Syllabus for
Bachelor of Science in Physics (Gen/Pass)
Under Choice Based Credit System
Academic Session:
w.e.f. 2020-2023

for

All Constituent/Affiliated Colleges Under

Binod Bihari Mahto Koyalanchal University, Dhanbad

Members of Board of Studies of CBCS Under- Graduate Syllabus as per Guidelines of the Binod Bihari Mahto Koyalanchal University, Dhanbad.

1.	Dr. K. Bandyopadhyay, Associate Professor University Dept. of Physics, BBMKU, Dhanbad	– Chairman
2.	Dr. D. K. Giri, Assistant Professor University Dept. of Physics, BBMKU, Dhanbad	– Member
3.	Dr. D.K. Singh, Assistant Professor Dept. of Physics, PKRM College, Dhanbad	– Member
	Two experts for UG	
4.	Dr. Umamageswari, Associate Professor, Dept. of Physics B.S. City College, Bokaro	– Member
5.	Dr. S. Sil, Assistant Professor Dept. of Physics, P.K.R.M College, Dhanbad	– Member

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COURSE STUCTURE

Semester	Course Code	Name of Paper	Full Marks	End Semester Marks	Mid Semester (Internal) Marks
I	**PHY-G-DSC-101A-T** (04 Credits, 60 Lectures) **PHY-G-DSC-101A-P** (02 Credits, 30 Lectures)	Mechanics Practical	75 25	60 20	15 5
	XYZ-G-DSC-102A-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or** **XYZ-G-DSC-102A-T** (04 Credits, 60 Lectures) **XYZ-G-DSC-102A-P** (02 Credits, 30 Lectures) Choice to choose from other disciplines		100 **or** 75 25	80 **or** 60 20	20 **or** 15 5
	XYZ-G-DSC-103A-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or** **XYZ-G-DSC-103A-T** (04 Credits, 60 Lectures) **XYZ-G-DSC-103A-P** (02 Credits, 30 Lectures) Choice to choose from other disciplines		100 **or** 75 25	80 **or** 60 20	20 **or** 15 5
	XYZ-G-AECC-101-T (02 Credits, 30 Lectures)	Language (English/Hindi/ NH+MB)	50	40	10
II	**PHY-G-DSC-201B-T** (04 Credits, 60 Lectures) **PHY-G-DSC-201B-P** (02 Credits, 30Lectures)	Electricity & Magnetism Practical	75 25	60 20	15 5
	XYZ-G-DSC-201B-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines		100	80	20

	or **XYZ-G-DSC-202B-T** (04 Credits, 60 Lectures) **XYZ-G-DSC-202B-P** (02 Credits, 30 Lectures) Choice to choose from other disciplines		**or** 75 25	**or** 60 20	**or** 15 5
	XYZ-G-DSC-203B-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or** **XYZ-G-DSC-203B-T** (04 Credits, 60 Lectures) **XYZ-G-DSC-203B-P** (02 Credits, 30 Lectures) Choice to choose from other disciplines		100 **or** 75 25	80 **or** 60 20	20 **or** 15 5
	XYZ-G-AECC-202-T Environmental Science (02 Credits, 30 Lectures)	Environmental Science	50	40	10
III	**PHY-G-DSC-301C-T** (04 Credits, 60 Lectures) **PHY-G-DSC-301C-P** (02 Credits, 30 Lectures)	Thermal Physics and Statistical Mechanics Practical	75 25	60 20	15 5
	XYZ-G-DSC-302C-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or** **XYZ-G-DSC-302C-T** (04 Credits, 60 Lectures) **XYZ-G-DSC-302C-P** (02 Credits, 30 Lectures) Choice to choose from other disciplines		100 **or** 75 25	80 **or** 60 20	20 **or** 15 5
	XYZ-G-DSC-303C-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or** **XYZ-G-DSC-303C-T** (04 Credits, 60 Lectures) **XYZ-G-DSC-303C-P** (02 Credits, 30 Lectures)		100 **or** 75 25	80 **or** 60 20	20 **or** 15 5

	Choice to choose from other disciplines				
	XYZ-G-SEC-301-T (02 Credits, 30 Lectures)	(Annexure-1)	50	40	10
IV	**PHY-G-DSC-401D-T** (04 Credits, 60 Lectures) **PHY-G-DSC-401D-P** (02 Credits, 30 Lectures)	Waves & Optics Practical	75 25	60 20	15 5
	XYZ-G-DSC-402D-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or** **XYZ-G-DSC-402D-T** (04 Credits, 60 Lectures) **XYZ-G-DSC-402D-P** (02 Credits, 30 Lectures) Choice to choose from other disciplines		100 **or** 75 25	80 **or** 60 20	20 **or** 15 5
	XYZ-G-DSC-403D-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or** **XYZ-G-DSC-403D-T** (04 Credits, 60 Lectures) **XYZ-G-DSC-403D-P** (02 Credits, 30 Lectures) Choice to choose from other disciplines		100 **or** 75 25	80 **or** 60 20	20 **or** 15 5
	XYZ-G-SEC-402-T (02 Credits, 30 Lectures)	(Annexure-1)	50	40	10
V	**PHY-G-DSE-501A-T** (04 Credits, 60 Lectures) **PHY-G-DSE-501A-P** (02 Credits, 30 Lectures)	Digital and Analog Circuits and Instrumentation Practical	75 25	60 20	15 5
	XYZ-G-DSE-502A-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or**		100 **or**	80 **or**	20 **or**

	XYZ-G-DSE-502A-T (04 Credits, 60 Lectures) **XYZ-G-DSE-502A-P** (02 Credits, 30 Lectures) Choice to choose from other disciplines		75 25	60 20	15 5
	XYZ-G-DSE-503A-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or** **XYZ-G-DSE-503A-T** (04 Credits, 60 Lectures) **XYZ-G-DSE-503A-P** (02 Credits, 30 Lectures) Choice to choose from other disciplines		100 **or** 75 25	80 **or** 60 20	20 **or** 15 5
	XYZ-G-SEC-503-T (02 Credits, 30 Lectures)	(Annexure-1)	50	40	10
VI	**PHY-G-DSE-601B-T** (04 Credits, 60 Lectures) **PHY-G-DSE-601B-P** (02 Credits, 30 Lectures)	Elements of Modern Physics Practical	75 25	60 20	15 5
	XYZ-G-DSE-602B-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or** **XYZ-G-DSE-602B-T** (04 Credits, 60 Lectures) **XYZ-G-DSE-602B-P** (02 Credits, 30 Lectures) Choice to choose from other disciplines		100 **or** 75 25	80 **or** 60 20	20 **or** 15 5
	XYZ-G-DSE-603B-T (06 Credits, 60 Lectures& 15 Tutorials) Choice to choose from other disciplines **or** **XYZ-G-DSE-603B-T** (04 Credits, 60 Lectures) **XYZ-G-DSE-603B-P** (02 Credits, 30 Lectures) Choice to choose from other		100 **or** 75 25	80 **or** 60 20	20 **or** 15 5

	disciplines				
	XYZ-G-SEC-604-T (02 Credits, 30 Lectures) (Annexure-1)	(Annexure-1)	50	40	10
	Total Marks		**2100**	**1680**	**420**

Note:

- For General/Pass Course: In Core Courses as DSC: select 03 papers from each of the 03 disciplines of choice for Semester I to IV and in Elective Courses as DSE: select 02 papers from each of the 03 disciplines of choice including interdisciplinary nature for Semester V to VI.
- **Symbol of Paper**: **XYZ-G-C-101-T**: The first three symbols in Roman capital letters indicate the subject; the next symbol H or G indicate Honours or General course; the next symbol(s) denotes Core (C), Generic Elective (GE), Discipline Specific Elective (DSE), Discipline Specific Choice (DSC),AECC, SEC, etc. Out of the next three digits, the first digit indicates the semester e.g. 1,2,3,4,5,6 for semester I, II, III, IV, V, VI respectively, and the next two digits indicate paper number. The last letter T or P indicates Theory or Practical.

Annexure - 1

SKILL DEVELOPMENT COURSES (SEC)

For General/Pass Course Degree:

(i) Compulsory for All Disciplines

1. Constitution of India and Human Rights
2. Environment and Public Health
3. Computer Applications and Information Technology

in ***Semester 3, Semester 4, and Semester 5 respectively.***

(II) Semester 6: One from the following may be chosen, may be common for a faculty or all faculty

The courses may include the following:

1. Entrepreneurship
2. Life Skills and Personality Development
3. Human Resource Development
4. Legal Aid and Awareness
5. Indian History, Culture and Diversity
6. Science and Life
7. Banking and Finance
8. Building Mathematical Ability
9. Capital and Stock Market

SEMESTER – I

PHY-G-DSC-101A-T: MECHANICS (04 Credits, 60 Lectures)

Instruction to Question Setter for End Semester Examination (ESE): *There will be two groups of questions. Five Questions to be answered out of Nine Questions. Group A is compulsory and will contain two questions. Question No.1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 Questions).Group B will contain descriptive type eight questions of twelve marks each, out of which any four are to answer. Each question carries 12 marks.*

Vector Analysis: Triple Scalar product, Triple Vector product, gradient, divergence, Curl and their physical significance, scalar and vector fields, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem. **(12 Lectures)**

Ordinary Differential Equations: 1st order homogeneous differential equations. 2^{nd}order homogeneous differential equations with constant coefficients. **(8 Lectures)**

Central force field: Motion of a particle in a central force field –two body problem. Kepler's Laws and their deduction. **(5 Lectures)**

Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. **(5 Lectures)**

Elasticity: Elastic constants and their interrelations, Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion, Torsional pendulum. **(12 Lectures)**

Fluids: Surface Tension: Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature. Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Variations of viscosity of liquid with temperature. **(10 Lectures)**

Special Theory of Relativity: Galilean transformations . Postulates of Special Theory of Relativity.Lorentz transformation, Length contraction.Time dilation. Relativistic addition of velocities. **(8 Lectures)**

Reference Books:

1. Mathematical Physics, H K Das and Dr. Rama Verma, S. Chand and Company Limited.
2. Mathematical Physics, B D Gupta, Vikash Publishing House, 4^{th} edition.
3. Mathematical Physics, B S Rajput, Pragati Prakashan.
4. Advanced Engineering Mathematics, D.G. Zill and W.S. Wright, 5 Ed., 2012, Jonesand Bartlett Learning.
5. Mathematical Tools for Physics, James Nearing, 2010, Dover Publications.

6. University Physics. F.W. Sears, M.W. Zemansky and H.D. Young, 13/e, 1986. Addison-Wesley.
7. Mechanics Berkeley Physics, v.1: Charles Kittel, et. al. 2007, Tata McGraw-Hill.
8. Physics – Resnick, Halliday& Walker 9/e, 2010, Wiley.
9. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
10. Elements of Properties of Matter, D. S. Mathur, S. Chand Publication.

PHY-G-DSC-101A-P (PRACTICAL) (02 credits, 30 Lectures)

Instruction to Question Setter for End Semester Practical Examination (ESE):*The questions in practical examination will be of equal to 20 marks and will be of 3 hours duration. Distribution of marks in practical paper of an end-semester examination will be of 60% in performance of experiment, 20% in record/note book and 20% in viva-voce.*

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kater's Pendulum.
9. To study the Motion of a Spring and calculate (a) Spring Constant, (b) g.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. A Text Book of Practical PHYsics, InduPrakash and Ramakrishna, 11th Edition, 2011, KitabMahal, New Delhi.
4. B.Sc. Practical Physics, N. N. Ghosh, Bharati Bhawan Publishers.
5. B.Sc. Practical Physics, C. L. Arora, S. Chand & Company.

SEMESTER - II

PHY-G-DSC-201B-T: ELECTRICITY & MAGNETISM (04 Credits, 60 Lectures)

Instruction to Question Setter for End Semester Examination (ESE): *There will be two groups of questions. Five Questions to be answered out of Nine Questions. Group A is compulsory and will contain two questions. Question No.1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 Questions).Group B will contain descriptive type eight questions of twelve marks each, out of which any four are to answer. Each question carries 12 marks.*

Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor.

Electric potential as line integral of electric field, potential due to a point charge,
Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser.Energy per unit volume in electrostatic field.
Polarisation, Displacement vector.Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric. **(25 Lectures)**

Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para-and ferro-magnetic materials. **(12 Lectures)**

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field. **(8 Lectures)**

Maxwell`s equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves. **(15 Lectures)**

Reference Books:

1. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education
2. Electricity & Magnetism, J.H. Fewkes&J.Yarwood. Vol. I, 1991, Oxford Univ. Press
3. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
5. D.J.Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
6. Electromagnetic Theory and electrodynamics Satyaprakash, , Kedar Nath Ram Nath Publishers
7. Electricity and Magnetism, K.K.Tiwari, S Chand Publishers.

PHY-G-DSC-201B-P (PRACTICAL) (02 credits, 30 Lectures)

Instruction to Question Setter for End Semester Practical Examination (ESE):*The questions in practical examination will be of equal to 20 marks and will be of 3 hours duration. Distribution of marks in practical paper of an end-semester examination will be of 60% in performance of experiment, 20% in record/note book and 20% in viva-voce.*

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. To compare capacitances using De'Sauty's bridge.
3. To study the Characteristics of a Series RC Circuit.
4. To study a series LCR circuit and determine its (a) Resonant frequency, (b) Quality factor
5. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.
6. To determine a Low Resistance by Carey Foster's Bridge.
7. To verify the Thevenin and Norton theorems.
8. To verify the Superposition, and Maximum Power Transfer Theorems.

Reference Books

1. Advanced Practical Physics for students, B.L.Flint&H.T.Worsnop, 1971, Asia Publishing House.
2. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed.2011, KitabMahal.
3. B.Sc. Practical Physics, N. N. Ghosh, Bharati Bhawan Publishers.
4. B.Sc. Practical Physics, C. L. Arora, S. Chand & Company.

SEMESTER – III

PHY-G-DSC-301C-T: THERMAL PHYSICS AND STATISTICAL MECHANICS (04 Credits, 60 Lectures)

Instruction to Question Setter for End Semester Examination (ESE): *There will be two groups of questions. Five Questions to be answered out of Nine Questions. Group A is compulsory and will contain two questions. Question No.1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 Questions).Group B will contain descriptive type eight questions of twelve marks each, out of which any four are to answer. Each question carries 12 marks.*

Laws of Thermodynamics: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between CP and CV, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient, Reversible and irreversible processes, Second law and Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics (statement only), Unattainability of absolute zero. **(22 Lectures)**

Thermodynamical Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations and applications - Joule-Thompson Effect, Clausius- Clapeyron Equation, Expression for (CP – CV), CP/CV, TdS equations. **(10 Lectures)**

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path, Transport Phenomena: Viscosity, Conduction and Diffusion, Law of equipartition of energy and its applications to specific heat of gases; mono-atomic and diatomic gases. **(10 Lectures)**

Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction from Planck's law-Rayleigh- Jeans Law, Stefan Boltzmann Law and Wien's displacement law. **(6 Lectures)**

Statistical Mechanics: Maxwell-Boltzmann law - distribution of velocity, Quantum statistics: Phase space - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law - photon gas - comparison of three statistics. **(12 Lectures)**

Reference Books:

1. Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
2. A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
3. Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.

4. Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears and G.L. Salinger. 1988, Narosa
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
6. Advanced Text Book on Heat, P. K. Chakrabarti, 10th Edn., Reprint 2015, Sreedhar Prakashan.
7. Heat Thermodynamics and Statistical Physics, Brijlal, Dr. N. Subrahmanyam and P. S. Hemne, S. Chand Publishers.

PHY-G-DSC-301C-P (PRACTICAL) (02 Credits, 30 Lectures)

Instruction to Question Setter for End Semester Practical Examination (ESE):*The questions in practical examination will be of equal to 20 marks and will be of 3 hours duration. Distribution of marks in practical paper of an end-semester examination will be of 60% in performance of experiment, 20% in record/note book and 20% in viva-voce.*

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.
2. Measurement of Planck's constant using black body radiation.
3. To determine Stefan's Constant.
4. To determine the coefficient of thermal conductivity of Cu by Searle's Apparatus.
5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
7. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.

Reference Books:

1. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
2. A Laboratory Manual of PHYsics for Undergraduate Classes, D.P.Khandelwal, 1985, Vani Publication.
3. B.Sc. Practical Physics, N. N. Ghosh, Bharati Bhawan Publishers.
4. B.Sc. Practical Physics, C. L. Arora, S. Chand & Company.

SEMESTER – IV

PHY-G-DSC-401D-T: WAVES & OPTICS (04 Credits, 60 Lectures)

Instruction to Question Setter for End Semester Examination (ESE): *There will be two groups of questions. Five Questions to be answered out of Nine Questions. Group A is compulsory and will contain two questions. Question No.1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 Questions).Group B will contain descriptive type eight questions of twelve marks each, out of which any four are to answer. Each question carries 12 marks.*

Superposition of Two Collinear Harmonic oscillations: Linearity & Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different

frequencies (Beats). **(6 Lectures)**

Waves Motion: Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. **(8 Lectures)**

Sound: Forced vibrations and resonance, Fourier's Theorem - Application to saw tooth wave and square wave Acoustics of buildings, Reverberation and time of reverberation - Absorption coefficient - Sabine's formula. **(10 Lectures)**

Interference: Interference: Division of amplitude and division of wavefront. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index. **(10 Lectures)**

Michelson's Interferometer: (1) Idea of form of fringes (no theory needed), (2) Determination of wavelength, (3) Wavelength difference, (4) Refractive index, and (5) Visibility of fringes. **(5 Lectures)**

Diffraction: Fraunhofer diffraction- Single slit; Double Slit. Plane Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. **(14 Lectures)**

Polarization: Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization. **(7 Lectures)**

Reference Books:

1. Fundamentals of Optics, F.A Jenkins and H.E White, 1976, McGraw-Hill
2. Principles of Optics, B.K. Mathur, 1995, Gopal Printing
3. Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publications
4. University PHYsics. F.W. Sears, M.W. Zemansky and H.D. Young. 13/e, 1986. Addison-Wesley
5. Introduction to Geometrical and Physical Optics, B. K. Mathur, Gopal Printing,
6. Geometrical and Physical Optics, P. K. Chakraborty, New Central Book Agancy (P) Ltd.
7. Introduction to Geometrical and Physical Optics, B. K. Mathur, Gopal Printing.
8. A Text Book on Light, B. Ghosh and K. G. Mazumdar, 5th Edn.,Reprint 2015, Sreedhar Publishers.
9. A Text Book of Optics, Dr. N. Subrahmanyam, Brijlal, Dr. M. N. Avadhanulu, S. Chand Publishers.

PHY-G-DSC-401D-P (PRACTICAL)(02 Credits, 30 Lectures)

Instruction to Question Setter for End Semester Practical Examination (ESE):*The questions in practical examination will be of equal to 20 marks and will be of 3 hours duration. Distribution of marks in practical paper of an end-semester examination will be of 60% in performance of experiment, 20% in record/note book and 20% in viva-voce.*

1. To determine the Frequency of an Electrically Maintained Tuning Fork by

Melde's Experiment and to verify λ2 – T Law.
2. To determine the Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
3. To determine the Refractive Index of the Material of a Prism using Sodium Light.
4. To determine Dispersive Power of the Material of a Prism using Mercury Light
5. To determine the value of Cauchy Constants.
6. To determine the Resolving Power of a Prism.
7. To determine wavelength of sodium light using Fresnel Biprism.
8. To determine wavelength of sodium light using Newton's Rings.
9. To determine the wavelength of Laser light using Diffraction of Single Slit.
10. To determine wavelength of (1) Sodium and (2) Spectral lines of the Mercury light using plane diffraction Grating
11. To determine the Resolving Power of a Plane Diffraction Grating.

Reference Books:

1. Advanced Practical PHYsics for students, B.L. Flint and H.T.Worsnop, 1971, Asia Publishing House.
2. B.Sc. Practical Physics, N. N. Ghosh, Bharati Bhawan Publishers.
3. B.Sc. Practical Physics, C. L. Arora, S. Chand & Company.

SEMESTER –V

PHY-G-DSE-501A-T: DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION (04 Credits, 60 Lectures)

Instruction to Question Setter for End Semester Examination (ESE): *There will be two groups of questions. Five Questions to be answered out of Nine Questions. Group A is compulsory and will contain two questions. Question No.1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 Questions).Group B will contain descriptive type eight questions of twelve marks each, out of which any four are to answer. Each question carries 12 marks.*

Digital Circuits: Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. **(7 Lectures)**

De Morgan's Theorems.Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. **(8 Lectures)**

Binary Addition.Binary Subtraction using 2's Complement Method).Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor. **(4 Lectures)**

Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics-Static and Dynamic, Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell. **(7 Lectures)**

Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains α and β. Relations between α and β. Load Line analysis of

Transistors.DC Load line and Q-point. Active, Cutoff, and Saturation Regions.Voltage Divider Bias Circuit for CE Amplifier.h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Class A, B, and C Amplifiers. **(17 Lectures)**

Sinusoidal Oscillators: Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator. **(5 Lectures)**

Instrumentations: Introduction to CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference. **(4 Lectures)**
Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Zener Diode and Voltage Regulation **(8 Lectures)**

Reference Books:

1. Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
2. Electronic devices and circuits, S. Salivahanan and N.Suresh Kumar, 2012, Tata Mc-Graw Hill.
3. Microelectronic Circuits, M.H. Rashid, 2nd Edn.,2011, Cengage Learning.
4. Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper,1990, PHI Learning
5. Digital Principles & Applications, A.P.Malvino, D.P.Leach&Saha, 7th Ed.,2011, Tata McGraw Hill
6. Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
7. OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd.

PHY-G-DSE-501A-P (Practical) (02 Credits, 30 Lectures)

Instruction to Question Setter for End Semester Practical Examination (ESE):*The questions in practical examination will be of equal to 20 marks and will be of 3 hours duration. Distribution of marks in practical paper of an end-semester examination will be of 60% in performance of experiment, 20% in record/note book and 20% in viva-voce.*

1. To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO
2. To verify and design AND, OR, NOT and XOR gates using NAND gates.
3. To study Half adder, Full adder and 4-bit Binary Adder.
4. To study Adder-Subtractor using Full Adder I.C.
5. To design an astable multivibrator of given specifications using 555 Timer.
6. To design a monostable multivibrator of given specifications using 555 Timer.
7. To study IV characteristics of PN diode, Zener and Light emitting diode
8. To study the characteristics of a Transistor in CE configuration.
9. To design a CE amplifier of a given gain (mid-gain) using voltage divider bias.
10. To design an inverting amplifier of given gain using Op-amp 741 and study its frequency response.
11. To design a non-inverting amplifier of given gain using Op-amp 741 and study its Frequency Response.
12. To investigate the use of an op-amp as a Differentiator
13. To design a Wien Bridge Oscillator using an op-amp.

Reference Books:

1. Basic Electronics: A text lab manual, P.B.Zbar, A.P.Malvino, M.A.Miller, 1994, Mc-Graw Hill.
2. Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
3. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, PrenticeHall.
4. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.

SEMESTER – VI

PHY-G-DSE-601B-T: ELEMENTS OF MODERN PHYSICS (04 Credits, 60 Lectures)

Instruction to Question Setter for End Semester Examination (ESE): *There will be two groups of questions. Five Questions to be answered out of Nine Questions. Group A is compulsory and will contain two questions. Question No.1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 Questions).Group B will contain descriptive type eight questions of twelve marks each, out of which any four are to answer. Each question carries 12 marks.*

Quantum Mechanics: De Broglie wavelength and matter waves; Davisson-Germer experiment. Wave description of particles by wave packets. Group and Phase velocities and relation between them. Bohr Correspondence Principle **(6 Lectures)**

Wave-particle duality, Heisenberg uncertainty principle (Uncertainty relations involving Canonical pair of variables): Derivation from Wave Packets impossibility of a particle following a trajectory; Energy-time & Position-momentum uncertainty principle **(8 Lectures)**

Time dependent Schrodinger equation and Time independent Schrodinger equation, Properties of Wave Function. Interpretation of Wave Function, Probability and probability current densities; Conditions for Physical Acceptability of Wave Functions. Normalization, Eigenvalues and Eigenfunctions. Expectation values of position and momentum. **(10 Lectures)**

One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions. **(4 Lectures)**

Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, Liquid Drop model: semi-empirical mass formula and binding energy. **(6 Lectures)**

Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life, successive disintegration; Elementary idea of Alpha decay; Beta decay. **(10 Lectures)**

Fission and fusion- mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. **(4 Lectures)**

Lasers: Einstein's A and B coefficients. Metastable states. Spontaneous and Stimulated emissions. Optical Pumping and Population Inversion. Three-Level and Four-Level Lasers. Ruby Laser and He-Ne Laser. **(12 Lectures)**

Reference Books:

1. Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury 2017, McGraw-Hill.
1. Modern Physics, John R.Taylor, Chris D.Zafiratos, Michael A.Dubson,2009, PHI Learning
2. Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore, 2003, McGraw Hill
3. Quantum Physics, Berkeley PHYsics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
4. Modern Physics, R.A. Serway, C.J. Moses, and C.A.Moyer, 2005, Cengage Learning.

PHY-G-DSE-601B-P (Practical) (02 Credits, 30 Lectures)

Instruction to Question Setter for End Semester Practical Examination (ESE):*The questions in practical examination will be of equal to 20 marks and will be of 3 hours duration. Distribution of marks in practical paper of an end-semester examination will be of 60% in performance of experiment, 20% in record/note book and 20% in viva-voce.*

1. To determine value of Boltzmann constant using V-I characteristic of PN diode.
2. To determine work function of material of filament of directly heated vacuum diode.
3. To determine value of Planck's constant using LEDs of at least 4 different colours.
4. To determine the ionization potential of mercury.
5. To determine the wavelength of H-alpha emission line of Hydrogen atom.
6. To determine the absorption lines in the rotational spectrum of Iodine vapour.
7. To study the diffraction patterns of single and double slits using laser source and measure its intensity variation using Photo sensor and compare with incoherent source – Na light.
8. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
9. To determine the value of e/m by magnetic focusing.
10. To setup the Millikan oil drop apparatus and determine the charge of an electron.

Reference Books:

1. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Format of question Papers of End-Semester Theory Examination

Binod Bihari Mahto Koyalanchal University, Dhanbad

End-Semester Examination xxxx(Session: xxxx-xx)

Subject/Code:

Full Marks: 80 Pass Marks: 32 Time:3Hours

General Instructions:

Candidates are required to give their answers in their own words as far as practicable.

The Questions are of equal value.

Answer any five questions of the following in which Q.1 is compulsory.

Group A

1. (A) Multiple Choice Questions (1x8=08)

(i) ……..
(ii) ……..
(iii) ……..
(iv) ……..
(v) ……..
(vi) ……..
(vii) ……..
(viii) ……..

(B) Short answer type questions (4x2=08)

(a) ……..
(b) ……..

Group B

(Long answer type questions)

Answer any four of the following. (16x4=64)

2. ……..
3. ……..
4. ……..
5. ……..
6. ……..
7. ……..
8. ……..
9. Short notes type questions (8x2=16)

(a) ……..
(b) ……..
(c) ……..
(d) ……..

……x……

Binod Bihari Mahto Koyalanchal University, Dhanbad

End-Semester Examination xxxx(Session: xxxx-xx)

Subject/Code:

Full Marks: 60 Pass Marks: 24 Time: 3Hours

General Instructions:

Candidates are required to give their answers in their own words as far as practicable.

The Questions are of equal value.

Answer any five questions of the following in which Q.1 is compulsory.

Group A

1. (A) Multiple Choice Questions (1x6=06)

(i) ……..

(ii) ……..

(iii) ……..

(iv) ……..

(v) ……..

(vi) ……..

(B) Short answer type questions (3x2=06)

(a) ……..

(b) ……..

Group B

(Long answer type questions)

Answer any four of the following. (12x4=48)

2. ……..

3. ……..

4. ……..

5. ……..

6. ……..

7. ……..

8. ……..

9. Short notes type questions (6x2=12)

(a) ……..

(b) ……..

(c) ……..

(d) ……..

……x……

Binod Bihari Mahto Koyalanchal University, Dhanbad

End-Semester Examination xxxx (Session: xxxx-xx)

Subject/Code:

Full Marks: 40 Pass Marks: 16 Time: 2Hours

General Instructions:

Candidates are required to give their answers in their own words as far as practicable.

The Questions are of equal value.

Answer any five questions of the following in which Q.1 is compulsory.

Group A

1. (A) Multiple Choice Questions (1x4=04)

(i) ……..

(ii) ……..

(iii) ……..

(iv) ……..

(B) Short answer type questions (2x2=04)

(a) ……..

(b) ……..

Group B

(Long answer type questions)

Answer any four of the following. (8x4=32)

2. ……..

3. ……..

4. ……..

5. ……..

6. ……..

7. ……..

8. ……..

9. Short notes type questions (4x2=8)

(a) ……..

(b) ……..

(c) ……..

(d) ……..

……x……