Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Mechanical Engineering
BME502 - THERMAL ENGINEERING - II
Fifth Semester, 2015-16 (odd Semester)

Course (catalog) description

To apply the thermodynamic concepts into various thermal application like IC engines, Steam Turbines, Compressors and Refrigeration and Air conditioning systems.

Compulsory/Elective course **:** Compulsory

Credit & contact hours : 3 & 45

Course Coordinator : Mr.S.Manavalan

Instructors **:** Mr. V.Srinivasan, Mr. S.Manavalan, Mr. Manikandan, Mr. Anbazhagan

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Mr. V.Srinivasan	V Sem – A & E Section	JR 106	8940737381	Srinivasan.mech@ bharathuniv.ac.in	Tuesday 12.30 to 01.30
Mr. S. Manavalan	V Sem – B Section	JR305	8939990775	Manavalan.mech@ bharathuniv.ac.in	
Mr. J.Manikandan	V Sem – C Section	JR105	9952586083	Manikandan.mech@ bharathuniv.ac.in	Wednesday 12.30 to 01.30
Mr. S. Anbazhagan	V Sem – D Section	JR310	9940027609	Anbazhagan.mech@ bharathuniv.ac.in	

Relationship to other courses:

Pre –requisites **:** Thermodynamics, Thermal Engineering – I

Assumed knowledge : Laws of Thermodynamics , Knowledge about Processes, PVT Relationship, Steam and air Properties

Following courses : Refrigeration & Air Conditioning, Heat & Mass Transfer, Power Plant Engineering

Syllabus Contents

UNIT I I.C. ENGINES 9

S.I.Engines-Simple carburetor- Idling, cruising and power range-MPFI system, Principles of Turbo charging, Ignition systems-Battery ignition and magneto ignition systems-Combustion-detonation factors and remedy – Pollution control norms. C.I Engines-Fuel injection systems, Combustion knocking factors and remedies Rating of fuels, Cooling and lubrication of I.C Engines.

UNIT TESTING OF I.C. ENGINES 9

Indicated power and Brake power, Mean effective pressure, Efficiencies, Morse test, Determination of torque, Brake power and Brake mean effective pressure, Specific fuel consumption, Brake thermal efficiency and different efficiencies, Performance curves and effect of various parameters on the performance of the engine.

UNIT III AIR COMPRESSORS 9

Reciprocating compressor-Multistage compression-Effect of clearance, volumetric efficiency, Rotary compressors, vane type, Root blowers, Screw compressors, Centrifugal compressors.

UNIT IV PRINCIPLES OF GAS DYNAMICS 9

Types of Jet engines, turbojet, ramjet, pulsejet. Aircraft propulsion theories, Parameters affecting flight performance, Thrust Augmentation, Types of Rocket engines.

UNIT V AIR CONDITIONING 9

Introduction to Psychrometry-Psychrometric chart-Psychrometric processes-summer and winter air conditioning, SHF, RSHF, GSHF, ESHF, Simple calculations used in psychrometry, Components used in air conditioners.

TEXT BOOKS:

1. S.C.Somasundaram-Thermal Engineering-New Age International (P) Ltd, 1999.
2. C.P.Arora-Refrigeration & Air conditioning, 2000
3. R.K.Rajput-Engineering Thermodynamics-Laxmi Publications

REFERENCES:

1. Mathur and Mehta, Thermal Engineering-Jain brothers, 1998
2. Ramalingam-Internal combustion engines-SciTech publications, 2003
3. YahyaS.M-Fundamantals of Compressible flow,New Age International(P)NewDelhi, 2008
4. Cohen H, Rogers GFC, Saravanamuttoo HIH, Gas Turbine Theory, Addison Wesley Longman Ltd, 2007
5. www.allexamresults.net/.../download-pdf-textbook-of-thermal-engineering.

Total : 45 Hours

Computer usage:

Professional component

General	-	5%
Basic Sciences	-	10%
Engineering sciences & Technical arts	-	75%
Professional subject	-	10%

Broad Area:

Thermal Engineering

Test Schedule

S.No	Test	Tentative Date	Portion	Duration
1	Cycle Test - 1	25.08.2016	Session 1 to 15	100 Min
2	Cycle Test – 2	29.09.2016	Session 61 to 35	100 Min
3	Model Test	28.10.2016	Session 1 to 45	3 Hrs
4	University Examination	22.11.2016	Session 1 to 45	3 Hrs

Mapping of Instructional Objectives with Program Outcome

COURSE OUTCOMES (COs)	
CO1	Learn the fundamental and concepts in IC engines
CO2	Learn Testing of IC engines
CO3	Learn types of air compressors
CO4	Study various principles of gas dynamics
CO5	Learn Air conditioning
CO6	Apply their learnt ideas in their field of work

		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2		M										
	CO3												
	CO4										H	M	
	CO5						L				H		M
	CO6							H			H		

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
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4	Approval	37th Meeting of Academic Council, May 2015							

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	**I.C. ENGINES**		
1	S.I.Engines	No	T3 – Chapter 23
2	Simple carburetor, Idling, cruising and power range	No	T3 – Chapter 23
3	MPFI system, Principles of Turbo charging,	No	T3 – Chapter 23
4	Ignition systems-Battery ignition and magneto ignition systems	No	T3 – Chapter 23
5	Combustion-detonation factors and remedy	No	T3 – Chapter 23
6	Pollution control norms	No	T3 – Chapter 23
7	C.I Engines-Fuel injection systems,	No	T3 – Chapter 23
8	Combustion knocking factors and remedies Rating of fuels,	No	T3 – Chapter 23
9	Cooling and lubrication of I.C Engines	No	T3 – Chapter 23
UNIT II	**TESTING OF I.C. ENGINES**		
10	Indicated power and Brake power	Yes	T3 – Chapter 23
11	Mean effective pressure, Efficiencies	Yes	T3 – Chapter 23
12	Morse test, Determination of torque	Yes	T3 – Chapter 23
13	Brake power and Brake mean effective pressure	Yes	T3 – Chapter 23
14	Specific fuel consumption	Yes	T3 – Chapter 23
15	Brake thermal efficiency	Yes	T3 – Chapter 23
16	Different efficiencies	Yes	T3 – Chapter 23

17	Performance curves	Yes	T3 – Chapter 23
18	Effect of various parameters on the performance of the engine	Yes	T3 – Chapter 23
UNIT III AIR COMPRESSORS			
19	Reciprocating compressor	Yes	T3 – Chapter 24
20			T3 – Chapter 24
21	Multistage compression	Yes	T3 – Chapter 24
22			T3 – Chapter 24
23	Effect of clearance	Yes	T3 – Chapter 24
24	Volumetric efficiency	Yes	T3 – Chapter 24
25	Rotary compressors	No	T3 – Chapter 24
26	Vane type, Root blowers	No	T3 – Chapter 24
27	Screw compressors, Centrifugal compressors	No	T3 – Chapter 24
UNIT IV PRINCIPLES OF GAS DYNAMICS			
28	Types of Jet engines	No	T3 – Chapter 25
29			
30	Turbojet, ramjet, pulsejet	No	T3 – Chapter 25
31			
32	Aircraft propulsion theories	No	T3 – Chapter 25
33			
34	Parameters affecting flight performance	No	T3 – Chapter 25
35	Thrust Augmentation	No	T3 – Chapter 25
36	Types of Rocket engines	No	T3 – Chapter 25
UNIT V AIR CONDITIONING			
37	Introduction to Psychrometry	No	T3 – Chapter 9
38	Psychrometric chart	No	T3 – Chapter 9
39	Psychrometric processes	No	T3 – Chapter 9
40	summer and winter air conditioning	No	T3 – Chapter 28
41	SHF, RSHF, GSHF, ESHF	No	T3 – Chapter 28
42	Simple calculations used in Psychrometry	Yes	T3 – Chapter 9
43			
44			
45	Components used in air conditioners	No	T3 – Chapter 28

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment / Seminar / Online Test / Quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by Mr. V. Srinivasan

Addendum

ABET Outcomes expected of graduates of B.Tech / MECH / program by the time that they graduate:

a) The ability to apply knowledge of mathematics, science, and engineering fundamentals.

b) The ability to identify, formulate and solve engineering problems.

c) The ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d) The ability to design and conduct experiments, as well as to analyze and interpret data

e) The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

f) The ability to apply reasoning informed by the knowledge of contemporary issues.

g) The ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

h) The ability to understand professional and ethical responsibility and apply them in engineering practices.

i) The ability to function on multidisciplinary teams.

j) The ability to communicate effectively with the engineering community and with society at large.

k) The ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.

l) The ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION:

Mechanical Engineering graduatesare enthusiastic to provide strong foundation in mathematical, scientific and engineering fundamentals necessary to analyze, formulate and solve engineering problems in the field of Mechanical Engineering.

PEO2: CORE COMPETENCE:

Mechanical Engineering graduates have competence to enhance the skills and experience in defining problems in the field of Mechanical Engineering and Technology design and implement, analyzing the experimental evaluations, and finally making appropriate decisions.

PEO3: PROFESSIONALISM:

Mechanical Engineering graduates made competence to enhance their skills and embrace new thrust areas through self-directed professional development and post-graduate training or education.

PEO4: PROFICIENCY:

Mechanical Engineering graduates became skilled to afford training for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS:

Mechanical Engineering graduates are morally merged to apply the ethical and social aspects of modern Engineering and Technology innovations to the design, development, and usage of new products, machines, gadgets, devices, etc.

S.No	Course Teacher	Signature
1	Mr. V.Srinivasan	
2	Mr. S.Manavalan	
3	Mr. J. Manikandan	
4	Mr. S. Anbazhagan	

Course Coordinator **HOD/MECH**

Mr. S.Manavalan