Module (Thermodynamics II) Catalogue

2023-2024

College/ Institute	Erbil Technical Engineering College	
Department	Technical Mechanical and Energy Engineering	
Module Name	Thermodynamics II	
Module Code	THE406	
Degree	Technical diploma ☐ Bachler ■ High Diploma ☐ Master ☐ PhD ☐	
Semester	4	
Qualification	Ph.D.	
Scientific Title	Lecturer	
Credits	5	
Module type	Prerequisite ☐ Core ■ Assist. ☐	
Weekly hours	4 hr.	
Weekly hours (Theory)	(2)hr. Class	(24) hr. Workload
Weekly hours (Practical)	(2)hr. Class	(24) hr. Workload
Number of Weeks	12	
Lecturer (Theory)	Dr. Bashir Eskander Kareem	
E-Mail & Mobile NO.	bashir.kareem@epu.edu.iq	
Lecturer (Practical)	Mr. Bashir Eskander Kareem	
E-Mail & Mobile NO.	bashir.kareem@epu.edu.iq	
Websites		

Course Book

Course Description	In the first semester the student learned about the principle of thermodynamics which summarized as zeroth, first and second laws of thermodynamics. In this course the student will learned about two important areas of application for thermodynamics are power generation and refrigeration. Both are usually accomplished by systems that operate on a thermodynamic cycle. Thermodynamic cycles can be divided into two general categories: power cycles and refrigeration cycles.
Course objectives	Completing the course, the student will have learned: • Thermodynamics cycles that are power cycles and refrigeration cycles • Power cycles were the devices or systems used to produce a net power output are often called engines, and the thermodynamic cycles they operate on are called power cycles. • Refrigeration cycles were the devices or systems used to produce a refrigeration effect are called refrigerators, air conditioners, or heat pumps, and the cycles they operate on are called refrigeration cycles. • Thermodynamic cycles can also be categorized as gas cycles and vapor cycles, depending on the phase of the working fluid. In gas cycles, the working fluid remains in the gaseous phase throughout the entire cycle, whereas in vapor cycles the working fluid exists in the vapor phase during one part of the cycle and in the liquid phase during another part.
Student's obligation	• Attendance and participation in the lecture are mandatory and will be considered in the grading. • There will be several quizzes during the academic year, not necessarily announced. The quiz contains the materials covered in previous lectures.

- There are 90-minute midterm exams and a 180 -minute final exam. All tests are in class, closed book, and closed notes.
- Any quiz or test missed without a supported documented and excused absence will represent a zero.
- Other activities like reports and mechanical project.

Required Learning Materials

- Data show, white board and PowerPoint are used throughout the lecture, Testing in department's Laboratory.
- Publish all lecture notes in college website before the lecture day.

Evaluation

Task		Weight (Marks)	Due Week	Relevant Learning Outcome
Paper Review				
Assignment	Homework	5	All the weeks	
	Class Activity	2		
	Report	5	Week 9	
	Seminar	5	Week 6	
	Essay			
	Project		Week 9	
Quiz		8	Week 4 & Week 8	

	Lab.	10	All the weeks	
	Midterm Exam	25		
	Final Exam	40		
Specific learning outcome:	**15. Student learning outcome:** Ch. 8: **GAS POWER CYCLES** (Basic considerations in the analysis of power cycles, the Carnot cycle and its value in engineering, Otto cycle: the ideal cycle for spark-ignition engines, Diesel cycle: the ideal cycle for compression-ignition engine0053, Brayton cycle: the ideal cycle for gas-turbine engines ….etc). Ch.9: **VAPOR AND COMBINED POWER CYCLES** (The Carnot vapor cycle, Rankine cycle: the ideal cycle for vapor power cycles, Deviation of actual vapor power cycles from idealized ones, The ideal reheat Rankine cycle, The ideal regenerative Rankine cycle, Combined gas–vapor power cycles …etc). Ch.10: **REFRIGERATION CYCLES** (Refrigerators And Heat Pumps, the pressure & enthalpy diagram, The Reversed Carnot Cycle, The Ideal Vapor-Compression Refrigeration Cycle, reversed heat engine cycle).			
Course References:	• Thermodynamics An Engineering Approach 5th Edition by Yunus Cengel. • Engineering thermodynamics by R.K Rajput 4th edition • Fundamental of Thermodynamics by Sonntag, Borgnakke and van Wylen. • Fundamentals of Engineering Thermodynamics 5th Edition (Moran & Shapiro).			

Course topics (Theory)	Week	Learning Outcome
Gas power cycles Otto cycle: the ideal cycle for spark-ignition engines	1	1
Diesel cycle: the ideal cycle for compression-ignition engine0053	2	2
Brayton cycle: the ideal cycle for gas-turbine engines	3	3
Vapor And Combined Power Cycles The Carnot vapor cycle Rankine cycle: the ideal cycle for vapor power cycles	4&5	4
The ideal reheat Rankine cycle The ideal regenerative Rankine cycle Combined gas–vapor power cycles	6&7	4
Refrigeration Cycles Refrigerators And Heat Pumps	8&9	5

the pressure & enthalpy diagram The Reversed Carnot Cycle	10	5
The Ideal Vapor-Compression Refrigeration Cycle	11	
Reversed heat engine cycle	12	
Practical Topics	**Week**	**Learning Outcome**
Heat exchanger	1 to 4	To investigate first law of thermodynamics practically
Specific heat capacity (calorimeter)	4 to 8	To determine the specific heat capacity of waters and metals
Heat engine/ gas law apparatus	8 to 12	To determine The Heat Engine/Gas Law Apparatus such as Charles' Law, Boyle's Law, and the Combined Gas Law

Questions Example Design

Q1/

a) what are the air-standard assumptions?
b) Why is the Carnot cycle not a realistic model for steam power plants

Q2/ Water enters the boiler of a steady-flow Carnot engine as a saturated liquid at 400 psia and leaves with a quality of 0.95. Steam leaves the turbine at a pressure of 20 psia. Show the cycle on a T-s diagram relative to the saturation lines, and determine (a) the thermal efficiency, (b) the quality at the end of the isothermal heat-rejection process, and (c) the net work output..

Extra notes:

No extra notes

External Evaluator

While reviewing the course catalogue and its contains, it appears that it offers the necessary areas for students to comprehend the principles of thermodynamics II and their analyses.

Assist. Prof. Dr. Banipal N. Yaqob
15/2/2024