

# 19FT204 THERMODYNAMICS AND HEAT ENGINES

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HS	CS	SA	S	BS
45	-	30	25	50	-	-	5	5



Source:

<https://www.sciencemag.org/news/2015/10/scientists-build-heat-engine-single-atom>

## COURSE DESCRIPTION AND OBJECTIVES:

This course deals with laws of thermodynamics, refrigeration, liquefaction and steam generation processes. The objective of this course is to make students understand the theory and applications of classical thermodynamics, and thermodynamic properties, equations of state and the methods used to describe and predict phase equilibrium.

## COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes	POs
1	Understand fundamentals of thermodynamic properties.	4
2	Derive and discuss the laws of thermodynamics.	1
3	Develop profound knowledge on refrigeration cycles.	2
4	Apply knowledge on different types of steam generators.	3

## SKILLS:

- ✓ To select suitable refrigerant for specific process.
- ✓ To estimate the thermal and volumetric properties of real fluids.
- ✓ To suggest industry specific boiler and usage.

**UNIT - I** **L-9**

**BASIC CONCEPTS** : The scope of thermodynamics; Dimensions and units; Different measurements - amount or size, force, temperature, pressure, work, energy, heat, zeroth law.

**UNIT - II** **L-9**

**FIRST LAW OF THERMODYNAMICS** : Joule's experiment; Internal energy; Statement of first law; Energy balance for closed system; Thermodynamic state and state functions; Equilibrium; Phase rule; Reversible processes; Constant-v and constant-p processes; Enthalpy; Heat capacity.

**UNIT - III** **L-9**

**THE SECOND LAW OF THERMODYNAMICS**: Statements of the second law; Heat engines; Thermodynamic temperature scales; Entropy; Mathematical statement of the second law; Third law of thermodynamics.

**UNIT - IV** **L-9**

**REFRIGERATION AND LIQUEFACTION** : The carnot refrigerator; The vapor compression cycle; The choice of refrigerant; Absorption refrigeration; Liquefaction processes.

**UNIT - V** **L-9**

**STEAM GENERATORS**: Classification of boilers; Comparison of fire tube and water tube boilers; Function of mountings and accessories; Constructional and operational details of cochran, babcock and wilcox boiler.

**TEXT BOOKS**

1. J. M. Smith, H. C. Vanness and M. M. Abbot, "Introduction to Chemical Engineering Thermodynamics", 6<sup>th</sup> edition, Tata McGraw Hill, 2005.
2. R. K. Rajput, "Thermal Engineering", 8<sup>th</sup> edition, Laxmi Publications, 2010.
3. Y. V. C. Rao, "Chemical Engineering Thermodynamics", 1<sup>st</sup> edition, Universities Press, 2004.

**REFERENCE BOOK**

1. P. K. Nag, "Engineering Thermodynamics", 5<sup>th</sup> edition, McGraw-Hill Education India Private Limited, 2013.