

## APPLIED THERMODYNAMICS

IV Semester: ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEC13	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: NIL</b>		<b>Practical Classes: Nil</b>		<b>Total Classes: 45</b>		
<b>Prerequisite: Thermodynamics.</b>								
<b>I. COURSE OVERVIEW:</b>								
<p>Applied Thermodynamics is science intended to introduce concepts and working principles of internal combustion engines which are widely used in different industrial applications such as automobile, agriculture, industry for transport, water pumping, electricity generation, earth moving and for supply mechanical power. This course also deals with working principles of compressors and refrigeration systems in various fields of engineering.</p>								
<b>II. COURSE OBJECTIVES:</b>								
<b>The students will try to learn:</b>								
<p>I. The concepts related to the operation of internal combustion engines based upon the fundamental engineering sciences of thermodynamics.</p> <p>II. The techniques for improving the efficiencies and performance of compressors and refrigeration systems retained to practical applications such as irrigation, air conditioning and refining oil and gas.</p> <p>III. The performance of Heat Engines in real-time applications by applying the various testing parameters of an engine.</p>								
<b>III. COURSE SYLLABUS:</b>								
<b>MODULE-I: IC ENGINES (09)</b>								
Four and two stroke engine, SI and CI engines, valve and port timing diagrams, fuel injection systems for SI and CI engines, ignition systems, cooling and lubrication system of IC engines.								
<b>MODULE –II: COMBUSTION IN SI ENGINES AND CI ENGINES (09)</b>								
Combustion in SI Engines: Normal combustion and abnormal combustion, importance of flame speed and effect of engine variables, type of abnormal combustion, pre-ignition and knocking, fuel requirements and fuel rating, anti-knock additives. Combustion in CI Engines: Four stages of combustion, delay period and its importance, effect of engine variables, diesel Knock.								
<b>MODULE –III: PERFORMANCE OF ENGINES AND COMPRESSORS (09)</b>								
Parameters of performance, measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, brake power, determination of frictional losses and indicated power, performance test, heat balance sheet.								
Classification of compressors: fans, blower and compressor, positive displacement and dynamic types, reciprocating and rotary types								
<b>MODULE –IV: CENTRIFUGAL AND AXIAL COMPRESSORS (09)</b>								
Centrifugal compressors: mechanical details and principle of operation, velocity and Pressure variation, Energy transfer, impeller blade shape-losses, slip factor, and power input factor, pressure coefficient and adiabatic coefficient, velocity diagrams, power. Axial flow compressors: Mechanical details and principle of operation, velocity triangles and energy transfer per stage degree of reaction, work done factor, isentropic efficiency, pressure rise calculations, poly-tropic efficiency.								
<b>MODULE –V: REFRIGERATION (09)</b>								
Mechanical refrigeration and types of refrigeration, units of refrigeration, air refrigeration system, details and principle of operation, applications of air refrigeration, vapor compression refrigeration systems, calculation of COP, effect of								

superheating and sub cooling, desired properties of refrigerants and common refrigerants, use of p-h charts for calculations.

#### **IV. TEXT BOOKS**

1. V. Ganesan, "I.C. Engines", Tata McGraw-Hill, 3rd Edition, 2011.
2. B. John Heywood, "Internal Combustion Engine Fundamentals", Tata McGraw-Hill, 2nd Edition, 2011.
3. R.K. Rajput, "Thermal Engineering", Lakshmi Publications, 1st Edition, 2011. P. K. Nag, "Engineering Thermodynamics", Tata McGraw Hill, 4th Edition, 2008.

#### **VI. REFERENCE BOOKS:**

1. Mathur, Sharma, "IC Engines", Dhanpat Rai & Sons, 3rd Edition, 2008.
2. Pulkrabek, "Engineering Fundamentals of IC Engines", Pearson Education, 2nd Edition, 2008.
3. Rudramoorthy, "Thermal Engineering", Tata McGraw-Hill, 5th Edition 2003.
4. C. P. Arora, "Refrigeration and Air Conditioning", Tata McGraw-Hill Education, 3rd Edition, 2013.
5. J. B. Jones, R. E. Dugan, "Engineering Thermodynamics", Prentice Hall of India Learning, 1st Edition, 2009.

#### **V. WEB REFERENCES:**

1. [http://www.newworldencyclopedia.org/entry/Internal\\_combustion\\_engine](http://www.newworldencyclopedia.org/entry/Internal_combustion_engine)
2. <http://www.nptel.ac.in/courses/112106133/#>
3. <https://www.grc.nasa.gov/www/k-12/airplane/engopt.html>