Lesson plan for the odd semester July to November 2019

Subject-Computer Programming and Thermodynamics

Class-B.Sc-second Year (3rd Semester)

July,2019 **3rd Week** **4th Week**	Computer organization, binary representation, algorithm development, flow-chart and their interpretation.
5th Week	Fortran preliminaries: integer and floating points arithmetic expression, built-in-function, executable and non-executable statement , input and output statements,
	Formats, If, Do and Go To statements, dimension arrays, statements function and function subprogram
August,2019 **1st Week**	Program of natural numbers , range of the set of given numbers, ascending and descending order
2nd Week	Mean and standard deviation, least square fitting of curve , roots of quadratic equation, product of two matrices
3rd Week	Numerical integration (Trapezoidal rule and Simpson 1/3 rule)
4th Week	Revision
5th Week	class problems and class test

September ,2019 1st Week	Thermodynamic system and Zeroth law of thermodynamics .first law of thermodynamics and its limitations, reversible and irreversible process . second law of thermodynamics and its significance ,Carnot theorem , Absolute scale of temperature
2nd Week	Absolute scale and magnitude of each division on work scale and perfect gas scale , joule free expension, joule Thomson effect, joule Thomson experiment , conclusions and explanation, analytical treatment of Joule Thomson effect.
3rd Week	Entropy ,calculations of entropy of reversible and irreversible process, T-S diagram, entropy of perfect gas, Nernst heat law
4th Week	Liquefaction of gases (oxygen , air, hydrogen and helium) , solidification of He below 4K ,cooling by adiabatic demagnetization
October ,2019 1st Week	Sessionals
2nd Week	Derivation of Clausius – Clapreyron and clausius latent heat equation and their significance, specific heat of saturated vapours , phase diagram and triple point of a substance
3rd Week	Maxwell thermodynamical relations, thermodynamical functions: Internal energy ,Helmholtz function, Enthalpy, Gibbs function
4th Week	**Vacations w.e.f. 24th Oct to 30th oct,2019**
Nov,2019 1st Week	Application of Maxwell relation: relation b/w to specific heats of gas, derivation of clausius-clapeyron equation , variation of intrinsic energy with volume for (1) perfect gas (2)vander wall gas
2nd Week	Derivation of Stefens law, deduction of theory of joule Thomson effect

Lesson plan for the odd semester July to November 2019

Subject-Laser physics(Unit 3,Unit4),Nuclear Physics (Unit 3,Unit4)

Class-B.Sc.(5th semester)

July,2019 **3rd Week**	Absorption and emission of radiation, Main features of a laser: Directionality, high intensity, high degree of coherence,
4th Week	spatial and temporal coherence, Einstein's coefficients and possibility of amplification, momentum transfer
5th Week	life time of a level, kinetics of optical absorption ((two and three level rate equation, Fuchbauer landerburg formula).population inversion:
August,2019 **1st Week**	A necessary condition for light amplification, resonance cavity, laser pumping, Threshold condition for laser emission, line broadening mechanism,
2nd Week	homogeneous and inhomogeneous line broadening (natural, collision and Doppler broadening). He-Ne laser(Principle, Construction and working)
3rd Week	RUBY laser (Principle, Construction and working),
4th Week	Optical properties of semiconductor, Semiconductor laser (Principle, Construction and working),
5th Week	Applications of lasers in the field of medicine and industry Revision of Unit 3

September ,2019 1st Week	Revision of Unit 4
2nd Week	Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators
3rd Week	Gas filled counters; Ionization chamber, proportional counter,
4th Week	G.M. Counter (detailed study), Scintillation counter and semiconductor detector.
October ,2019 1st Week	Sessionals
2nd Week	Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration, Photonuclear reaction
3rd Week	Radiative capture, Direct reaction, Heavy ion reactions and spallation Reactions. Conservation laws, Q-value and reaction threshold**. Revision of Unit 3**
4th Week	**Vacations w.e.f. 24th Oct to 30th oct,2019**
Nov,2019 1st Week	Nuclear Reactors, General aspects of Reactor Design
2nd Week	Nuclear fission and fusion reactors, (Principle, construction, working and use). **Revision of unit 4**

Lesson plan for the odd semester July to November 2019

Subject-Wave and Optics
Class-B.Sc(semester 3rd)

July,2019 3rd Week	Interference by Division of wave front,Young's double slit experiment,Coherenc,conditions of Interference
4th Week	Fresnel's biprism and its applications to determination of wavelength of sodium light and thickness of a mica sheet
5th Week	Lloyd's mirror
August,2019 1st Week	Difference between Bi-prism and Lloyd's mirror fringes,phase change on reflection
2nd Week	Interference by division of Amplitude,thin films,plane parallel film
3rd Week	Interference due to transmitted light,wedge shaped film,Newton's rings
4th Week	Interferometers; Michelson interferometer and its applications to 1)standardization of a meter 2)determination of wavelength
5th Week	Revision of Unit 1

September ,2019 1st Week	Revision of unit 2
2nd Week	Huygen's Fresnel's diffraction: Fresnel's assumptions and half period zones, rectilinear propagation of light
3rd Week	zone plate, diffraction at a straight edge, rectangular slit and circular aperture,
4th Week	diffraction due to a narrow slit and wire + Revision of Unit 3
October ,2019 1st Week	Sessionals
2nd Week	Fraunhoffer diffraction: single-slit diffraction, double-slit diffraction
3rd Week	N-slit diffraction, plane transmission granting spectrum,
4th Week	**Vacations w.e.f. 24th Oct to 30th oct,2019**
Nov,2019 1st Week	dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating. Differences between prism and grating spectra.
2nd Week	Revision of unit 4

Lesson plan for the odd semester July to November 2019

Subject-CLASSICAL MECHANICS
Class-B.Sc.-First Year (1st Semester)

July,2019 **3rd Week**	**Unit 1: Basic concepts of Classical mechanics** Mechanics of single and system of particles, Conversion law of linear momentum,
4th Week	Conversion law of Angular momentum and mechanical energy for a particle and a system of particles,
5th Week	Centre of Mass and equation of motion
August,2019 **1st Week**	Constrained Motion, Numerical problems and Revision
2nd Week	**Unit2: Generalized Notations** Degrees of freedom and Generalized coordinates, Transformation equations, Generalized Displacement
3rd Week	Generalized Velocity, Acceleration, Momentum, Force and Potential, Hamilton's variational principle
4th Week	Lagrange's equation of motion from Hamilton's principle, Linear Harmonic oscillator, Simple pendulum, Atwood's machine.
5th Week	Numerical problems and Revision.

September ,2019 1st Week	**Unit 3: Theory of relativity** Frame of reference, limitation of Newton's law of motion, Inertial frame of reference, Galilean transformation, Frame of reference with linear acceleration
2nd Week	Classical relativity-Galilean invariance, Transformation equation for a frame of reference- inclined to an inertial frame and Rotating frame of reference,
3rd Week	Non-inertial frames-The accelerated frame of reference and Rotating frame of reference,
4th Week	Numericals and short Answers
October ,2019 1st Week	Sessionals
2nd Week	Effect of centrifugal and coriolis forces due to Earth's rotation, Fundamental frame of reference, Michelson- Morley's experiment,concept of Einstein's relativity.
3rd Week	**Unit 4: Applications of theory of relativity** Special theory of relativity, Lorentz co-ordinate and physical significance of Lorentz invariance
4th Week	**Vacations w.e.f. 24th Oct to 30th oct,2019**
Nov,2019 1st Week	Length Contraction, Time Dilation, Twin Paradox, Velocity addition theorem, Variation of mass with velocity, Mass energy equivalence
2nd Week	Transformation of relativistic momentum and energy, relation between relativistic momentum and energy,Mass, velocity, momentum and energy of zero rest mass.

Lesson plan for the odd semester July to November 2019

Subject-Computer Programming and Thermodynamics

Class-B.Sc-second Year (3rd Semester)

July,2019 **3rd Week** **4th Week**	Computer organization, binary representation, algorithm development, flow-chart and their interpretation.
5th Week	Fortran preliminaries: integer and floating points arithmetic expression, built-in-function, executable and non-executable statement , input and output statements,
	Formats, If, Do and Go To statements, dimension arrays, statements function and function subprogram
August,2019 **1st Week**	Program of natural numbers , range of the set of given numbers, ascending and descending order
2nd Week	Mean and standard deviation, least square fitting of curve , roots of quadratic equation, product of two matrices
3rd Week	Numerical integration (Trapezoidal rule and Simpson 1/3 rule)
4th Week	Revision
5th Week	class problems and class test

September ,2019 1st Week	Thermodynamic system and Zeroth law of thermodynamics .first law of thermodynamics and its limitations, reversible and irreversible process . second law of thermodynamics and its significance ,Carnot theorem , Absolute scale of temperature
2nd Week	Absolute scale and magnitude of each division on work scale and perfect gas scale , joule free expension, joule Thomson effect, joule Thomson experiment , conclusions and explanation, analytical treatment of Joule Thomson effect.
3rd Week	Entropy ,calculations of entropy of reversible and irreversible process, T-S diagram, entropy of perfect gas, Nernst heat law
4th Week	Liquefaction of gases (oxygen , air, hydrogen and helium) , solidification of He below 4K ,cooling by adiabatic demagnetization
October ,2019 1st Week	Sessionals
2nd Week	Derivation of Clausius – Clapreyron and clausius latent heat equation and their significance, specific heat of saturated vapours , phase diagram and triple point of a substance
3rd Week	Maxwell thermodynamical relations, thermodynamical functions: Internal energy ,Helmholtz function, Enthalpy, Gibbs function
4th Week	## Vacations w.e.f. 24th Oct to 30th oct,2019
Nov,2019 1st Week	Application of Maxwell relation: relation b/w to specific heats of gas, derivation of clausius-clapeyron equation , variation of intrinsic energy with volume for (1) perfect gas (2)vander wall gas
2nd Week	Derivation of Stefens law, deduction of theory of joule Thomson effect

Lesson plan for the odd semester July to November 2019

Subject-Electricity
Class-B.Sc- First Year (1ST Semester)

July,2019 **3rd Week**	**Unit I: Vector background and Electric field** Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance
4th Week	Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem.
5th Week	Derivation of electric field E from potential as gradient, Derivation of Laplace and Poisson equations, Electric flux
August,2019 **1st Week**	Gauss's Law, Mechanical force of charged surface,Energy per unit volume. Revision
2nd Week	Magnetic induction, Magnetic flux, Solenoidal nature of vector field of induction, properties of B (i) Div (B)=0 (ii) Curl (B)=μJ
3rd Week	Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory)
4th Week	Cycle of magnetization- hystresis loop (Energy dissipation, Hystresis loss and importance of Hystresis Curve)
5th Week	**Unit 3: Electromagnetism** Maxwell equations and their derivations, Displacement current, Vector and Scalar potentials

September ,2019 **1st Week**	Boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation), Poynting vector and Poynting theorem.
2nd Week	Revision of unit 1 and class test
3rd Week	**Unit 4: A. C. Analysis** A.C. circuit analysis using complex variable with (a) Capacitance and Resistance (CR)(b) Resistance and Inductance (LR)
4th Week	Revision of unit 1 and class test
October ,2019 **1st Week**	sessional
2nd Week	(c) Capacitance and Inductance (LC) and (d) Capacitance, Inductance and Resistance (LCR),
3rd Week	Series and parallel resonance circuit, Sessional Discussion
4th Week	**Vacations w.e.f. 24th Oct to 30th oct,2019**
Nov,2019 **1st Week**	Quality factor (sharpness of resonance).Revision of Unit 3
2nd Week	Revision of Unit 4

Lesson plan for the odd semester July to November 2019

Subject-CLASSICAL MECHANICS

Class-B.Sc.-First Year (1st Semester)

July,2019 **3rd Week**	**Unit 1: Basic concepts of Classical mechanics** Mechanics of single and system of particles, Conversion law of linear momentum,
4th Week	Conversion law of Angular momentum and mechanical energy for a particle and a system of particles,
5th Week	Centre of Mass and equation of motion
August,2019 **1st Week**	Constrained Motion, Numerical problems and Revision
2nd Week	**Unit2: Generalized Notations** Degrees of freedom and Generalized coordinates, Transformation equations, Generalized Displacement
3rd Week	Generalized Velocity, Acceleration, Momentum, Force and Potential, Hamilton's variational principle
4th Week	Lagrange's equation of motion from Hamilton's principle, Linear Harmonic oscillator, Simple pendulum, Atwood's machine.
5th Week	Numerical problems and Revision.

September ,2019 1st Week	**Unit 3: Theory of relativity** Frame of reference, limitation of Newton's law of motion, Inertial frame of reference, Galilean transformation, Frame of reference with linear acceleration
2nd Week	Classical relativity-Galilean invariance, Transformation equation for a frame of reference- inclined to an inertial frame and Rotating frame of reference,
3rd Week	Non-inertial frames-The accelerated frame of reference and Rotating frame of reference,
4th Week	Numericals and short Answers
October ,2019 1st Week	Sessionals
2nd Week	Effect of centrifugal and coriolis forces due to Earth's rotation, Fundamental frame of reference, Michelson- Morley's experiment,concept of Einstein's relativity.
3rd Week	**Unit 4: Applications of theory of relativity** Special theory of relativity, Lorentz co-ordinate and physical significance of Lorentz invariance
4th Week	**Vacations w.e.f. 24th Oct to 30th oct,2019**
Nov,2019 1st Week	Length Contraction, Time Dilation, Twin Paradox, Velocity addition theorem, Variation of mass with velocity, Mass energy equivalence
2nd Week	Transformation of relativistic momentum and energy, relation between relativistic momentum and energy,Mass, velocity, momentum and energy of zero rest mass.

Lesson plan for the odd semester July to November 2019

Subject-Quantum Mechanics(unit 1 & 2) And Nuclear Physics(Unit 1& 2)

Class-B.Sc- Third Year(3rd Semester)

July,2019 **3rd Week**	**Unit I: Nuclear Structure and Properties of Nuclei** Determination of size of nuclei by Rutherford Back Scattering, Nuclear composition (p-e and p-n hypotheses),
4th Week	Nuclear properties; Nuclear size, spin, parity, statistics, magnetic dipole moment, quadruple moment (shape concept). mass and binding energy, systematic of nuclear binding energy, nuclear stability
5th Week	Determination of mass by Bain-Bridge, Bain-Bridge and Jordan mass spectrograph. Determination of charge by Mosley Law.
August,2019 **1st Week**	**Unit II: Nuclear Radiation decay Processes** **Radiation interaction** Interaction of heavy charged particles (Alpha particles); Energy loss of heavy charged particle (idea of Bethe formula, no derivation), Range and straggling of alpha particles.
2nd Week	Geiger-Nuttal law. Interaction of light charged particle (Beta-particle), Energy loss of beta-particles (ionization), Range of electrons, absorption of beta-particles
3rd Week	Interaction of Gamma Ray; Passage of Gamma radiations through matter (Photoelectric, Compton and pair production effect) electron-positron annihilation. Absorption of Gamma rays (Mass attenuation coefficient) and its application.
4th Week	Alpha-disintegration and its theory. Energetics of alpha-decay, Origin of continuous beta spectrum (neutrino hypothesis), types of beta-decay and energetics of beta-decay. Nature of gamma rays, Energetics of gamma rays.
5th Week	Revision

September ,2019 **1st Week**	**Unit I: Origin quantum physics (Experimental basis)** Overview, scale of quantum physics, boundary between classical and quantum phenomena, Photon, Photoelectric effect, Compton effect (theory and result), Frank-Hertz experiment, de-Broglie hypothesis.
2nd Week	Davisson and Germer experiment, ・G.P.Thomson experiment. Phase velocity, group velocity and their relation. Heisenberg's uncertainty principle.
3rd Week	Time energy and angular momentum, position uncertainty.Uncertainty principle from de Broglie wave. (Wave-particle duality). Gamma Ray Microscope, Electron diffraction from a slit.
4th Week	Derivation of 1-D time-dependent Schrodinger wave equation (subject to force, free particle). Time-independent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance.
October ,2019 **1st Week**	Sessionals
2nd Week	Orthogonality and Normalization of function, concept of observer and operator. Expectation values of dynamical quantities, probability current density. Revision
3rd Week	**Unit II: Application of Schrodinger wave equation:** (i) Free particle in one-dimensional box (solution of Schrodinger wave equation,eigen functions, eigen values, quantization of energy and momentum, nodes and anti nodes, zero point energy). ii) One dimensional step potential E > Vo (Reflection and Transmission coefficient)
4th Week	**Vacations w.e.f. 24th Oct to 30th oct,2019**
Nov,2019 **1st Week**	(iii) One dimensional step potential E < Vo (penetration depth calculation). (iv) One dimensional potential barrier, E > Vo (Reflection and Transmission coefficient)
2nd Week	(v) One-dimensional potential barrier, E < Vo (penetration or tunneling coefficient). (vi) Solution of Schrodinger equation for harmonic oscillator (quantization of energy, Zero-point energy, wave equation for ground state and excited states). Revision

Lesson plan for the odd semester July to November 2019

Subject-Laser physics(Unit 3,Unit4),Nuclear Physics (Unit 3,Unit4)

Class-B.Sc.(5th semester)

July,2019 **3rd Week**	Absorption and emission of radiation, Main features of a laser: Directionality, high intensity, high degree of coherence,
4th Week	spatial and temporal coherence, Einstein's coefficients and possibility of amplification, momentum transfer
5th Week	life time of a level, kinetics of optical absorption ((two and three level rate equation, Fuchbauer landerburg formula).population inversion:
August,2019 **1st Week**	A necessary condition for light amplification, resonance cavity, laser pumping, Threshold condition for laser emission, line broadening mechanism,
2nd Week	homogeneous and inhomogeneous line broadening (natural, collision and Doppler broadening). He-Ne laser(Principle, Construction and working)
3rd Week	RUBY laser (Principle, Construction and working),
4th Week	Optical properties of semiconductor, Semiconductor laser (Principle, Construction and working),
5th Week	Applications of lasers in the field of medicine and industry Revision of Unit 3

September ,2019 1st Week	Revision of Unit 4
2nd Week	Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators
3rd Week	Gas filled counters; Ionization chamber, proportional counter,
4th Week	G.M. Counter (detailed study), Scintillation counter and semiconductor detector.
October ,2019 1st Week	Sessionals
2nd Week	Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration, Photonuclear reaction
3rd Week	Radiative capture, Direct reaction, Heavy ion reactions and spallation Reactions. Conservation laws, Q-value and reaction threshold**. Revision of Unit 3**
4th Week	**Vacations w.e.f. 24th Oct to 30th oct,2019**
Nov,2019 1st Week	Nuclear Reactors, General aspects of Reactor Design
2nd Week	Nuclear fission and fusion reactors, (Principle, construction, working and use). **Revision of unit 4**

Lesson plan for the odd semester July to November 2019

Subject-Wave and Optics
Class-B.Sc(semester 3rd)

July,2019 **3rd Week**	Interference by Division of wave front,Young's double slit experiment,Coherenc,conditions of Interference
4th Week	Fresnel's biprism and its applications to determination of wavelength of sodium light and thickness of a mica sheet
5th Week	Lloyd's mirror
August,2019 **1st Week**	Difference between Bi-prism and Lloyd's mirror fringes,phase change on reflection
2nd Week	Interference by division of Amplitude,thin films,plane parallel film
3rd Week	Interference due to transmitted light,wedge shaped film,Newton's rings
4th Week	Interferometers; Michelson interferometer and its applications to 1)standardization of a meter 2)determination of wavelength
5th Week	Revision of Unit 1

September ,2019 **1st Week**	Revision of unit 2
2nd Week	Huygen's Fresnel's diffraction: Fresnel's assumptions and half period zones, rectilinear propagation of light
3rd Week	zone plate, diffraction at a straight edge, rectangular slit and circular aperture,
4th Week	diffraction due to a narrow slit and wire + Revision of Unit 3
October ,2019 **1st Week**	Sessionals
2nd Week	Fraunhoffer diffraction: single-slit diffraction, double-slit diffraction
3rd Week	N-slit diffraction, plane transmission granting spectrum,
4th Week	**Vacations w.e.f. 24th Oct to 30th oct,2019**
Nov,2019 **1st Week**	dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating. Differences between prism and grating spectra.
2nd Week	Revision of unit 4