

Faculty of Engineering & Technology, SRM University, Kattankulathur – 603203  
School of Mechanical Engineering

**Department of Mechanical Engineering**  
**Course plan**

Course code : ME1007 Date : 30 June 2014  
Course title : Thermodynamics  
Semester : 3  
Academic year / semester : 2014-2015 / Odd  
(June – November 2014)

**Section details:**

Section	Class Room No.	Details of Faculty member				Student contact time
		Name	Room No.	Inter com No.	e-mail id	
A	UB801	Dr. G.Kasiraman	MEC107		kasiraman.g@ktr.srmuniv.ac.in	Wednesday & Friday 12.15-1.30pm
B	UB802	Mr.V.Thirunavukkarasu	MEB302		thirunavukkarasu.v@ktr.srmuniv.ac.in	
C	UB803	Mr. S. Bharath Subramanian	H502		bharathsubramanian.s@ktr.srmuniv.ac.in	
D	UB804	Mr. M. Shivasankar	H313		sivashankar.m@ktr.srmuniv.ac.in	
E	UB805	Mr.N.Vijay Krishna	H314		vijaykrishna.n@ktr.srmuniv.ac.in	
F	UB806	Mr. G. Manigandaraja	MEB305 A		manikandaraja.g@ktr.srmuniv.ac.in	
G	UB807	Mr.Shamboo Yadav	MEB104		Shamboo.m@ktr.srmuniv.ac.in	
H	UB815	Mr.M.D.Kathirkaman	H502		kathirkaman.d@ktr.srmuniv.ac.in	
I	UB818	Mr. R. Manoj Kumar	MEB208 /H		manojkumar.p@ktr.srmuniv.ac.in	
J	U 819	Mr. V.Rajashekar	MEC107		rajasekar.v@ktr.srmuniv.ac.in	
K	U822	Mr. A. Perungosh	MEB101 B		perungosh.a@ktr.srmuniv.ac.in	
L	UB901	Mr. S. Ponsankar	H502A		ponsankar.s@ktr.srmuniv.ac.in	

**Direct assessment details:**

Name of assessment	Marks	Topics	Tentative date	Duration
Cycle test - I	10	Basic Concepts & Ist law	04-08-2014	100 minutes
Surprise test	05	Second law	Third Week of August 2014	10 – 15 min
Cycle test - II	10	Second Law-Entropy & Availability	29-08-2014	100 minutes
Model examination	20	Entire Syllabus	15-10-2014	3 hours
End semester examination	50	Entire Syllabus	November 2014	3 hours
Attendance	05	N/A		

Syllabus of the course:

		L	T	P	C
ME1007	THERMODYNAMICS	2	2	0	3
	Prerequisite				
	Nil				

(Use of approved Steam tables are permitted in the University Examinations)

**PURPOSE**

This course provides the basic knowledge about thermodynamic laws and relations, and their application to various processes.

**INSTRUCTIONAL OBJECTIVES**

Expected to

1. Understand the thermodynamic laws and their applications
2. Know the concept of entropy and availability
3. Know about the properties of steam and the use of steam tables and mollier chart.
4. Know about thermodynamic relations

**UNIT I - BASIC CONCEPTS OF THERMODYNAMICS**

**(12 hours)**

Macroscopic approach and microscopic approach - Thermodynamic system and surrounding - forms of energy - Properties of a system - State and equilibrium - Quasi static process - Zeroth law of thermodynamics, first law of thermodynamics, heat, work - Application of first law to non-flow system - Thermodynamic analysis of control volume - Steady flow energy equation - Applications.

**UNIT II - SECOND LAW OF THERMODYNAMICS**

**(12 hours)**

Kelvin-Planck statement - Clausius statement - Carnot cycle - Cyclic heat engine - Heat reservoirs - Refrigerator and heat pump - Equivalence of Kelvin - Planck and Clausius statements - Reversibility and irreversibility.

**UNIT III - ENTROPY AND AVAILABILITY**

**(12 hours)**

Clausius theorem - Clausius inequality - Entropy principle - Property diagrams involving entropy - Entropy change of ideal gases - Entropy generation in a closed system - Entropy generation in an open system - Third law of thermodynamics - Introduction to availability in non-flow and flow process.

**UNIT IV - PROPERTIES OF STEAM**

**(12 hours)**

Steam formation - Temperature entropy diagram-Mollier diagram-Specific properties of steam -Use of steam tables & Mollier chart - Methods of heating and expanding the steam - Constant volume heating - Constant pressure expansion - Isothermal expansion - Hyperbolic expansion-isentropic expansion – Polytrophic expansion - Throttling process - Dryness fraction measurement.

**UNIT V - THERMODYNAMIC RELATIONS**

**(12 hours)**

Maxwell's equations - Clapeyron equation -general relations for  $du$ ,  $dh$ ,  $ds$ ,  $C_p$  and  $C_v$  - Joule Thomson coefficient. Gas mixtures - Dalton's law of partial pressures - P-V-T behavior of gas mixtures - Property calculations.

**TOTAL : 60**

**TEXT BOOKS**

1. Nag.P.K, "Engineering Thermodynamics", 4th Edition, Tata McGraw Hill Education, New Delhi, 2008.
2. Yunus.N.J, Cengel.A, and Michael Boles, "A., Thermodynamics – An Engineering Approach, 6th Edition", Tata McGraw Hill- Education, 2008.

**DATA BOOKS**

1. Ramalingam. K.K, "Steam tables, Sci.Tech Publishers", 2009.
2. Khurmi.R.S, "Steam Table"s, S.Chand Publishers, 2012.

**REFERENCES**

1. Kothandaraman.C.P, Domkundwar.S, Anand Domkundwar, "A Course in Thermal Engineering", Dhanpat Rai & Co. (P) Ltd., 2010.
2. Mahesh M. Rathore, "Thermal Engineering", Tata Mc Graw Hill Education private limited, Reprint 2011.
3. Michael Moran.J, and Howard Shapiro.N, "Fundamentals of Engineering Thermodynamics", 4th Edition, John Wiley & Sons, New York, 2000.
4. William Z. Black, James G.Hartley, "Thermodynamics", 3rd edition Pearson, 2010.

Course designed by		Department of Mechanical Engineering										
1	Student Outcome	A	b	c	d	e	f	g	h	i	j	k
		x				x						
2	Category	GENERAL (G)			BASIC SCIENCES (B)			ENGINEERING SCIENCES AND TECHNICAL ART (E)			PROFESSIONAL SUBJECTS (P)	
											X	
3	Broad area  (for professional courses only, i.e 'under P' category)	Manufacturing			Design		Thermal		General			
							X					
4	Course Coordinator	Dr. G. Kasiraman										

### SESSION PLAN

Session No.	TITLE/DETAILS OF CHAPTER	REFERENCES
<b>Basic Concepts of Thermodynamics</b>		
1	Introduction to Thermodynamics Macroscopic and Microscopic aspects, System, surrounding and boundary	T1- 1.1,1.2
2	Forms of energy, properties of a system, State and equilibrium, Quasi-static process	T1- 1.3,1.5,1.6
3	Zerth law, Heat, Work, First law, limitations	T1-2.1,3.7, 3.10,4.1
4	Application of first law to non flow systems	T1-4.2
5	Tutorial – First law – closed system	T1-4.2
6	Thermodynamic analysis of control volume	T1-5.1
7	Steady flow energy equation	T1-5.2,5.3
8	Applications of SFEE	T1-,5.4
9	Tutorial – First law – open system	T1-5.2,5.3,5.4
<b>Second Law of Thermodynamics</b>		
10	Kelvin Planck Statement, Clausius Statement	T1-6.4,6.5
11	Carnot cycle, Cyclic Heat Engine, Thermal Reservoirs.	T1-6.11,6.2,6.3
12	Tutorial – Carnot cycle and Heat engines	T1-6.11,6.2,6.3
13	Tutorial – Carnot cycle and Heat engines	T1-6.11,6.2,6.3
14	Refrigerator and Heat pump	T1-6.6
15	Tutorial - Refrigerator and Heat pump	T1-6.1
16	Equivalence of Kelvin Planck and Clausius Statements	T1-6.7
17	Reversibility and Irreversibility	T1-6.8
18	Tutorial- Reversibility and Irreversibility	T1-6.8
<b>Entropy and Availability</b>		
19	Clausius Theorem - Clausius Inequality	T1-7.3,7.6
20	Entropy principle, Property diagram involving entropy	T1-7.4,7.8
21	Entropy change of Ideal gases	T1-7.7,10.3.2
22	Entropy generation in a closed system	T1-7.11
23	Tutorial	
24	Entropy generation in a open system	T1-7.12
25	Tutorial	
26	Third law of thermodynamics	R3-8.16
27	Introduction to availability in non-flow and flow process	T1-8.8

<b>Properties of Steam</b>		
28	Steam formation, Specific properties of steam, T-s diagram	R4-10.3,10.4,10.6
29	Mollier Diagram, Use of steam tables and Mollier chart	R4-10.6
30	Methods of heating and expanding the steam, Constant volume heat, constant pressure and isothermal expansion	R4-10.7
31	Hyperbolic, Isentropic, Polytropic expansion and Throttling process	R4-10.7
32	Tutorial – Solving problems using steam table	R4-10.6
33	Tutorial – Solving problems using steam table	R4-10.6
34	Tutorial – Solving problems using Mollier chart	R4-10.6
35	Dryness fraction measurement	R4-10.8
36	Tutorial – Dryness fraction measurement	R4-10.8
<b>Thermodynamic Relations</b>		
37	Introduction. Derivation of Maxwell's equations	T1-11.2
38	Derivation of Clayperon equation	T1-11.8
39	General relations for dh,du,ds,c <sub>p</sub> and c <sub>v</sub>	T1-11.3-11.6
40	Tutorial	
41	Tutorial	
42	Joule Thomson Co-efficient, Gas mixtures, Daltons law of partial pressure	T1-11.7,10.8
43	P-V-T behavior of gas mixtures	T1-10.9
44	Property Calculations	T1-10.10
45	Tutorial	


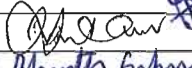

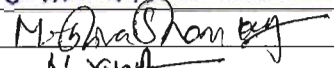
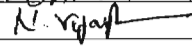
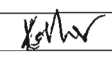
#### **Text Books**

1. Nag, P. K, Engineering Thermodynamics, 4th Edition, Tata McGraw Hill, New Delhi, 1995
2. Yunus A. Cengel, and Michael A Boles, Thermodynamics - An Engineering Approach, 2nd Edition, McGraw Hill India, 1994

#### **Reference Books**

1. Michael Moran, J., and Howard Shapiro, N., Fundamentals of Engineering Thermodynamics, 4th Edition, John Wiley & Sons, New York, 2000
2. Rayner Joel, Basic Engineering Thermodynamics, 5th Edition, Addison Wesley, New York, 1996
3. Holman, J. P., Thermodynamics, 4th Edition Tata McGraw Hill, New Delhi, 1998
4. Kothandaraman, C. P., and Domkundwar, S., A Course in Thermal Engineering, 5th Edition, Dhanpat Rai & Sons, New Delhi, 1998

Name & Signature of the Faculty:

Name	Signature
Dr. G.Kasiraman	
Mr.V.Thirunavukkarasu	
Mr. S. Bharath Subramanian	
Mr. M. Shivasankar	
Mr.N.Vijay Krishna	
Mr. G. Manigandaraja	
Mr.Shamboo Yadav	
Mr.M.D.Kathirkaman	
Mr. R. Manoj Kumar	
Mr. V.Rajashekar	
Mr. A. Perungosh	
Mr. S. Ponsankar	

  
(Course Co-ordinator)

Dean/Mechanical Engg.