DEPARTMENT OF PHYSICS

MAHATMA GANDHI UNIVERSITY, NALGONDA

Semester wise Blow up of Syllabi (2017-18)

Blow up of Syllabi

B.Sc Physics Course under CBCS

(W.e.f academic Year 2017-18)

I - SEMESTER STARTS HERE

Paper-I **SUB: MECHANICS**

Lecture No.	Topic	Remarks
UNIT-I VECTOR ANALYSIS		
Lecture-1	Introduction & Syllabus Analysis	
Lecture-2	Basic Concepts ,Partial differentiation	
Lecture-3	Scalar field, Vector Field ,Gradient of Scalar field-physical Significance	
Lecture-4	Divergence of a Vector Field-Physical Significance	
Lecture-5	Curl of a Vector Field-Physical Significance	
Lecture-6	Vector Integration-Line, Surface & Volume Integrals – Physical Significance	
Lecture-7	Gauss Divergence Theorem	
Lecture-8	Stokes Theorem	
Lecture-9	Greens Theorem	
Lecture-10	Problems on Gauss Theorem, Stokes Theorem & Green's Theorem	
Lecture-11	Problems	
Lecture-12	Problems	
UNIT-II Mechanics of Particles		
Lecture-13	Newton's Laws of Motion & Relation Between them, Inertia, F= ma derivation	
Lecture-14	Linear Momentum, Conservation of Linear Momentum-Examples	
Lecture-15	System of Variable Mass – Newton II Law for Variable Mass System	
Lecture-16	Motion of a Rocket-Expression for Final Velocity at any instant of time –cases	
Lecture-17	Multistage Rocket – Conservation Energy –Conservative Force & Non-Conservative Force with examples	
Lecture-18	Concept of Collisions & Types -Two & Three Dimensional Collisions (Definitions)–Two Dimensional Oblique Collision-Expression for Final Velocities.	
Lecture-19	Special case of Two Dimensional Elastic Collision - Expression for Final Velocities	
Lecture-20	Impact Parameter, Distance of Closest approach & Scattering Cross Section (Concepts Only)	
Lecture-21	Problems	
UNIT-II Mechanics of Rigid Bodies		
Lecture-22	Definitions of Rigid Body, Torque, Angular Momentum & Moment of Inertia ,Rotational Kinetic Energy, Radius of Gyration	
Lecture-23	Rotational Kinematic Relations	
Lecture-24	Equation of motion for a Rigid Body (Rotating rigid Body)	
Lecture-25	Expression for Moment of Inertia Tensor	
Lecture-26	Expression for Euler Equations	
Lecture-27	Application of Euler Equations	
Lecture-28	Precession of a Symmetric top-Expression for Precessional velocity	
Lecture-29	Construction & working of Gyroscope	
Lecture-30	Problems	

UNIT-III CENTRAL FORCES		
Lecture-31	Definition & Examples of Central Force	
Lecture-32	Characteristics of Central Force(Conservative Nature of Central force & Conservation of Angular Momentum)	
Lecture-33	Conservative (Central) force as Negative Gradient of Potential energy, Acceleration of a particle under central force in Polar Coordinates	
Lecture-34	Equation of Motion of a particle under a central force	
Lecture-35	Gravitational Field, Gravitational Potential	
Lecture-36	Kepler's Laws –Proof of Kepler's First Law	
Lecture-37	Proof of Kepler's First Law	
Lecture-38	Proof of Kepler's Second & Third Law	
Lecture-39	Rotating Frame s of reference –Expression for Corioli's force	
Lecture-40	Consequences of Corioli's force	
Lecture-41	Problems	
UNIT-IV Special Theory of Relativity		
Lecture-42	Inertial & Non-Inertial Frames of Reference ,Galilean Transformations	
Lecture-43	Michelson –Morley Experiment –Explanation of Null Result	
Lecture-44	Postulates of Special Theory of Relativity – Lorentz Transformation Equations	
Lecture-45	Consequences of Lorentz Transformation Equations- Length Contraction ,Time dilation	
Lecture-46	Addition of Velocities, Relative mass Expression	
Lecture-47	Mass-Energy Equivalence	
Lecture-48	Momentum energy relations	
Lecture-49	Concept of Four Vector formalism	
Lecture-50	Problems	
Lecture-51	Problems	

Textbooks :

1. Berkeley Physics Course. Vol.1, Mechanics by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008*.
2. Fundamentals of Physics. Halliday/Resnick/Walker *Wiley India Edition 2007*.
3. First Year Physics - *Telugu Academy*.
4. Introduction to Physics for Scientists and Engineers. F.J. Ruche. *McGraw Hill*.

Reference Books :

1. Fundamentals of Physics by Alan Giambattista et al *Tata-McGraw Hill Company* Edition, 2008.
2. University Physics by Young and Freeman, *Pearson Education, Edition 2005*.
3. Sears and Zemansky's University Physics by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition*.
4. An introduction to Mechanics by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies*.
5. Mechanics. Hans & Puri. *TMH Publications*.
6. Engineering Physics. R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications*.
7. R P Feymman, RB Lighton and M Sands - The Feymman Lectures in Physics, Vol.-1, BI Publications,
8. J.C. Upadhyay - Mechanics.
9. P.K. Srivastava - Mechanics, New Age International

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II - SEMESTER STARTS HERE

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Paper-II **SUB: WAVES & OSCILLATONS**

Lecture	Topic	Remarks
UNIT-I	**FUNDAMENTALS OF VIBRATIONS**	
Lecture-1	Definition, Examples and Characteristics of SHM	
Lecture-2	Equation of Motion of Simple harmonic Oscillator	
Lecture-3	Solution of Simple harmonic Oscillator	
Lecture-4	Compound pendulum –Measurement of Time Period (T) & Acceleration due to gravity (g)	
Lecture-5	Torsion Pendulum & Measurement of Rigidity Modulus(ŋ)	
Lecture-6	Lissajous Diagrams-Combination of two mutually perpendicular SHMs having same frequency (1:1)	
Lecture-7	Lissajous Diagrams-Combination of two mutually perpendicular SHMs having different frequency(1:2)	
Lecture-8	Problems	
Lecture-9	Problems	
UNIT-II	**Damped & Forced Oscillations**	
Lecture-10	Definition & Equation of motion of damped harmonic Oscillator	
Lecture-11	Solution of damped harmonic Oscillator(Over Damped ,Critical Damped)	
Lecture-12	Solution of damped harmonic Oscillator(Under Damped)	
Lecture-13	Energy of Damped harmonic Oscillator & Comparison with un damped harmonic Oscillator	
Lecture-14	Logarithmic Decrement, Relaxation time	
Lecture-15	Quality Factor, Comparison between undamped & Damped Oscillations	
Lecture-16	Equation of motion of damped harmonic Oscillator	
Lecture-17	Definition & Equation of motion of Forced Harmonic Oscillator	
Lecture-18	Solution of Forced Harmonic Oscillator	
Lecture-19	Definition of Resonance , Amplitude Resonance & Velocity Resonance	
Lecture-20	Coupled Oscillators, Normal Coordinates ,Normal Modes of Vibrations	
Lecture-21	Equation of motion of Two Coupled Systems	
Lecture-22	Problems	
Lecture-23	Problems	
UNIT-III	**Vibrating strings**	
Lecture-24	Equation of Transverse wave along a stretched string	
Lecture-25	General Solution of Wave equation & its Significance	
Lecture-26	Modes of vibrations of stretched string clamped at both ends	
Lecture-27	Harmonics , Overtones, Laws of vibrating strings	
Lecture-28	Energy Transport	
Lecture-29	Transverse Impedance	
Lecture-30	Problems	
Lecture-31	Problems	
UNIT-IV	**VIBRATIONS OF BARS**	
Lecture-32	Equation of motion of Longitudinal Vibrations in bar-Expression for wave Velocity	

Lecture-33	Solution of Longitudinal wave equation –Boundary Conditions	
Lecture-34	Longitudinal Vibrations in bar fixed at Both ends(Fixed –Fixed Bar)	
Lecture-35	Longitudinal Vibrations in bar Free at Both ends(Free – Free Bar)	
Lecture-36	Longitudinal Vibrations in bar Fixed at one end & free at other end(Fixed –Free Bar)	
Lecture-37	Longitudinal Vibrations in bar clamped at the mid point	
Lecture-38	Equation of motion of Transverse Vibrations in bar-Expression for wave Velocity	
Lecture-39	Solution of Transverse wave equation –Boundary Conditions	
Lecture-40	Transverse Vibrations in bar fixed at Both ends(Fixed – Fixed Bar)	
Lecture-41	Transverse Vibrations in bar Free at Both ends(Free – Free Bar)	
Lecture-42	Transverse Vibrations in bar Fixed at one end & free at other end(Fixed –Free Bar)	
Lecture-43	Comparison between Longitudinal Vibrations & Transverse Vibrations in bars &Tuning Fork	
Lecture-44	Problems	
Lecture-45	Problems	

Textbooks and Reference books

1. Berkeley Physics Course Vol.1, Mechanics by C.Kittel, W.Knight, M.A Ruderaman-Tata-McGraw hill Company Edition 2008.
2. Fundamentals of Physics. Halliday/REsnick/Walker Wiley India Edition 2007.
3. First Tear Physics –Telugu Academy
4. Introduction to Physics for Scientists and Engineers F.J.Ruche. Mc Graw Hill.
5. Fundamentals of Physics by Alan Giambattista et al Tata-Mc Graw Hill Company Edition, 2008.
6. University Physics by Young and Freeman, Pearson Education, Edition 2005.
7. Sears and Zemansky's University Physics by Hugh D.Young, Roger A. Freedom Pearson Education Eleventh Edition.
8. An introduction to Mechanics by Daniel Kleppner & Robert Kolenkow. The McGraw Hill Companies
9. Mechanics. Hans & Puri. TMH Publications.
10. Engineering Physics. R.K. Gaur & S.L. Gupta, Dhanpat Rai Publications.
11. The Feymman Lectures in Physics, vol,-1 *R P Feymman, RB Lighton and M Sands, BI Publications*
12. Mechanics-P.K. Srivastava – New age International.

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III - SEMESTER STARTS HERE

Paper-III **Thermal Physics**

UNIT – I :Chapter -1: Kinetic Theory of Gases		
Lecture No.	**Name of the Topic**	**Remarks**
Lecture -1	Syllabus Analysis	
Lecture -2	Introduction –Fundamental Assumptions of Kinetic theory of Gases	
Lecture-3	Kinetic Interpretation of Temperature , average ,rms, most probable velocities of gas molecules	
Lecture -4	Derivation of the equation for Maxwell's law of distribution of velocities& graphical representation.	
Lecture -5	Definition & Derivation for mean free path – Maxwell equation for mean free path.	
Lecture -6	Transport phenomenon- Deriving an expression for coefficient of viscosity of gas.	
Lecture -7	Deriving an expression for coefficient of thermal conductivity on the basis of Kinetic Theory**.**	
Lecture -8	Deriving an expression for coefficient of diffusion of gas on the basis of Kinetic Theory	
Lecture -9	Problems	
Chapter -2: Thermodymamics		
Lecture -10	Basics of thermodynamics(System-types: Homogenous, Heterogeneous systems ,Thermo dynamical Variables, Thermo dynamic equilibrium, Thermo dynamic processes,work-energy,Heat)	
Lecture -11	Zeroth law of Thermodymamics,First law of Thermodynamics- Mathematical formulation –limitations ,reversible & Irreversible process with examples & Indicator diagrams	
Lecture -12	Cornot cycle-Cornot engine efficiency (Concepts & formula only)- Cornot's theorem(statement Only)	
Lecture -13	Second law of thermodynamics –Kelvin Plank statement,Clausius statement & their equivalence, thermodynamic scale of temperature	
Lecture -14	Entropy -Physical Significance, Change in Entropy in reversible & Irreversible process	
Lecture -15	Principle of Increase of entropy-entropy & disorder, entropy of Universe	
Lecture-16	Temperature –entropy diagrams(T-S)& Uses	
Lecture-17	Change of entropy of perfect gas in terms of (T,V),(T,P),(P,V)	
Lecture-18	Change of entropy when ice changes into steam & Problems	
Lecture-19	Problems	
UNIT – II Chapter -1:Thermodynamic Potentials & Maxwell's Equations		
Lecture-20	Thermodynamic Potentials –Derivation of Maxwell Thermodynamic relations	
Lecture -21	Derivation Clausius –Clayperon's equation –Applications	
Lecture-22	Derivation for ratio of Specific Heats	
Lecture-23	Derivation for difference of Specific Heats for perfect gas-special cases (Cp-Cv=R, Cp-Cv=TEα^2V(for Ideal gases)	
Lecture-24	Cp-Cv=R(1+2a/VRT) for Vander wall's gas	
Lecture-25	Joule Kelvin Effect-Expression for Joule Kelvin coefficient for perfect & vanderwall's gas	
Lecture-26	Problems	
Chapter -2: Low Temperature Physics		
Lecture-27	Introduction-Phase Transitions of I & II orders	
Lecture-28	Joule-Kelvin effect-Liquification of gas using Porous Plug Experiment	
Lecture-29	Joule's expansion- distinction between Adiabatic, Joule-Thomson Cooling & Joule expansion	
Lecture -30	Expression for Joule Thomson Cooling	

Lecture-31	Principle of regenerative cooling - Liquification of Helium by Capitza's Method	
Lecture-32	Production of Low temperatures -methods	
Lecture-33	Adiabatic Demagnetization- Production of Low temperature	
Lecture-34	Refrigeration – Principle-Properties of good Refrigerent.	
Lecture-35	Vapour Compression machine-principle & working	
Lecture-36	Problems	
UNIT – III: Quantum Theory of Radiation		
Lecture-37	Basic Terminology used in Quantum Theory of Radiation-Kirchho ff's law, Stefan's law	
Lecture-38	Black Body-Ferri's Black Body, Distribution of energy in the spectrum of black body.	
Lecture-39	Derivation Wein's Displacement law	
Lecture-40	Derivation Rayleigh-jean's law	
Lecture-41	Quantum theory of radiation –Planks law-U.V Catastrophe	
Lecture-42	Derivation Wein's law, Wein's Displacement law Rayleigh-jean's law, Stefan's law from Plank's law	
Lecture-43	Measurement of radiation using Pyrometer- Types of radiation Pyrometers.	
Lecture -44	Construction & Working of Disappearing Filament Optical Pyrometer	
Lecture -45	Solar Constant-Determining of Solar Constant using Angstrom's Pyroheliometer	
Lecture -46	Estimation temperature of the Sun-Problems	
UNIT – IV: Statistical Mechanics		
Lecture-47	Introduction –basic terminology –postulates of Statistical Mechanics	
Lecture-48	Phase Space- Concept of ensemble & some known ensembles-comparison	
Lecture-49	Classical & Quantum statistics & their differences	
Lecture-50	Concept of probability, probability theorems (Addition Theorem, Multiplication theorem)	
Lecture- 51	Maxwell's-Boltzmann Distribution law	
Lecture-52	Molecular energies in an Ideal gas	
Lecture-53	Maxwell's-Boltzmann velocity Distribution law	
Lecture-54	Bose-Einstein Distribution law	
Lecture-55	Application B-E Distribution to Photons- Plank's Radiation formula b	
Lecture-56	Fermi-Dirac Distribution law	
Lecture-57	Application F-D Distribution to white Dwrafs & neutron stars	
Lecture-58	Definition of Fermi energy, comparison between M-B,F-D,B-E distribution laws	
Lecture-59	Concept of Black hole	
Lecture-60	Problems	

Textbooks

1. Fundamentals of Physics. Halliday/Resnick/Walker.*C. Wiley India Edition 2007*.
2. Second Year Physics – *Telugu Academy.*
3. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co*.

Reference Books

1. Modern Physics by G. Aruldhas and P. Rajagopal, *Eastern Economy Education*.
2. Berkeley Physics Course. Volume-5. Statistical Physics by F. Reif. *The McGraw-Hill Companies*.
3. An Introduction to Thermal Physics by Daniel V. Schroeder.*Pearson Education Low Price Edition*.
4. Thermodynamics by R.C. Srivastava, Subit K. Saha&Abhay K. *Jain Eastern Economy Edition*.
5. Feyman's Lectures on Physics Vol. 1,2,3& 4. *Narosa Publications*.
6 .B.B. Laud "Introduction to statistics Mechanics" (Macmillan 1981)
7. F.Reif:"Statistical Physics "(Mcgraw-Hill, 1998)

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IV - SEMESTER STARTS HERE

Paper-IV SUB: OPTICS

Unit- I Interference		
Lecture	Topic	Remarks
Lecture-1	Syllabus Analysis	
Lecture-2	Introduction –principle f Super Position, Superposition of two sinusoidal waves	
Lecture-3	Theory of Interference fringes	
Lecture-4	Coherence –Temporal Coherence, Spatial Coherence	
Lecture-5	Conditions for Interference of Light-types of Interference	
Lecture-6	Interference by Division of wave Front-Fresnel's Biprism-Determination of wave length	
Lecture-7	Determination of thickness of a transparent material using Biprism	
Lecture-8	Change of phase on reflection, Lloyd's mirror experiment, Difference between Biprism & Lloyd's mirror fringes.	
Lecture-9	Interference by division amplitude-Oblique incidence of a plane wave on a thin film due to reflected light(Cosine Law)	
Lecture-10	Interference due to transmitted light(Cosine law)	
Lecture-11	Color of thin films, Non-reflecting films, Interference by a plane parallel film illuminated by a point source.	
Lecture-12	Interference by a film with two Non-parallel reflecting surfaces (wedge shaped film)-determination of diameter of thin wire.	
Lecture-13	Newton's rings in reflected light with & without contact between lens & glass plate	
Lecture-14	Newton's rings in transmitted light (Heidinger fringes)	
Lecture-15	Determination of wave length of monochromatic light & refractive Index of liquid using Newton's rings arrangement.	
Lecture-16	Michelson Interferometer- Construction & working –Types of fringes	
Lecture-17	Determination of wave length of monochromatic light,difference in wave length of sodium(Na) D_1,D_2 lines & thickness of thin transparent plate.	
Lecture-18	Problems	
Unit- II Diffraction		
Lecture-19	Introduction – Diffraction definition & examples, Fresnel's assumptions about Diffraction –Distinction between Fresnel & Fraunhoffer diffraction.	
Lecture-20	Fraunhoffer diffraction due to single slit	
Lecture-21	Diffraction due to circular aperture, Limit of resolution-Rayleigh's criterion.	
Lecture-22	Fraunhoffer diffraction due to double slit-effect of increasing slit width-distinction between single slit & double slit diffraction pattern	
Lecture-23	Fraunhoffer diffraction pattern with N-slits (Diffractional Grating)	
Lecture-24	Formation of spectrum with a grating-resolving power of grating – difference between prism spectrum & grating spectrum	
Lecture-25	Determination wave length of light in normal method using diffraction Grating.	
Lecture-26	Determination wave length of light in oblique incidence method using diffraction Grating	
Lecture-27	Fresnel's diffraction –Half period zones – Area of the half period zone – the resultant amplitude at any point due to individual zone &	

	whole wave front	
Lecture-28	Zone plate – Diffraction theory	
Lecture-29	Comparison of Zone plate with convex lens- Phase reversal zone plate	
Lecture-30	Diffraction at a straight edge – Difference between interference & Diffraction-	
Lecture-31	Problems	
Unit- III Polarization		
Lecture-32	Introduction – Methods of polarization by reflection , refraction	
Lecture-33	Producing polarized light by double refraction ,selective absorption , scattering of light	
Lecture-34	Brewster's law, Malus law	
Lecture-35	Definitions of optic axis O-ray,E-ray, Positive crystal , Negative Crystal ,Uni axial Crystals, Bi axial Crystal	
Lecture-36	Nicol Prism –Principle – construction –working as polarizer & analyzer	
Lecture-37	Refraction of plane wave incident on –ve &+ve crystals (Huygen's explanation)	
Lecture-38	Quarter wave plate & Half wave plate	
Lecture-39	Babinet's compensator – Construction & Theory	
Lecture-40	Optical activity- Fresnel's theory of optical activity & mathematical analysis	
Lecture-41	Laurent's half shade polarimeter – construction & working - analysis of light	
Lecture-42	Distinguish between polarized light & un polarized light, Distinguish between Dextrorotatory & laevorotatory substances	
Lecture-43	Problems	
Unit- IV Chapter 1 Aberrations		
Lecture-44	Introduction (Deviation produced by a lens & Dispersion of light through prism)- Aberration & types	
Lecture-45	Spherical Aberration – Longitudinal Spherical Aberration produced by a plane refracting surface	
Lecture-46	Longitudinal Spherical Aberration produced by a spherical refracting surface & thin lens	
Lecture-47	Minimization techniques of spherical Aberration	
Lecture-48	Coma - Minimization technique(Abbe – Sine Condition)	
Lecture-49	Astigmatism- Curvature of field & Distortion – Methods of removing	
Lecture-50	Chromatic Aberration – types – Calculation of Longitudinal chromatic aberration of a lens	
Lecture-51	Achromatic doublet –Minimization of chromatic aberration	
Lecture-52	Removal of chromatic aberration by a separated doublet	
Lecture-53	Problems	
Chapter 2: Optical Fibers		
Lecture-54	Introduction of fiber optics –Optical fiber- Principle –Acceptance angle –Derivation for Numerical Aperture	
Lecture-55	Types of Optical Fiber –Step Index Fiber	
Lecture-56	Graded Index Fiber	
Lecture-57	Rays & Modes in Optical Fiber , Optical Fiber materials	
Lecture-58	Principles of fiber communications	
Lecture-59	Advantages of fiber Optic Communication	
Lecture-60	Problems	

Textbooks

1.Optics by Ajoy Ghatak. *The McGraw-Hill companies*.
2.Optics by Subramaniyam and Brijlal. *S. Chand & Co*.
3.Fundamentals of Physics. Halliday/Resnick/Walker.*C. Wiley India Edition 2007*.
4.Optics and Spectroscopy. R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co*.
5.Second Year Physics – *Telugu Academy.*

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1. Modern Engineering Physics by A.S. Vasudeva. *S.Chand& Co. Publications.*
2. Feyman's Lectures on Physics Vol. 1,2,3& 4. *Narosa Publications*.
3. Fundamentals of Optics by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
4. K. Ghatak, Physical Optics'
5. D.P. Khandelwal, Optical and Atomic Physics' (Himalaya Publishing House, Bombay,1988)

7. Smith and Thomson: 'Optics' (John Wiley and sons)