paper Name-(SEC) Optoelectronics

CLASS –VI SEM

Total Hours-32hours

NAME OF THE FACULITIES - HJA, BS, HCP ,ANA

DURATION – APRIL TO JULY

Sl.NO.	Topic covered	No. of Lecture Hours	Methodology/pedagogy
1	**Optical process in a semiconductor:** Electron-hole pair formation and recombination, absorption in semiconductor direct and indirect band gap semiconductors, effect of electric field on absorption, Franz-Keldysh effect in semiconductors.	4	Black board/ Group discussion
2	**Optoelectronic devices:** Light Emitting Diodes|Materials for light emitting diodes, Principle of action of LED, expression for light power in terms of photon energy, homostructured LED and Heterojunction LED, drawbacks of homostructured LED. Types of LED structures|planar, dome type, surface emitter, edge emitter, super luminescent structure. Performance characteristics of LED |Optical output power-current characteristics, forward current voltage characteristics, Modulation bandwidth, power bandwidth product, Lifetime, Rise time/fall time, reliability, Internal quantum e_ciency, advantages / disadvantages of using LED. Numerical problems.	10	Black board/ Group discussion
3	**Organic optoelectronic devices:** Organic light emitting diodes (OLED), Theprinciple of OLED, characterisation, structure, efficiency, multilayer OLED.	2	Black board/ Group discussion
4	**Photo detectors:** Important parameters of photodetectors, Detector responsivity, spectral response range, response time, quantum effciency, capacitance,noise characteristics. Absorption of radiation| absorption coefficient, mention of expression for photocurrent, long wavelength cut off, direct and indirect absorption. Types of photodiodes|Junction photodiodes, pin diode,avalanche photodiodes, CCD photodetectors; Comparison of different detectors,Photomultiplier tubes. Phototransistors| characteristics. Photo conductive Detectors |expression for photoconductive gain (as in the book of Kasap S.O.). Numerical problems.	10	Black board/ Group discussion
5	**Photovoltaic devices:** Solar cell|IV characteristics, effciency, materials.Organic photovoltaic diodes (OPVD) fundamental process, exciton absorption, exciton dissociation, charge transport, charge collection, characterisation. Numerical problems.	6	Black board/ Group discussion