

**Reduced Syllabus for  
Bachelor of Science in Physics (GE/Gen) for  
Sem IV and Physics (Gen/Pass) for Sem V  
Under Choice Based Credit System  
For the Academic Session w.e.f. 2020-2023**



*for*  
**All Constituent/Affiliated Colleges Under  
Binod Bihari Mahto Koyalanchal University,  
Dhanbad**

Sanjay Kumar Si  
24-09-22

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**SEMESTER – IV**  
**PHY-H-GE-404-T/ 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.

**Waves Motion:** Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. **(12 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. **(12 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. **(14 Lectures)**

**Diffraction:** Fraunhofer diffraction- Single slit, Double Slit. Plane Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. **(14 Lectures)**

**Polarization:** Transverse nature of light waves. Plane polarized light – production and analysis. **(8 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 Agency (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, 5<sup>th</sup> Edn., Reprint 2015, Sreedhar Publishers.
9. A Text Book of Optics, Dr. N. Subrahmanyam, Brijlal, Dr. M. N. Avadhanulu, S. Chand Publishers.

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**PHY-H-GE-404-P/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  $\lambda^2 - T$  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. **(10 Lectures)**

De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. **(6 Lectures)**

Binary Addition. Binary Subtraction using 2's Complement Method). Half Adders and Full

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Adders.

**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. **(8 Lectures)**

**Bipolar Junction transistors:** n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains  $\alpha$  and  $\beta$ . Relations between  $\alpha$  and  $\beta$ . Load Line analysis of Transistors. DC Load line and Q-point. Active, Cutoff, and Saturation Regions. **(14 Lectures)**

**Sinusoidal Oscillators:** Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator. **(6 Lectures)**

Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Zener Diode and Voltage Regulation **(10 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, 2<sup>nd</sup> 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.

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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, Prentice Hall.
4. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.

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