

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B. Sc. PHYSICS - SEMESTER – I

TYPE OF COURSE: MAJOR DISCIPLINE SPECIFIC COURSE

PROGRAMME CODE: SCIUG101

COURSE CODE: SC23MJDSCPHY101

COURSE NAME: Mathematical, Thermodynamics, Waves-Sound and Electronics

(Effective from June 2023 Under NEP – 2020)

Total Credits: 04	Theory	External Marks -50
Teaching Hours per Week: 04		
Teaching Hours per Semester: 60		Internal Marks - 50

Course Objective:

1. To Understand the concepts and significance of Scalar and Vector Fields, operations with operator ∇ and Gauss's Theorem, Stoke's Theorem
2. To Understand the applications of laws of Thermodynamics & the concepts of entropy.
3. To teach how to calculate changes in various Thermodynamic processes.
4. To develop knowledge about theory of resonator and its application, ultrasonic waves, its production and application
5. To develop knowledge about basic concepts, working of various rectifier and Filter circuits.

Course Outcome:

After the successful completion of the course students will be able to

1. Understands the concepts and significance of Scalar and Vector Fields as well as operations of operator ∇ , Gauss's Theorem and Stoke's Theorem.
2. Understands the Thermodynamics, Carnot's theorem and concepts of entropy.
3. Learns about Ultrasonics, production and its applications.
4. Will Get sufficient knowledge of sound and theory of resonator.
5. Learns sufficient knowledge of various rectifier, Filter circuits and applications of them.

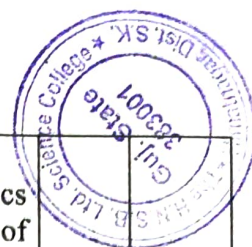
Syllabus

Unit No.	Content	Credit	Lect. Hrs 60
Unit-1	Mathematical Physics: Vector Algebra and Vector Analysis: Dyadic(1.10), Scalar Triple product(1.11), Reciprocal vectors(1.12), Vector Triple product(1.13), Pseudo vectors and Pseudo Scalars(1.16), Some Important Definition about Vectors, Integration of vector: Line Integration, Surface Integration and Volume Integration(2.3a,b), Partial differentiation(2.4), Gradient of a scalar point function(2.5), Divergence of vector(2.6), Curl of a vector(2.8), More about the Vector differential Operator ∇ (2.9), Multiple Del Operations(2.11), Some useful identities(2.13), Gauss' Theorem(2.14), Stokes Theorem(2.17). (<i>Related Examples & Problems</i>) Basic Reference: <i>Introduction to Classical Mechanics</i> by R.G. Takwale & P.S. Puranik (Tata McGraw-Hill Publishing Company Ltd.)	1	15

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Unit-2	Thermodynamics: Thermodynamics of Refrigerator: Second Law of Thermodynamics (2.8), Carnot's Theorem (2.9), Thermodynamic absolute Scale of temperature (2.10), Thermodynamics of Refrigeration (4.2) Entropy: Introduction of Entropy (2.13), Change of Entropy in a Reversible Process (2.14), change of entropy in an Irreversible process (2.15), Principle of Increase of Entropy of Degradation of Energy (2.16), Formulation of the Second law in term of Entropy(2.17), Entropy and second law(2.18), Third law of Thermodynamics (Nernst's Heat Theorem)(2.19) (<i>Related Examples & Problem</i>) Basic Reference : <i>Thermodynamics and Statistical Physics by Dr. J.P. Agarwal and Satya Prakash (Pragati Prakashan)</i>	1	15
Unit-3	Waves and Sound: Wave: Theory of Resonator (6.16), Dependence of the Frequency of resonator on the size and shape of the mouth (6.17), Velocity of Transverse waves along a stretched string (7.1), law's of Transverse Vibration of Strings (7.3), Melde's Experiment(7.5), Kundt's Tube (7.13) (<i>Related Examples & Problem</i>) Ultrasonic waves: Ultrasonics (11.23), Production of Ultrasonics (11.24), Magneto-Striction Effect (11.24.2), Piezo-Electric Effect Method-Oscillator(11.24.3), Detection of Ultrasonic Waves(11.25), Applications of Ultrasonic waves (11.27) (<i>Related Examples & Problem</i>) Basic Reference : <i>Waves And Oscillations by N. Subhramanyam & Brijlal (Vikas Publishing House Pvt. Ltd, – 2nd Revised Edition.</i>	1	15
Unit-4	Electronics : Rectifier and Power Supply: The Half Wave Rectifier (4.1) - [Average or D.C. output Voltage, Average or D.C. output current, RMS value of output current, Rectifier efficiency(Ratio of Rectification), Ripple factor, Voltage Regulation, Peak inverse voltage(PIV), Transformer Utilization Factor (TUF)], The Full Wave Rectifier (4.2) - [Average or D.C. output current, RMS value of output current, , Average or D.C. output Voltage, Rectifier efficiency(Ratio of Rectification), Ripple factor, Voltage Regulation, Peak Inverse Voltage(PIV), Transformer Utilization Factor(TUF)], Comparison of Half and Full Wave Rectifiers Circuit (4.3), The Bridge Rectifier (4.4). Filter Circuits: The Half Wave Rectifier with Series Inductor Filter(4.7.1) and with capacitor filter(4.7.2), The Full Wave Rectifier with Series Inductor Filter(4.7.3), Choke Input Filter or L-section Filter(L-C Filter)(4.7.4), Capacitor Input Filter(C-L- C Filter or π-Filter), [Comparison of L and π-section filter circuits] Basic Reference : <i>Hand book of Electronics by Gupta and Kumar</i>	1	15



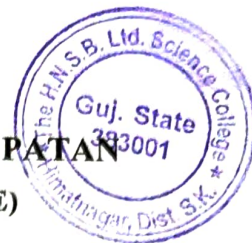

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: Further Reading – Other References :

- 1) Mathematical Method in physical sciences by M.L.Boas (john Willey&Sons)
- 2) Mathematical Physics by B D Gupta (4th Edition)
- 3) Mathematical Physics by H K Das
- 4) Vector analysis by Prof. R N Desai Uni. Granth Nirman Board, Gujarat
- 5) Heat and Thermodynamics by Zeemansky
- 6) University Physics by Sears, Zeemankky and young (Narosa Publishing House)
- 7) Heat and Thermodynamics by Richard H. Dittmon & Mark W. Zemansky (TMH)
- 8) Heat and Thermodynamics by A.B. Gupta and H. P. Roy (New Central Book)
- 9) Electronic Device & Circuits by Allen Mottershead , (PHI Pvt. LTD)
- 10) Electronics and Radio Engineering by M.L.Gupta.
- 11) Basic Electronis and Linear circuits by Bhargva Kulshreshth & Gupta TMH Edition
- 12) Elements of Electronics by Bagde & Singh


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HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

PROGRAMME CODE: SCIUG101
(Effective from June 2023 Under NEP – 2020)

TYPE OF COURSE	CREDIT	COURSE CODE
Major Discipline Core Course (MJDSCP)	2 (Group A)	SC23MJDSC P PHY101(A)
Major Discipline Core Course (MJDSCP)	2 (Group B)	SC23MJDSC P PHY101(B)
Minor Discipline Core Course (MIDSCP)	2	SC23MIDSC P PHY102
Inter-Discipline Core Course (MDCP)	2	SC23MDSC P PHY103

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)

Course Objectives:

- To gain practical knowledge by applying the experimental method to correlate with the Physics theory.
- To provide hands on experience with equipment such as, spectrometer, Pendulum, Flywheel and electronic circuits.
- To learn the usage of electrical and optical systems of various measurements.
- To impart practical knowledge by performing experiments based on the principles of theory courses.
- To provide training how to analyze the experimental data and graphical analysis.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in the group.

EXPERIMENTS

FOR MAJOR COURSE 2 Credit for Group A COURSE CODE: SC23MJDSC P PHY101(A)

- Determine a Damping coefficient, Relaxation and quality factor in the damped motion of a simple Pendulum.
- Study of Resonator: Verification of relation $n^2 (V + kv) = \text{constant}$ and determine the frequency of unknown for k.
- Determination of angular acceleration (α) and find MI of a Fly wheel using plot α verses Torque
- Arrangement of Spectrometer for parallel rays using Schuster method and to find Angle of Prism
- Calibration of the Spectrometer and determines the wavelength of unknown line of Hg-spectrum.
- To Find Refractive index of liquid using convex lens.
- Analysis of error.
- Verification of Stefan Boltzmann's fourth power law using A.C./D.C. Source
- Melde's Experiment: (i) To prove P/L constant and (ii) P²T constant
- Least square Method
- Study of Travelling Microscope, To determine Gauz eliment, Diameter of tube, width of auxiliary slit
- To find the Young's Modulus of the material of a Rectangular Bar by Bending. (Y by cantilever)

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LABORATORY EXPERIMENTS
For MAJOR COURSE 2 Credit for Group B
COURSE CODE: SC23MJDSC P PHY101(B)

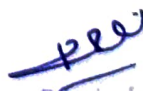


1. V-I characteristics of Zener diode
2. Study of Zener Diode as a voltage Regulator.
3. Study of the Series Resonance with Frequency Variation. (C constant)
4. Determination of the capacitance 'C' of a condenser.
5. P-N Junction diode as Half Wave Rectifier Without filter. Calculation of Percentage of Regulation.
6. P-N Junction diode as Half Wave Rectifier (i) With Series Inductor Filter
(ii) With Shunt Capacitor Filter. Calculation of Percentage of Regulation.
7. Verification of Thevenin's Theorem.
8. Study of Logic Gates: AND, OR and NOT. Verification of Truth table and giving understanding of voltage level for "0" and "1" level.
9. Experimental Measurements of Power Supply, Resistor, Diode, Transistor by Multimeter
10. Study of Step Up Transformer. To determine Turn Ratio, % of Efficiency, Energy loss due to copper loss for a given transformer.
11. Study of Bridge Rectifier (i) Without filter (ii) With Series Inductor Filter
(iii) With Shunt Capacitor Filter. Calculation of Percentage of Regulation.
12. Study of Maximum Power transfer Theorem

Course Outcome: Learning Outcomes

By the end of the course, the students will be able to understand.

- The basic principles of Physics related to their courses in the practical way.
- The operational details of spectrometer, electronic circuits etc.
- The experimental design aspects to determine various properties of like gravity, qualifactor, Refractive index, determination of Cauchy's Constants, analysis of spectra, Analysis of error, determine value of unknown frequency etc.
- The process to analyze the observations and infer the outcome of the experiments.
- How to analyze the experimental data and graphical analysis.


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