SRI VENKATESWARA UNIVERSITY
B.SC. DEGREE COURSE IN PHYSICS (NON MATHS)
III SEMESTER

(UNDER CBCS W.E.F. 2021-22)

Course-III: HEAT AND THERMODYNAMICS

(For Non-MathsCombinations)

Work load: 60 hrs per semester **4 hrs/week**

Course outcomes:

On successful completion of this course, the student will be able to:

- *Develop an understanding on the concepts of Thermodynamics, Thermoelectricity, Low temperature Physics and Quantum theory of Radiation.*
- *Develop critical understanding of concept of Thermodynamic potentials and formulation of Maxwell's equations.*
- *Get familiarized with the principles of See beck effect, Thomson effect and Peltier effect.*
- *Understand the different methods of production of low temperatures and study the applications of substances at low temperatures.*
- *Examine the nature of black body radiations.*

UNIT-I:Kinetic theory of Gases: **(12 Hrs)**

Kinetic theory of gases- Assumptions-Pressure of an ideal gas; molecular interpretation of temperature- Maxwell's law of distribution of molecular speeds (no derivation); experimental verification; Zeroth law of thermodynamics, Measurement of temperature- Platinum resistance thermometer, Thermoelectric thermometer.

UNIT-II: Thermodynamics : **(12 Hrs)**

First law of thermodynamics, work done in isothermal and adiabatic changes ,Reversible and irreversible process, Carnot's cycle, Carnot's theorem; Second law of thermodynamics, Kelvin's and Claussius statements; Entropy, physical significance; Change in entropy in reversible and irreversible processes, Entropy and disorder-Entropy of universe.

UNIT-III: Low temperature Physics: (12 Hrs)

Methods for producing very low temperatures, Joule Kelvin effect, Porous plug experiment , Joule expansion-Distinction between adiabatic and Joule Thomson expansion-Expression for Joule Thomson cooling-Liquefaction of air by Linde's method, Production of low temperatures by adiabatic demagnetization (qualitative), Principle of refrigeration ,Practical applications of substances at low temperatures.

UNIT-IV: Measurement, Laws and Theories of Radiation: (12 Hrs)

Black body, Ferry's black body, Distribution of energy in the spectrum of Black body ,Kirchoff's law, Wein's displacement law, Stefan-Boltzmann's law and Rayleigh-Jean's law (Statements only), Planck's radiation formula (no derivations), Types of pyrometers, Disappearing filament optical pyrometer and its working; Solar constant and its determination using Angstrom pyroheliometer, Estimation of surface temperature of Sun.

UNIT-V: Thermoelectricity : (12 Hrs)

See beck effect, Variation of thermo emf with temperature; Thermo electric series; Measurement of thermo emf using potentiometer, Law of intermediate metals and intermediate temperatures - Peltier effect, Thomson effect; Thermoelectric diagrams and their uses, Thermoelectric power; Applications of thermoelectric effects.

REFERENCE BOOKS

- B.Sc. Physics, Vol.2, Telugu Academy, Hyderabad
- Physics for Biology and Premedical Students –D.N. Burns & SGG Mac Donald
- Unified Physics Vol .II, Optics and Thermo dynamics, Jai Prakash Nath & Co .Ltd., Meerut.
- Heat and Thermodynamics, N.Subramanyam and L.Brijlal, S.Chand& Co.
- Electricity and Magnetism, N.Subramanyam and L.Brijlal, S.Chand& Co.
- University Physics, HD Young, MW Zemansky, FW Sears, Narosa Publishers, New Delhi

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B.Sc. DEGREE COURSE IN PHYSICS (NON MATHS)
III- SEMESTER

(Under CBCS W.E.F. 2021-22)

Practical Course-III :Heat and Thermodynamics

Work load: 30 hrs **2 hrs/week**

On successful completion of this practical course ,the student will be able to:

- *Perform basic experiments in thermal Physics, such as, determinations of Stefan's constant, coefficient of thermal conductivity, variation of thermo-emf of a thermocouple with temperature difference at its two junctions, calibration of a thermocouple and Specific heat of a liquid.*

Minimum of 6 experiments to be done and recorded:

1. Specific heat of a liquid –Joule's calorimeter –Barton's radiation correction
2. Thermal conductivity of bad conductor-Lee's method
3. Thermal conductivity of rubber.
4. Measurement of Stefan's constant.
5. Specific heat of a liquid by applying Newton's law of cooling correction.
6. Heating efficiency of electrical kettle with varying voltages.
7. Thermo emf- thermo couple potentiometer
8. Thermal behavior of an electric bulb (filament/torch light bulb)
9. Measurement of Stefan's constant- emissive method
10. Study of variation of resistance with temperature - Thermistor.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

- MEASURABLE
    1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
    2. Student seminars (on topics of the syllabus and related aspects (individual activity)
    3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
    4. Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity)

5. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))
6. General
7. Group Discussion
8. Visit to Research Stations and related industries
9. Others

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Problem-solving exercises,
3. Observation of practical skills,
4. Individual and group project reports,
5. Efficient delivery using seminar presentations,

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BOS Chairman