

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B. Sc. PHYSICS - SEMESTER – I
TYPE OF COURSE: MINOR DISCIPLINE SPECIFIC COURSE



PROGRAMME CODE: SCIUG101

COURSE CODE: SC23MIDSCPHY102

COURSE NAME: Mathematical Physics and Heat-Thermodynamics

(Effective from June 2023 Under NEP – 2020)

Total Credits: 02	Theory	External Marks - 25
Teaching Hours per Week: 02		Internal Marks - 25
Teaching Hours per Semester: 30		

Course Objective:

- To Understand the concepts and significance of Scalar and Vector Fields, operations with operator ∇ and Gauss's Theorem, Stoke's Theorem
- To Understand the applications of laws of Thermodynamics & the concepts of entropy.
- To teach how to calculate changes in various Thermodynamic processes.

Course Outcome:

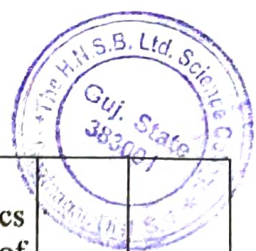
After the successful completion of the course students will be able to

- Understands the concepts and significance of Scalar and Vector Fields as well as operations of operator ∇ , Gauss's Theorem and Stoke's Theorem.
- Understands the Thermodynamics, Carnot's theorem and concepts of entropy.
- Calculate changes in various Thermodynamic processes.

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 $\mathbf{A}$ (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
	: Further Reading – Other References : 3) Mathematical Method in physical sciences by M.L.Boas (john Willey&Sons) 4) Mathematical Physics by B D Gupta (4th Edition) 3) Mathematical Physics by H K Das 5) 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)		

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

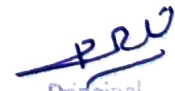
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TYPE OF COURSE	CREDIT	COURSE CODE
Minor Discipline Core Course (MIDSCP)	2	SC23MIDSC P PHY102

Teaching Hours per Week: 04 Hours for 2 Credit practical and Teaching Hours per Semester: 60 Hours

Minor Discipline Core Course (MIDSCP) Practical

1. Melde's Experiment: (i) To prove P/L constant and (ii) P^2T constant
2. Study of Resonator: Verification of relation $n^2 (V + kv) = \text{constant}$ and determine the frequency of unknown for k .
3. Determination of angular acceleration (α) and find MI of a Fly wheel using plot α verses Torque.
4. Least square Method
5. Arrangement of Spectrometer for parallel rays using Schuster method
6. Study of the Series Resonance with Frequency Variation, Fix Capacitor.
7. Determination of the capacitance 'C' of a condenser.
8. Study of Maximum Power transfer Theorem
9. Study of Step Up Transformer: To determine Turn Ratio, % of Efficiency, energy loss due to copper loss for a given transformer.
10. P-N Junction diode as Half Wave Rectifier Without filter. Calculation of Percentage of Regulation.
11. Verification of Thevenin's Theorem.
12. Calibration of the Spectrometer and determines the wavelength of unknown line of Hg-spectrum.


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