Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	Erbil Technology collage	
Department	Renewable energy Technology	
Module Name	Thermodynamics	
Module Code	THE202	
Degree	**Technical Diploma** [*] **Bachelor** [ ] **High Diploma** [ ] **Master** [ ] **PhD** [ ]	
Semester	**1st , 1st stage**	
Qualification	**MSc.**	
Scientific Title	**Assistant Lecturer**	
ECTS (Credits)	**7**	
Module type	**Prerequisite** [ ] **Core** [*] **Assist.** [ ]	
Weekly hours	**4**	
Weekly hours (Theory)	**(2)hr Class**	**(171)Total hrs Workload**
Weekly hours (Practical)	**(2)hr Class**	**(171)Total hrs Workload**
Number of Weeks	**12**	
Lecturer (Theory)	Mayasah Hatem Aswad	
E-Mail & Mobile NO.	**mayasah.aswad@epu.edu.iq**	
Lecturer (Practical)	Mayasah Hatem Aswad	
E-Mail & Mobile NO.	**mayasah.aswad@epu.edu.iq**	
Websites		

Course Book

Course Description	Thermodynamic is a branch of physics concerned with heat and temperature and their relation to energy and work, the studying of this science provided knowledge of the field. We will have a degree for theoretical part from quizzes and mid-term exam and final exam , and for the practical part we will have quizzes too and reports and final exam .			
Course objectives	The purpose of studying Thermodynamic is to help the student to understand the thermodynamic principles to provide an introductory treatment of thermodynamics from a mechanical- engineering viewpoint.			
Student's obligation	Missed classes will not be compensated including the quizzes and the scheduled assignments. The students will lose marks on unattended classes with quizzes unless a legal document or authorized leave is presented which should explain the excuse of the absence. However, the absent student should take the responsibility for making up the missed lecture.			
Required Learning Materials	All lectures prepared in soft and exhibit on data show. Also they are given to students in hard copy. Make about 10 activities and one intermediate exam during annual course.			
Evaluation	**Task**	**Weight (Marks)**	**Due Week**	**Relevant Learning Outcome**

	Paper Review				
	Assignments	Homework	10		
		Class Activity	2		
		Report	14		
		Seminar			
		Essay			
		Project			
	Quiz		4		
	Lab.		14		
	Midterm Exam		16		
	Final Exam		40		
	Total		100		
Specific learning outcome:	At the end of the course the students will understand the meaning of thermodynamic philosophy and how to use the first and second laws of thermodynamic to solve any problem and find solutions in their work fields.				
Course References:	• Engineering Thermodynamics by P.K.Nag. • Thermodynamics by Shavit and Gutfinger. • Thermodynamics- Engineering Approach by Cengel & Boles.				

Course topics (Theory)	**Week**	**Learning Outcome**
Fundamental Concept and Definitions: Introduction, basic concept, system, control volume, surrounding, boundaries, and types of systems, concept of continuum, equilibrium, state, and process.	1	
Work and Heat, gas laws, ideal gas, real gas, Daltons law, property of mixture of gases.	2	
Zeros' law of thermodynamics: concept of temperature and its measurement, temperature scales.	3	

First law of thermodynamics: thermodynamic definition of work, displacement work for various non-flow processes, Joules experiment.	4	
First law analysis for closed system (non-flow processes), internal energy and enthalpy, limitations of first law of thermodynamics.	5	
Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer.	6	
Second law of thermodynamics: Thermal reservoirs, Energy conversion, Heat engines, Efficiency, Reversed heat engine, Heat pump, Refrigerator	7	
Coefficient of performance, Kelvin Plank and Clausius statement of second law of thermodynamics, Equivalence of the two statements.	8	
Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and its corollaries, thermodynamic temperature scale.	9	
Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, principles of entropy increase.	10	
Statement of the third law of thermodynamics.	11	
Properties of steam, Critical point, Saturation state, Simple Rankine cycle.	12	
Practical Topics	**Week**	**Learning Outcome**
Temperature measuring devices – report and discussion.	1	
Calculate of temperature in different ways- report and discussion	2	
Sensible heat and latent heat- report and discussion.	3	
Study of air properties- report and discussion	4	

Study the characteristic of a thermal pump - report and discussion	5	
Transforming mechanical energy to thermal energy - report and discussion	6	
Set the specific heat of a solid body - report and discussion	7	
Study the steam engine - report and discussion	8	
Study the fire tube boiler - report and discussion	9	

Questions Example Design

Q1/ Fill the following blanks:

1- Working substance is _____.

2- Types of systems are _____, _____ and _____.

3- Power is _____, its units in _____.

4- Amount of gas has a pressure of 300 kpa, volume of 0.02m^3 and a temperature of 30℃.If R=0.24kj/kg.k then the mass of this gas will be _____.

5- Polytropic process means _____.

(25Mark)

Q2/ Air at atmospheric pressure of 1.06bar and a temperature of 15℃ is compressed isothermally to 14 bar and is therefore expanded adiabatically reversibly to the atmospheric pressure.

What is the final temperature and specific volume of the air? Calculate also the work done and is it transferred to or from the surroundings.

Use: R= 0.287kj/kg.K C_p= 0.992kj/kg.K

Mark)25(

Q3/ A gas whose pressure, volume, and temperature are 275 KN /m^2 , 0.09 m^3 , and 185℃ respectively has its state changed at constant pressure until its temperature becomes 15℃ . How much the heat is transferred from the gas and how much the work is done on the gas during the process? Take C_p=1.008 kj/kg.K and R=0.29 kj/kg.K.

(25Mark)

Q4/Calculate ΔU and ΔH for 1 kg of water when it is vaporized at the constant temperature of 100℃ and the constant pressure of 101.33kpa. The specific volume of liquid and vapor water are 0.00104 and 1.673m^3kg^{-1}. Heat in the amount 2256.9kj is added to the water.

(25Mark)

Extra notes:

I hope to have new developed devices for the practical part.

External Evaluator

This course book is suitable for the requirements of the department and the specialization in it... Dler Abdullah Ahmed (M.Sc.) mechanical engineering