

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		Internal Marks - 50
Teaching Hours per Semester: 60		

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	<p>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></p> <p>Basic Reference: <i>Introduction to Classical Mechanics by R.G. Takwale & P.S. Puranik (Tata McGraw-Hill Publishing Company Ltd.)</i></p>	1	15

Unit-2	<p>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>)</p> <p>Basic Reference : <i>Thermodynamics and Statistical Physics by Dr. J.P. Agarwal and Satya Prakash (Pragati Prakashan)</i></p>	1	15
Unit-3	<p>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>)</p> <p>Basic Reference : <i>Waves And Oscillations by N. Subhramanyam & Brijlal (Vikas Publishing House Pvt. Ltd, – 2nd Revised Edition.</i></p>	1	15
Unit-4	<p>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]</p> <p>Basic Reference : <i>Hand book of Electronics by Gupta and Kumar</i></p>	1	15

: Further Reading – Other References :

- 1) Mathematical Method in physical sciences by M.L.Boas (John Wiley & 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 Zemansky
- 6) University Physics by Sears, Zemansky 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 Electronics and Linear circuits by Bhargava Kulshreshtha & Gupta TMH Edition
- 12) Elements of Electronics by Bagde & Singh**