HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–III

TYPEOFCOURSE:MAJORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 COURSECODE:SC23MJDSCPHY301

COURSENAME:THERMODYNAMICS, MODERN PHYSICS & SOLID STATE PHYSICS

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:04 TeachingHoursperWeek:04TeachingHoursperSemester: 60	THEORY MAJOR I	ExternalMarks-50 InternalMarks-50

CourseObjective:

- To understand the principles of Heat and Thermodynamics, Mathematical Theorems, Liquification of Gases
- Learns about Franck -Hertz Experiment, Bohr's Theory, Sommerfield Model
- To develope foundation in Atomic Spectra, Understand Spectroscopic terms Zeeman Effect, Paschan Back effect etc.
- To Learn Crystal Lattice and Crystal structure, the Seven crystal Systems.

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- Understand the principles of Heat and Thermodynamics, Mathematical Theorems, Liquification of Gases
- Learns about Franck -Hertz Experiment, Bohr's Theory, Sommerfield Model
- Learns the concepts Atomic Spectra, Understood Spectroscopic terms Zeeman Effect, Paschan Back effect
- Get sufficient knowledge of Crystal Lattice and Crystal structure, The Seven crystal Systems.

Syllabus

Unit No.	Content	Credit	Lect.Hrs60
Unit-1	**Thermodynamics:** **Heat and Thermodynamics**: Characteristic functions, Enthalpy(11.1), The Helmholtz and Gibb's function(11.2), Two Mathematical Theorems(11.3), Maxwell's equation(11.4), The T-dS equations(11.5), InternalEnergy equation(11.6), Heat capacity equation, The Thermal Exapansivity (11.9), Compressibility(11.10), Joule-Kelvin effect (Porous plug Experiment) (12.1) Liquification of Gases by Joule-Kelvin Effect (12.2) *(Related Examples, Problems, MCQ & Short Questions)* **Basic Reference:** *Heat and Thermodynamics by Mark W. Zeemansky (5th Edition)*	1	15
Unit 2	**Modern Physics :** **Atomic Spectra:** Franck -Hertz Experiment(2.16), Critical Potentials (2.17), Shortcoming of Bohr's Theory(2.19) , Sommerfield extension of Bohr theory (2.20), Limitations of Sommerfield Model(2.21) *(Related Examples, Problems, MCQ & Short Questions.)* **Matter Waves and Schrodinger Equations :** Formulation of Quantum Mechanics(1.19), Photon: The Quantization of field(1.20),: A Free Particle in One Dimension(2.1), Generalization to Three Dimension(2.2), The Operator correspondence and the Schrodinger equation for a particle subject to forces(2.3). *(Related Examples, Problems, MCQ & Short Questions.)*	1	15

Principal
The HNSB. Ltd. Science College
Himatnagar-383 001

	Basic Reference: 1. *Atomic and Molecular Physics by Raj Kumar (Campus Books)* *2. A Text Book of Quantum Mechanics by Mathews and K.Venkatesan, Tata Mc-Graw Hill Publication*		
Unit -3	**ATOMIC PHYSICS:** **Atomic Spectra**: Orbital and Magnetic Dipole Moment (4.1), Larmor Precession (4.2), Space quantization(4.3), electron spin (4.4), Vector model of atom (4.5), Spectroscopic terms and their notations(4.6), Stern Gerlach Experiment(4.7), Pauli's Exclusion Principle(4.8). Zeeman Effect-Normal Zeeman Effect and anomalous Zeeman Effect(12.1), Explanation of Normal Zeeman Effect(12.2), Explanation of Anomalous Zeeman Effect(12.3), Paschan Back effect (12.4). Stark Effect of Hydrogen (13.1) (*Related Examples, Problems, MCQ & Short Questions.)* **Basic Reference**: Atomic & Molecular sprctra by Rajkumar Kedarnath Prakashan Meerut.	1	15
Unit-4	**SOLID STATE PHYSICS** **Crystal Structure:** Crystalline and Amorphous Solid(1.1) , Crystal Lattice and Crystal structure(1.2), Translational Symmetry, Space, Unit Cell and Primitive Cell(1.3), Symmetry Elements in Crystals(1.4-1.4.1 to 1.4.6), The Seven crystal Systems(1.5), Coordination Number(1.5.1), Some important crystal structure(1.6) , Simple Cubic Structure(1.6.1), Body Centered Cubic (BCC) Structure(1.6.2), Face Centered Cubic (FCC) Structure(1.6.3), Hexagonal closed packed structure (1.6.4), Sodium chloride structure (1.6.5), Cesium chloride structure (1.6.6), Diamond structure (1.6.7), Wigner-Seitz Cells (1.7), Miller Indices (1.8), The inter planar spacing of crystal planes (1.11). (*Related Examples, Problems, MCQ & Short Questions)* **Basic Reference:** Solid State Physics By Ajay Kumar Saxena (Macmillan India Limited)	1	15

: Further Reading – Other References:

(1) HeatandThermodynamicsbyZeemansky
(2) UniversityPhysicsbySears,Zeemankkyandyoung(6th Edition Narosa Publishing)
(3) HeatandThermodynamicsbyRichardH.Dittmon&MarkW.Zemansky (TMH)
(4) HeatandThermodynamicsbyA.B.GuptaandH.P.Roy
(5) Thermodyna -mics and Statistical Physics by Singhal–Agarwal-Prakash Pragati Prakashan, Meerut.
(6) Spectroscopy Vol-1 by Walker & Straw
(7) Atomic Physics by J.B. Rajam (5th Edition – 1960) S. Chand & Co.
(8) Physics of Atoms and Molecules by B.H.Brandsden & C.J.Joachagh, Pearson Education.
(9) Modern Physics by Kenneth Krane, Jon wiley &sons
(10) Elements of Spectroscopy S L Gupta, V Kumar & R C Sharma (24th Edition) Pragati Prakashan,
(11) Molecular Structure and Spectroscopy G Aruldhas, Prentice Hall of India Private Limited
(12) Elements of Solid State Physics (2003) by J. P. Shrivastav, PHI
(13) Introduction to solid state Physics By C.Kittle (John Willey)
(14)Fundamen- tal of solid state Physics By Saxena, Gupta, Saxena (Pragati Prakashan)
(15) Solid State Physics By Ajay Kumar Saxena (Macmillan India Limited)
(16) Solid State Physics by S O Pillai

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER–III

TYPEOFCOURSE:MAJORDISCIPLINESPECIFICCOURSE

PROGRAMMECODE:SCIUG101 **COURSECODE:SC23MJDSCPHY301A**

COURSENAME:ELECTROMAGNETICS, OPTICS AND ELECTRONICS

(EffectivefromJune2024UnderNEP–2020)

TotalCredits:04 TeachingHoursperWeek:04TeachingHoursperSemester: 60	THEORY MAJOR II	ExternalMarks- 50 InternalMarks-50

CourseObjective:

- To Learns the basics concepts and the law of Electrostatics and Magnetostatics.
- To develop foundation in optics and Learn the concepts of diffraction, Single slit, Double Slit Fraunhoffer diffraction
- To learn the the knowledge of Resolving Power of Optical Instruments and the basic concepts of Polarization and Retarders.
- To develop sufficient knowledge about Farmat's principle.
- To understands and recalls the basic concepts of Basic Transistors
- To provide sufficient knowledge of Transistors Current Component, static (Input and Output) characteristics

CourseOutcome:

Afterthesuccessfulcompletionofthecoursestudentswillbe ableto

- Understands basics concepts of electrostatics and Magnetostatics.
- Learns the foundation of optics as well as the concepts of diffraction. Also Understands the concepts of Single slit, Double Slit Fraunhoffer diffraction
- Learns basic concepts of Polarization and Retarders.
- Get sufficient knowledge of Basic Transistors
- Learns the knowledge of various type of Transistors Current Component, static (Input and Output) characteristics

Syllabus

Unit No.	Content	Credit	Lect.Hrs60
Unit-1	**ELECTROSTATICS AND MAGNETOSTATICS :** **Electrostatics in Dielectric**: Introduction to polar and non polar dielectrics, Gaseous Non Polar Dielectrics (2.11), Gaseous Polar Dielectrics (2.12), Non Polar Liquids (2.13), Solid Dielectrics Electrets(2.14), Methods of Electrostatics Images (3.11 i to v) (*RelatedExamples&Problems*) **Magnetostatics :** The Magnetic Potential (4.9-a & b) Magnetic Vector Potential due to small Current Loop(4.12), An Alternative method for finding the Vector Potential A and the field B due to Current Loop(4.13), Magnetization(4.15), Magnetic Field Vector (4.16),Magnetic susceptibility and Permeability (4.17), Boundary Conditions(4.18), Uniformly Magnetized Sphere in External Magnetic Field (4.19), A comparison of Static Electric and Magnetic Field (4.20) (*RelatedExamples&Problems*) **BasicReference:**. Electromagnetics by B.B. Laud, New Age Publisher	1	15

Unit-2	**OPTICS :** **Diffraction:** Fraunhoffer Diffraction Introduction (18.1)Fraunhoffer Diffraction at a Single slit (18.2), Intensity distribution in diffraction pattern due to a single slit (18.2.1) Fraunhoffer diffraction at a double slit (18.4), Fraunhoffer diffraction at double slit (Calculus method)(18.4.1), Distinct between single slit and double slit diffraction pattern (18.4.2), Fraunhoffer diffraction at N slit(18.6 & 18.6.1), Plane Diffraction Gratting (18.7), Theory of plane transmission gratting (18.7.1), Dispersive power of Grating (18.7.7) *(RelatedExamples&Problem, MCQ, SQ)* **Resolving Power:** Resolving Power of Optical Instrument(19.5), Resolving Power of a telescope(19.7), Relation between magnifying power and resolving power of a telescope(19.7.1)., Resolving power of a plan transmission grating (19.12)*(RelatedExamples&Problem, MCQ, SQ)* **BasicReference:***ThermodynamicsandStatisticalPhysicsbyDr.J.P.AgarwalandSatyaPrakash(PragatiPrakashan)*	1	15
Unit-3	**OPTICS:** **Fermat's Principle :** Fermat's principle (2.1), Fermat's principle of least time(2.2), law of reflection and law of refraction(2.3) **Polarization:** Introduction(20.1), Polarization by double refraction(20.5.5), Double refraction(20.8.3), Huygens' explanation of double refraction(20.9 & 20.9.1), Types of Polarized light(20.15),, Retarders or Wave plate (Quarter wave plate) (20.17.1), (Half wave plate)(20.17.2), Production of Elliptically polarized light(20.18), Detection of Elliptically polarized light(20.18.1). *(RelatedExamples&Problem, MCQ, SQ)* **Basic Reference:***A text book of OPTICS by Dr. N.Subrahmanyam, Brijlal, Dr.M. N. Avadhanulu - S Chand*	1	15
Unit-4	**ELECTRONICS:** **Basic Transistors:** (Review of Construction of Transistor) Transistor Current Component(4.18), Detailed Transistor Leakage Currents (4.18-1) (Collector to Base and Collector to Emitter Leakage Current), C-B configuration static (Input and Output)characteristics)(4.09-1), Load Line(4.21), Operating Point(4.22) *(Related Examples, Problems, MCQ & Short Questions)* **Transistor Biasing and Stabilization:** Bias Stabilization (Operating Point stabilization) (8.7, 8.7.1 & 8.7.2), Stability factor (8.8), Stabilization by Collector Base Resistance (8.9) Stabilization by potential divider and Emitter resistor (8.10) *(Related Examples, Problems, MCQ & Short Questions)* **Basic Reference:** 1. Hand book of Electronics by Gupta & Kumar 30th Revised Edition, 2002 Pragati Prakashan	1	15

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER –III (PRACTICALCOURSE)

PROGRAMMECODE:SCIUG101

(EffectivefromJune2024UnderNEP–2020)

LABORATORYEXPERIMENTS: MAJOR COURSE 2 Credit for Group A

COURSECODE: SC23PMJDSCPHY301 Group A

TYPE OFCOURSE	CREDIT	Marks	COURSECODE
MajorDisciplineCoreCoursePractical (MJDSCP)	2 (Group A)	25 CCE + 25 SEE =50	SC23PMJDSCPHY301
TeachingHours TeachingHoursperWeek:08 Hours for 4 Credit practical (120 Hours per Semester) TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)			

LABORATORYEXPERIMENT COURSE: Group A

1. To Find out Viscosity co- efficient of liquid using co-axial viscometer.
2. To determine Young Modulus 'Y' for metal rod using Kund 's tube.
3. To find out the value of e/k using power transistor (PNP →CK 100 or NPN→SL-100).
4. To Determine Self Inductance of inductor by Anderson Bridge.
5. To determination of 'l_0','r' and 'a' for resonance pendulum.
6. To Determine Unknown Wave Length of Light 'λ' using Hartzmann Formula.
7. To Find out The Refractive Index of Ordinary and Extra Ordinary Rays using Dual Refraction From Calcite Prism.
8. To Find out The Wave Length of Light using Newton's Rings.
9. Stirling's formula (Numerical interpolation).
10. To determine unknown resistance using Post Office Box.

CourseObjectives:

- Togainpracticalknowledgebyapplyingtheexperimentalmethodtocorrelatewiththe Physicstheory.
- Toprovidehandsonexperiencewithequipmentsuchas,spectrometer,Pendulum, Viscometer, Newtons ring apparatus, power transistor and Anderson bridge.
- Tolearntheusageofelectricalandopticalsystemsofvariousmeasurements.
- Toprovidetraininghow toanalyzetheexperimentaldataandgraphicalanalysis.

CourseOutcome:LearningOutcomes:

Bytheendofthecourse,thestudentswillbeableto,

- Gainspracticalknowledgeofexperimentalmethods and Get sufficient knowledge about equipmentslike,spectrometer,Pendulum, Viscometer, Newtons ring apparatus, power transistor and Anderson bridge.
- Determineunknown wavelength, refractive index, electricalandopticalproperties.
- Get sufficient knowledgebyperformingexperimentsbasedontheprinciplesoftheory course.
- Analyzeand understands theexperimentaldataandgraphicalanalysis.
- Developthe communicationskillsby discussing basicprinciplesofscientific conceptsinthegroup.

HEMCHANDRACHARYANORTHGUJARATUNIVERSITY,PATAN

B.Sc.PHYSICS-SEMESTER –III (PRACTICALCOURSE)

PROGRAMMECODE:SCIUG101

(EffectivefromJune2024UnderNEP–2020)

COURSE NAME: MAJOR DISCIPLINE PRACTICAL COURSE 2 Credit for Group B

COURSECODE: SC23PMJDSCPHY301 Group B

TYPE OFCOURSE	CREDIT	Marks	COURSECODE
MajorDisciplineCoreCoursePractical (MJDSCP)	2 (Group B)	25 CCE + 25 SEE =50	SC23PMJDSCPHY301
TeachingHours TeachingHoursperWeek:08 Hours for 4 Credit practical (120 Hours per Semester) TeachingHoursperWeek:04 Hours for 2 Credit practical (60 Hours per Semester)			

LABORATORY EXPERIMENT COURSE: Group A

1. To determine the Absolute Value of Capacity using B.G or B.G
2. Obtain the Characteristics of UJT and Determination of R_{BB}, V_d& η
3. To Verify De Morgen's Theorems using IC-7400.
4. Absorption Co-Efficient of Liquid using Photocell.
5. Obtain the Characteristics of PNP Common Base Transistor.
6. A Study of Characteristics of JFET & Determination of μ, r_d, gm
7. Construction of AND, OR, NOT Gates Using NAND & NOR Universal Gates.
8. Numerical Analysis (Minimum Class Method)
9. To determine μ, r_d, g_m parameter of the JFET
10. A Study of Load line and determination of Q point for BJT

CourseObjectives:

- Togainpracticalknowledgebyapplyingtheexperimentalmethodtocorrelatewiththe Physicstheory.
- Toaware about circuit analysis of various electronic apparatus.
- Toget knowledgebyperformingexperiments and determine various parameter related with it.
- Toprovidetraininghow toanalyzetheexperimentaldataandgraphicalanalysis.
- Todevelopcommunicationskillsanddiscussthebasicprinciplesofscientific conceptsinthegroup.

CourseOutcome:LearningOutcomes:

Bytheendofthecourse,thestudentswillbeableto understands,

- ThebasicprinciplesofPhysicsrelatedtocoursesinthepracticalway.
- Operationaldetailsand Experimentalmethods of various electronic circuits.
- Aware about JFET, Various Gate, UJT, Photocell and Ballestic Galvanometer.
- DetermineQ-point of BJT, μ, r_d, g_m parameter of the JFET, Absorption Co-Efficient of Photocelletc.
- Get sufficient knowledgebyperformingexperimentsbasedontheoretical aspect.
- Learns howtoanalyzetheexperimentaldataandgraphicalanalysis.
- Developthe communicationskillsby discussing basicprinciplesofscientific conceptsinthegroup.