

<b>Devi Ahilya University, Indore, India Institute of Engineering &amp; Technology</b>				<b>1 Year M.E.( Design &amp; Thermal Engg.) Full Time</b>			
<b>Subject Code &amp; Name</b>	<b>Instructions Hours per Week</b>			<b>Credits</b>			
<b>DTR1G1 Advanced Thermodynamics</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>
	<b>3</b>	<b>1</b>	<b>-</b>	<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>
<b>Duration of Theory Paper: 3 Hours</b>							

**Objective:** The basic objective of the subject is to deal fundamentals of Thermodynamics, Compressible Fluid Flow properties, Thermodynamics relations & Exergy.

**Prerequisite:** Basic Engineering Thermodynamics.

### COURSE CONTENT

#### UNIT 1

##### **Mass And Energy Analysis Of Control Volume**

Control Volume, Steady Flow Process, Mass Balance and Energy Balance in a Simple Steady Flow Processes, Variable Flow Processes, Comparison of SFEE with Euler and Bernoulli Equations, Examples of a Variable Flow Problems. Illustrative Problems.

#### UNIT 2

##### **Thermodynamic Property Relations**

Mathematic Theorems, Maxwell's Relations, TdS Equations, Heat Capacities, Joule Kelvin Effects, Clausius Clapeyron Equation, Gibb's Phase Rule, General Thermodynamic considerations on an Equation of State. Illustrative Problems

#### UNIT 3

##### **Exergy**

Work Potential of Energy, Reversible work and Irreversibility, Second Law Efficiency, Exergy Change of System, Exergy of a Closed System, Exergy of a Steady Flow System, Maximum Work Obtainable Conditions, Illustrative Problems

#### UNIT 4

##### **Vapour Power Cycles**

General Aspects, Simple Steam Power Cycle, Rankine Cycle, Reheat Cycle, Ideal Regenerative Cycle, Feedwater Heaters, Exergy Analysis of Vapour Power Cycles, Illustrative Problems

#### UNIT 5

##### **Finite Time Thermodynamics**

General Aspects, Application of principles on Reversible and Irreversible Cycles, Maximum Power Output conditions, Effect of Cycle Irreversibility Parameter on the performance of the Cycles, Performance of Engines working under Maximum Power and Maximum Power Density conditions, Entropy Generation Minimization, Concepts of Virtual Entropy, Illustrative Problems.

#### **Books Recommended:**

- [1.] Y.A Cengel, *Thermodynamics-An Engineering Approach*, McGraw Hill Companies, 2006.
- [2.] P.K Nag, *Engineering Thermodynamics*, The McGraw Hill Companies, Third Edition
- [3.] G.E Myers, *Engineering Thermodynamics*, Prentice Hall, Third Edition