<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Name</th>
<th>L-T-P-Credits</th>
<th>Year of Introduction</th>
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<tr>
<td>ME205</td>
<td>THERMODYNAMICS</td>
<td>3-1-0-4</td>
<td>2016</td>
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**Prerequisite:** nil

**Course Objectives:**
1. To understand basic thermodynamic principles and laws
2. To develop the skills to analyze and design thermodynamic systems

**Syllabus**
Basic concepts, zeroth law of thermodynamics and thermometry, energy, first law of thermodynamics, second law of thermodynamics, entropy, irreversibility and availability, third law of thermodynamics for pure substances, equations of state, properties of gas mixtures, Introduction to ideal binary solutions, general thermodynamic relationships, combustion thermodynamics

**Expected outcome:** At the end of the course the students will be able to
1. Understand the laws of thermodynamics and their significance
2. Apply the principles of thermodynamics for the analysis of thermal systems

**Text Books**
2. E.Rathakrishnan Fundamentals of Engineering Thermodynamics, PHI, 2005

**References Books:**
4. M. Achuthan, Engineering Thermodynamics, PHI, 2004

**Steam Tables/Data book**
5. R.S. Khurmi, Steam table with Mollier chart, S. Chand, 2008
### Course Plan

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem. Exam Marks</th>
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</table>
| I      | Role of Thermodynamics in Engineering and Science -- Applications of Thermodynamics  
Zeroth Law of Thermodynamics, Measurement of Temperature-Thermometry, reference Points, Temperature Scales, Ideal gas temperature scale, Comparison of thermometers-Gas Thermometers, Thermocouple, Resistance thermometer  
Energy - Work - Pdv work and other types of work transfer, free expansion work, heat and heat capacity. | 7 | 15% |
| IV     | Available Energy, Availability and Irreversibility- Useful work, Dead state, Availability function, Availability and irreversibility in open and closed systems - Gouy-Stodola theorem , Third law of thermodynamics. Pure Substances, Phase Transformations, Triple point, properties during change of phase, T-v, p-v and p-T diagram of pure substance, p-v-T surface, Saturation pressure and Temperature, T-h and T-s diagrams, h-s diagrams or Mollier Charts, Dryness Fraction, steam tables. Property calculations using steam tables. | 10 | 15% |

**FIRST INTERNAL EXAM**

**SECOND INTERNAL EXAM**
| VI | General Thermodynamic Relations – Combined First and Second law equations – Helmholtz and Gibb’s functions - Maxwell’s Relations, Tds Equations. The Clapeyron Equation, equations for internal energy, enthalpy and entropy, specific heats, Throttling process, Joule Thomson Coefficient, inversion curve. #Introduction to thermodynamics of chemically reacting systems, Combustion, Thermochemistry – Theoretical and Actual combustion processes- Definition and significance of equivalence ratio, enthalpy of formation, enthalpy of combustion and heating value (*in this section numerical problems not included) | 10 | 20% |

END SEMESTER EXAM

**Question Paper Pattern**

Total marks: 100, Time: 3 hrs
Approved steam tables permitted
The question paper should consist of three parts

**Part A**
4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part B**
4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part C**
6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

**Note:** In all parts, each question can have a maximum of four sub questions, if needed.