



HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B. Sc. PHYSICS : SEMESTER -V

TYPE OF COURSE: MINOR DISCIPLINE SPECIFIC COURSE (THEORY)

COURSE NAME: MODERN PHYSICS, ELECTRICITY, ELECTRONICS
HOLOGRAPHY AND FIBER OPTICS

PROGRAMME CODE: SCIUG103

COURSE CODE: SC23MIDSCPHY502

(Effective from June 2025 Under NEP-2020)

Total Credits:04	THEORY MINOR	External Marks (SEE) - 50
Teaching Hours per Week: 04		Internal Marks (CCE) - 50
Teaching Hours per Semester: 60		

Course Objective: To provide concepts of aspecial theory of relativity.

- To Give basic knowledge of various elementary particles.
- To Understands the concept of various network transformations and To study the Thyristors and Optoelectronic Devices.
- To obtain a deep knowledge of principle of holography and hologram and To provide experimental knowledge of Recording of Holograms
- To develop knowledge of various type of holography and To learn the fiber optical system and fiber optics.
- To get sufficient knowledge about Characteristics of the Fibre Optic Communication System

Course Outcome: After the successful completion of the course students will be able to

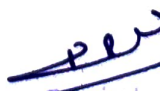
- Understands the concept of a special theory of relativity and its various aspects.
- Get sufficient knowledge of Leptons, Hadrons, Neutrino, Antineutrino, Quarks etc.
- Understands the concept of various network transformations & Will studies about Thyristors and Optoelectronic Devices.
- Principle of holography and hologram.
- Get sufficient experimental knowledge of Recording of Holograms and develop skills of it.
- fiber optical system, fiber optics and Merits of Optical Fibres
- Characteristics of the Fibre Optic Communication System and also about of Disadvantages of Fiber Optics.

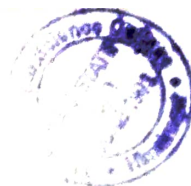
Syllabus

UnitNo.	Content	Credit	Lect. Hrs 60
Unit-1	RELATIVITY AND PARTICLE PHYSICS: (a) Special Theory Relativity: Newtonian Relativity(14.1), Michelson-Morley experiment(14.2), Special theory of relativity(14.3), Lorentz Transformation(14.4), Consequences of Lorentz Transformation(14.5) - (a) Relativity of simultaneity (b) Lorentz-fitz Gerald length Contraction (c) Time dilation, Addition of Velocities (14.6), Variation of mass with Velocity(14.7) Mass- energy relation (14.8) <i>Related Examples, Problems, MCQ & Short Questions</i> (b)Elementary Particles: Interaction and Particles (13.1), Leptons and Hadrons (13.1.1), Leptons (13.2), Neutrino and Antineutrino (13.2.1), Other Leptons (13.2.3), Hadrons (13.3), Quarks (13.5) <i>Related Examples, Problems, MCQ & Short Questions</i> Basic Reference: (1) Introduction to Classical Mechanics by R G Takwale& P S Puranik McGrawHill Education (India) Private Limited {For (a)} (2) Concepts of Modern Physics by Arthur Beiser, S. Mahajan, S R Choudhury {For c} (Seventh Edition) McGraw Hill Education {For (b)}	1	15



Unit-II	ELECTRICITY AND POWER ELECTRONICS: (a) Network Transformations: Principle of duality (1.3), Reduction of Complicated network (1.4), Conversions between T and π sections (1.5), The bridged-T network (1.6), The Lattice Network (1.7), The Reciprocity theorem (1.9), The compensation theorem (1.12), Driving point impedance, transfer impedance (1.14), The parallel-T network (1.17). <i>Related Examples, Problems, MCQ & Short Questions</i> (b) Thyristors and Optoelectronic Devices : Introduction to Thyristors, Triac (2.51), Diac (2.52), Introduction to Optoelectronic Devices (3.1), LDR (Light Dependent Resistor) or PhotoConductive Cell (3.2), Applications of LDR (3.3), Photo-Transistor (3.5), Photovoltaic or Solar Cells: construction, working, Characteristic and Efficiency of Solar cell(3.6), Lasers (3.8), Laser Action (3.9), Spontaneous and Stimulated Emission Probabilities and Condition of Population Inversion (3.10), P-N Junction Laser Diode (3.11). <i>Related Examples, Problems & Short Questions</i> Basic Reference : (1) <i>Networks, Lines and Fields</i> by J. D. Ryder Prentice Hall. {For (a)} (2) <i>Hand Book of Electronics</i> by Gupta and Kumar, 46th revised Edition 2019. {For (b)}	1	15
Unit-III	HOLOGRAPHY: Holography:Introduction (23.1), Principle of Holography (23.2), Recording of the hologram (23.2.1), Reconstruction of the image (23.1.2),coaxial holography (23.3), off-axis holography (23.4), Theory (23.5), Holograms (23.6), Orthoscopic and pseudoscopic images (23.6.1), Holography and Photography (23.6.2) Important properties of Hologram (23.7), Classification of holograms (23.8), Applications (23.9), Medical application (23.10) <i>Related Examples, Problems & Short Questions</i> Basic Reference: <i>A Textbook of Optics</i> by Dr.N.Subrahmanyam, Brijlal and Dr. M. N. Avadhanulu (as per UGC Model syllabus,25th revise addition 2012, reprint 2018) (S. Chand Co.)	1	15
Unit-IV	FIBER OPTICS: Fiber Optics:Introduction (24.1), Optical Fibre (24.2), Necessity of cladding(24.2.1),Optical Fibre System (24.2.2), Optical fiber cable (24.2.3), Total Internal Reflection (24.3), Propagation of Light Through and Optical Fibre (24.4),Critical angle of Propagation (24.4.1), Acceptance angle (24.4.2), Fraction of refractive index (24.5), Numerical aperture(24.6), Skip distance and number of total internal reflections (24.7), Classification of optical fibres (24.10), Types of Optical Fibre (24.11), (24.11.1, 24.11.2, 24.11.3), V-Number (Normalize frequency)(24.13), Losses in Optical Fibre (24.15), Attenuation (24.15.1), Bandwidth (24.17), Characteristics of the Fibres (24.18), Fibre Optic Communication System (24.21), Merits of Optical Fibres (24.22), Disadvantages (24.22.1). <i>Related Examples, Problems & Short Questions</i> Basic Reference: <i>A Textbook of Optics</i> by Dr.N.Subrahmanyam, Brijlal and Dr. M. N.Avadhanulu (as per UGC Model syllabus,25th revise addition 2012, reprint 2018) (S. Chand Co.)	1	15


Principal
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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. PHYSICS - SEMESTER –V (PRACTICAL COURSE)

TYPE OF COURSE: MINOR DISCIPLINE SPECIFIC PRACTICAL COURSE
COURSE NAME: MINOR PRACTICAL COURSE (LABORATORY EXPERIMENTS)

PROGRAMME CODE: SCIUG103 COURSE CODE: SC23PMIDSCPHY502

(Effective from June 2025 Under NEP–2020)

TYPE OF COURSE	CREDIT	Marks	COURSE CODE
Minor Discipline Core Course Practical (PMiDSC)	2 (Group A) and 2 (Group B) (Total 4 Credit)	25 CCE + 25 SEE =50 (For Both Group)	SC24PMiDSCPHY502
Teaching Hours Teaching Hours per Week: 08 Hours for 4 Credit practical (120 Hours per Semester) Teaching Hours per Week: 04 Hours for 2 Credit practical (60 Hours per Semester)			

LABORATORY EXPERIMENT COURSE: GROUP A (PMiDSC - Minor)

1. Calibration of CRO and Applications of CRO
2. Numerical analysis newton' Forward and backward interpolation formula.
3. Determination radius of curvature given convex lens by Optical lever
4. To determination of 'L₀' 'R' and 'a' for resonance pendulum .
5. To determine unknown wave length of light 'λ' Using Hartzman formula
6. To find out the refractive index of ordinary and extraordinary using dual refraction from Calcite prism
7. Numerical analysis Jacobi interaction methods.

LABORATORY EXPERIMENT COURSE: GROUP B (PMiDSC - Minor)

1. To Determine resistance of bulb at room temperature using post office box
2. To verify De Morgan's theorems using IC -7400
3. A study of characteristic of JFET & Determination μ , r , & g_m
4. To study of load line & determination of Q- point for BJT.
5. To Determine absolute value of Capacity using B.G,
6. A study of Input characteristic of UJT
7. To Determine Low Value of 'C' using Schering Bridge.

“Arise, Awake and Stop not till your GOAL is Reached”.

– SWAMI VIVEKANAND

[Signature]
Principal

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