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SASURIE COLLEGE OF ENGINEERING

Approved by AICTE, New Delhi. Affiliated to Anna University, Chennai

Near NH544, Coimbatore Bypass, Near Vijayamangalam Tollgate,Tirupur 638056

NAAC DOCUMENTS

QUALITY INDICATOR FRAME WORK

CRITERION - 1

CURRICULAR ASPECTS

SUBMITTED BY

IQAC

INTERNAL QUALITY ASSURANCE CELL

SASURIE COLLEGE OF ENGINEERING

Criterion 1	Curricular Aspects	100

Curricular Planning and Implementation (20)

The Institution ensures effective curriculum planning and delivery through a well-plannedand documented process including Academic calendar and conduct of continuous internal Assessment

Table of Contents

SASURIE INSTITUTIONS

SASURIE
College of Engineering
Vijayamangalam, Tiruppur.

Department : Mechanical Engineering
Subject Code & Name: ME8391&ENGINEERINGTHERMODYNAMICS
Class & Batch II
Semester III

CONTENTS–COURSEFILE

S.NO	PARTICULARS	REMARKS
1	Student name list	
2	Subject Information Record	
3	Syllabus	
4	Test Plan for the Subject	
5	Unit test mark sheet(Consolidated)	
6	Unit test question paper	
7	Model question paper	
8	Sample Answer paper for all test (Min-3)	
9	Assignment–schedule and paper	
10	Lecture Note	

	Prepared by	Verified by
Sign	S.A.	V.P.
Name	S.A.RAMESH	V.P.Krishnamurthy
	Faculty	HOD

Dr.M.VIJAYAKUMAR ME., Ph.D.,
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TIME TABLE ODD SEM 2020-21

DATE	9.30AM -10.30AM	10.30AM-11.30AM	11.30AM-12.30PM	1.30PM-2.30PM	2.30PM-3.30PM
MON				ETD	
STAFF NAME				S A RAMESH	
TUE					ETD
STAFF NAME					S A RAMESH
WED				ETD	
STAFF NAME				S A RAMESH	
THU		ETD			
STAFF NAME		S A RAMESH			
FRI					ETD
STAFF NAME					S A RAMESH
SAT	ETD			ETD	
STAFF NAME	S A RAMESH			S A RAMESH	

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College of Engineering
Vijayamangalam, Tiruppur.

STUDENT NAME LIST

SUBJECT NAME: ENGINEERING THERMODYNAMICS

SUBJECT FACULTY : S.A.RAMESH AP/MECH

S.NO	REGISTERNUMBER	NAMEOFTHESTUDENT	REMARKS
1	732419114001	AmulrajP	
2	732419114002	ArunkumarB	
3	732419114003	Kavikrishnan P	
4	732419114004	KishoreB	
5	732419114006	PavendharS	
6	732419114007	Priyadharshan G	
7	732419114008	SelventhiranS	
8	732419114010	ThirunavukkarasuS	

	Prepared by	Verified by
Sign	S.A.	V.P.
Name	S.A.Ramesh	V.P.Krishnamurthy
	Faculty	HOD

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SUBJECT INFORMATION RECORD

Department	: MECHANICAL ENGINEERING
Subject	: ENGINEERING THERMODYNAMICS
Year	: II YEAR
Semester	: III
Last year handled by	: S.A.RAMESH
Percentage of Result (last year)	: 68%
Quality Objectives	:
Reference Book	:

	Prepared by	Verified by
Sign	S.A.R	V.P.K
Name	S.A.Ramesh	V.P. Krishnamurthy
	Faculty	HOD

Dr.M.VIJAYAKUMAR ME., Ph.D.,
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ME8391 **ENGINEERING THERMODYNAMICS** **L T P C 3 2 0**

OBJECTIVE:

- To familiarize the students to understand the fundamentals of thermodynamics and to perform thermal analysis on their behavior and performance.

(Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and Psychrometric Chart permitted)

UNIT I BASIC CONCEPTS AND FIRST LAW **9+6**

Basic concepts - concept of continuum, comparison of microscopic and macroscopic approach. Path and point functions. Intensive and extensive, total and specific quantities. System and their types. Thermodynamic Equilibrium State, path and process. Quasi-static, reversible and irreversible processes. Heat and work transfer, definition and comparison, sign convention. Displacement work and other modes of work .P-V diagram. Zeroth law of thermodynamics – concept of temperature and thermal equilibrium- relationship between temperature scales -new temperature scales. First law of thermodynamics -application to closed and open systems – steady and unsteady flow processes.

UNIT II SECOND LAW AND AVAILABILITY ANALYSIS **9+6**

Heat Reservoir, source and sink. Heat Engine, Refrigerator, Heat pump. Statements of second law and its corollaries. Carnot cycle Reversed Carnot cycle, Performance. Clausius inequality. Concept of entropy, T-s diagram, Tds Equations, entropy change for - pure substance, ideal gases - different processes, principle of increase in entropy. Applications of II Law. High and low grade energy. Available and non-available energy of a source and finite body. Energy and irreversibility. Expressions for the energy of a closed system and open systems. Energy balance and entropy generation. Irreversibility. I and II law Efficiency.

UNIT III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE **9+6**

Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Application of I and II law for pure substances. Ideal and actual Rankine cycles, Cycle Improvement Methods - Reheat and Regenerative cycles, Economiser, preheater, Binary and Combined cycles.

UNIT IV IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS **9+6**

Properties of Ideal gas- Ideal and real gas comparison- Equations of state for ideal and real gases- Reduced properties. Compressibility factor-.Principle of Corresponding states. -Generalised Compressibility Chart and its use-. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation, Phase Change Processes. Simple Calculations.

UNIT V GAS MIXTURES AND PSYCHROMETRY **9+6**

Mole and Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

TOTAL : 75 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Apply the first law of thermodynamics for simple open and closed systems under steady and unsteady conditions.

CO2 Apply second law of thermodynamics to open and closed systems and calculate entropyand availability.

CO3 Apply Rankine cycle to steam power plant and compare few cycle improvement methods

CO4 Derive simple thermodynamic relations of ideal and real gases

CO5 Calculate the properties of gas mixtures and moist air and its use in psychometricprocesses

TEXT BOOKS :

1. R.K.Rajput, "A Text Book Of Engineering Thermodynamics ",Fifth Edition,2017.
2. Yunus a. Cengel & michael a. Boles, "Thermodynamics", 8th edition 2015.

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TESTPLANFORSUBJECT

Subject :ENGINEERINGTHERMODYNAMICS Faculty:S.A.RAMESH

Semester : III Year:II

Department: MECHANICAL

S. No.	Description	Planned Date/Month	Actual Conducted Date/Month	Remarks
1	INTERNALTEST –I	16.09.2020	16.09.2020	
2	INTERNALTEST –II	17.10.2020	17.10.2020	
3	MODEL EXAM	03.11.2020	03.11.2020	

	Prepared by	Verified by
Sign	S.A.Ramesh	V.P.Krishnamurthy
Name	S.A.RAMESH	V.P.KRISHNAMURTHY
	Faculty	HOD

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LESSON PLAN

Faculty Name : S.A.RAMESH
Designation: Assistant Professor
Department : MECH
Semester/ Year: III / II
Subject : ENGINEERING THERMODYNAMICS
Academic Year : 2020-2021

S.No.	Proposed		Details of Topic Covered	TA	Ref.	Actual		Remarks
	Date	Period				Date	Period	
			UNIT I GAS AND STEAM POWER CYCLES					
1	30.09.2020	4	Air Standard Cycles	1	2	30.09.2020	4	
2	30.09.2020	4	Otto Cycle	1	2	30.09.2020	4	
3	01.10.2020	2	Diesel Cycle	1	2	01.10.2020	2	
4	01.10.2020	2	Dual cycle	1	2	01.10.2020	2	
5	03.10.2020	1	Brayton cycle	1	2	03.10.2020	1	
6	03.10.2020	4	Air Standard Cycles analysis	1	2	03.10.2020	4	
7	5.10.2020	4	Performance and Comparison	1	2	5.10.2020	4	
8	06.10.2020	5	Rankine cycle	1	2	06.10.2020	5	
9	07.10.2020	4	Reheat rankine cycle	1	2	07.10.2020	4	
			UNIT II RECIPROCATING AIR COMPRESSOR					
10	08.10.2020	2	Classification of reciprocating air compressor	1	2	08.10.2020	2	
11	09.10.2020	5	Comparison of reciprocating air compressor	1	2	09.10.2020	5	
12	10.10.2020	1	working principle,	1	2	10.10.2020	1	
13	10.10.2020	4	with and without clearance of reciprocating air	1	2	10.10.2020	4	
14	12.10.2020	4	Volumetric efficiency,	1	2	12.10.2020	4	
15	13.10.2020	5	Isothermal efficiency	1	2	13.10.2020	5	
16	14.10.2020	4	Isentropic efficiency	1	2	14.10.2020	4	
17	15.10.2020	2	Multistage air compressor with Intercooling	1	2	15.10.2020	2	
18	16.10.2020	5	Working principle of Rotary compressors with	1	2	16.10.2020	5	
19	17.10.2020	1	comparison of Rotary compressors with	1	2	17.10.2020	1	
			UNITE III INTERNAL COMBUSTION ENGINES AND COMBUSTION					
20	17.10.2020	4	IC engine – Classification, working,	1,3	1,2	17.10.2020	4	
21	19.10.2020	4	IC engine -components and their functions.	1,3	1,2	19.10.2020	4	
22	20.10.2020	5	Ideal and actual : Valve and port timing diagrams	1,3	1,2	20.10.2020	5	
23	21.10.2020	4	p-v diagrams- two stroke & four stroke,	1,3	1,2	21.10.2020	4	
24	22.10.2020	2	SI & CI engines – comparison	1,3	1,2	22.10.2020	2	
25	23.10.2020	5	SI & CI engines – comparison	1,3	1,2	23.10.2020	5	
26	24.10.2020	1	performance comparison of SI and CI engines	1,3	1,2	24.10.2020	1	
27	24.10.2020	4	Desirable properties and qualities of fuels	1,3	1,2	24.10.2020	4	
28	26.10.2020	4	Air-fuel ratio calculation – lean and rich mixtures	1,3	1,2	26.10.2020	4	
29	27.10.2020	5	Combustion in SI & CI Engines	1,3	1,2	27.10.2020	5	
30	28.10.2020	4	Knocking – phenomena and control.	1,3	1,2	28.10.2020	4	
			UNIT IV INTERNAL COMBUSTION ENGINE PERFORMANCE AND SYSTEMS					
31	29.10.2020	2	Performance parameters and calculations	1	2	29.10.2020	2	
32	30.10.2020	5	Morse and Heat Balance tests	1	2	30.10.2020	5	
33	31.10.2020	1	Multipoint Fuel Injection system	1,3	2	31.10.2020	1	
34	31.10.2020	4	Common Rail Direct Injection systems	1,3	2	31.10.2020	4	
35	02.11.2020	4	Ignition systems – Magneto	1,3	2	02.11.2020	4	
36	03.11.2020	5	Ignition systems – Battery	1,3	2	03.11.2020	5	

37	04.11.2020	4	Ignition systems – Electronic.	1,3	2	04.11.2020	4	
38	05.11.2020	2	Lubrication and Cooling systems	1,3	2	05.11.2020	2	
39	06.11.2020	5	Concepts of Supercharging	1,3	2	06.11.2020	5	
40	07.11.2020	1	Turbocharging	1,3	2	07.11.2020	1	
41	07.11.2020	4	Emission Norms	1,3	2	07.11.2020	4	
			UNIT V GAS TURBINES					
42	09.11.2020	4	Gas turbine cycle analysis	1	2	09.11.2020	4	
43	10.11.2020	5	open cycle	1	2	10.11.2020	5	
44	11.11.2020	4	closed cycle	1	2	11.11.2020	4	
45	12.11.2020	2	Performance analysis	1	2	12.11.2020	2	
46	13.11.2020	5	Performance and its improvement	1	2	13.11.2020	5	
47	14.11.2020	1	Regenerative cycles	1	2	14.11.2020	1	
48	14.11.2020	4	Intercooled cycles	1	2	14.11.2020	4	
49	16.11.2020	4	Reheated cycles	1	2	16.11.2020	4	
50	17.11.2020	5	combinations of cycles	1	2	17.11.2020	5	
51	18.11.2020	4	Materials for Turbines.	1	2	18.11.2020	4	
52	19.11.2020	2	Tutorial	1	2	19.11.2020	2	
53	20.11.2020	5	Over view	1	2	20.11.2020	5	

Reference books (Ref):

1. Kothandaraman.C.P., Domkundwar. S,Domkundwar. A.V., "A course in thermal Engineering", Fifth Edition, "Dhanpat Rai &
2. Rajput. R. K., "Thermal Engineering" S.Chand Publishers, 2017

Teaching Aids (TA):

1. Black Board with Chalk
2. Overhead Projector
3. LCD Projector
4. Others (Field vists, Charts, Cutset Models)

	Prepared by	Verified by	Authorized by
Sign:	S.A.Ramesh	V.P.Krishnamurthy	T.S.Sivakumaran
Name:	S.A.Ramesh	Mr.V.P.Krishnamurthy	Dr.T.S.Sivakumaran
	Faculty	HD	Principal

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Register Number:

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Internal Test - I			Date/Session	16.09.2020	Marks	50
Course code	ME8391	Course Title	Engineering Thermodynamics			
Regulation	2017	Duration	1 Hour 30 Minutes	Academic Year	2020-21	
Year	II	Semester	III	Department	Mechanical	

COURSE OUTCOMES

CO1:	Explain the first law of thermodynamics for simple systems under steady and unsteady conditions
CO2:	Apply second law of thermodynamics to open & closed systems and calculate entropy & availability.
CO3:	Describe Rankine cycle to steam power plant and compare few cycle improvement methods
CO4:	Derive simple thermodynamic relations of ideal and real gases
CO5:	Calculate the properties of gas mixtures and moist air and its use in psychometric processes

Q.No.	Question	CO	BTS
	PART A **(Answer all the Questions 10 x 2 = 20 Marks)**		
1	Define Equilibrium	CO1	R
2	Differentiate between point and path function	CO1	U
3	Write down the equation for first law for steady flow process.	CO2	R
4	Give the energy equation applicable for an adiabatic nozzle and turbine.	CO2	R
5	State the thermodynamics definition of Work.	CO2	R
6	Classify the properties as intensive or extensive or neither.	CO2	R
7	State first law for a closed system undergoing process and cycle.	CO2	R
8	Enlist the similarities between Heat and Work	CO1	U
9	Why does free expansion have zero work transfer?	CO1	R
10	Explain the automobile radiator analyzed as an open or closed system.	CO2	A
	PART B **(Answer all the Questions 2 x 15 = 30 Marks)**		
11a	The following data referred to a 12 cylinder, single acting, two stroke marine diesel engine. Speed = 150rpm; cylinder diameter = 0.8m; Stroke of piston = 1.2m; Area of indicator diagram = 5.5x10- 4m2, length of the indicator diagram = 0.06m; spring value = 147MPa/m. Find the net rate of work transfer from the gas to piston in KW.	CO1	R
	OR		
11b	In a gas turbine the gas enters at the rate of 5 Kg/s with a velocity of 50m/s and enthalpy of 900KJ/kg and leaves the turbine with a velocity of 150 m/s and enthalpy of 400 KJ/kg. The loss of heat from the gas to the surroundings is 25 KJ/kg. Assume for gas R = 287 KJ/kg K and Cp = 1.004 KJ/kg K and the inlet conditions to be at 100KPa and 27oC. Determine the power output of the turbine and the diameter of the inlet pipe.	CO1	U
12a	Air contained in the cylinder and piston arrangement comprises the system. A cycle is completed by four process 1-2,2-3,3-4 and 4-1. The energy transfers are listed below. Compute the table and determine the net work in KJ. Also check the validity of the first law of thermodynamics	CO2	R

Process	Q(KJ)	W(KJ)	U(KJ)
1-2	40	?	25
2-3	20	-10	?
3-4	-20	?	?
4-1	0	8	?

	OR		
12b	Prove that internal energy is a property.	CO1	A

S-A

Course Faculty
(Name /Sign / Date)

S A-RAMESH.

V. P. 16/9/20

HoD
(Name /Sign / Date)

16/9/20

Principal
(Name /Sign / Date)

Dr.M.VIJAYAKUMAR M.E., Ph.D.,
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Internal Assessment Test Answer Book

Name	ANUL RAJ P			**Year/ Semester/Section**	II/III
Register number	7224115001	**Date/Session**	11/9/2020	**Department**	MECH
Course code	ME8391	**Course Title**	Engineering thermodynamics		
Internal Assessment Test	**IAT 1** ☑	**IAT 2** ☐	**IAT 3** ☐	**Model** ☐	
Name and Signature of the Invigilator with date	S.A.Ramesh				

Instruction to the Student: Put tick mark to the question attended in the column against question.

Part A			Part B/ Part C					Total Marks
Q. No.	✓	Marks	Q. NO.	✓	a Marks	✓	b Marks	
1	✓	1	11	✓	13		—	13
2	✓	1	12	✓	14		—	14
3	✓	1	13					
4	✓	1	14					
5	✓	1	15					
6	✓	1	16					
7	✓	1					Grand Total	27
8	✓	1						
9	✓	1						
10	✓	1						
Total		10	37/50 Grand Total				S.A.Ramesh 11/09/20 Name and Signature of the Examiner with date	

To be filled by the examiner

Course Outcomes	1	2	3	4	5	6	Total
Marks allotted	24	26	—	—	—	—	50
Marks Obtained	17	20	✓	✓	✓	—	37

IQAC Audit - Remarks

V.P. 11/9/20

Name and Signature of the IQAC member

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DEPARTMENT OF MECHANICAL ENGINEERING

Assignment Question Paper

Assignment – 01			Date of Issue:	29.08.2020	Marks	10
Course code	ME8391	Course Title	Engineering Thermodynamics			
Year	II YEAR	Semester/Section	03	Date of Submission:	05.09.2020	

Q.No	Questions	CO
	Explain the Process of thermodynamics.	CO1

S.A.Murugesh 28/8/2020

Name and Signature of the Faculty Incharge

S.A.RAMESH.

V.P. 29/8/20

HoD/MECH

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Vijayamangalam, Tiruppur.

DEPARTMENT OF MECHANICAL ENGINEERING

Assignment Answer Sheet

Name of the Student : Priyadharshan. G

AU Register Number: 732419114007

Assignment – 01			Date of Issue:	29.08.2020	Marks	10
Course code	ME8391	Course Title	Engineering Thermodynamics			
Year	II YEAR	Semester/Section	03	Date of Submission:	05.09.2020	

Q.No	Questions	CO
1	Explain the Process of thermodynamics.	CO1

Mark Allocation

Rubrics	Marks Allocated	Marks obtained
Content Quality	6	5
Presentation Quality	2	2
Timely submission	2	2
Total marks	10	9

S. A. Ramesh 6/9/2020

Name and Signature of the Faculty Incharge

S A RAMESH

V.P. 6/9/20

HoD/MECH

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Classroom› ENGINEERINGTHERMODYNAMICS
IIMECH

Stream Classwork People Grades

Sortbylastname	Nov3,2020 MODELEXAM outof100	Oct17,2020 INTERNALTEST-II outof100	Oct7,2020 Thermodynamic Relation outof100	Sep16,2020 INTERNALEXAM I outof100	Sep 5 2020 ASSIGNMENT I outof100
Class average	85.33	84.17	86.75	72.67	68
AMUL RAJ	70	84	70	74	90
Arunkumar B	90	84	89	70	98
KAVIKRISHNAN P	74	50	84	50	94
Kishore Rana	70	87	90	75	90
pavendhar saraboji	96	96	78	79	80
Priyadharshan G	89	98	99	92	90
Selventhiran .S	80	70	88	70	72
thiru arasu	79	90	80	70	80

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