هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**CHEMICAL ENGINEERING THERMODYNAMICS**
Course Code:	**222 CHET**
Program:	**Chemical Engineering Technology (CHET)**
Department:	**Chemical Engineering Technology**
College:	**College of Applied Industrial Technology (CAIT)**
Institution:	**Jazan University**
Version:	**V2022-Eng-revised**
Last Revision Date:	**01 Mar 2024**

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	3 hours **(Contact hours: 4 hours/ week)**				
2. Course type					
a.	University ☐	College ☐	Department ■	Track☐	Others☐
b.	Required ■	Elective☐			
3. Level/year at which this course is offered:	**Level 3/ Second Year**				
4. Course general Description This course provides the basic thermodynamic fundamentals, the principle of conservation of energy as applied to thermodynamic systems, in addition to the laws of thermodynamics. This course also deals with the study of properties of pure substances, including calculation of work transfer and heat transfer in Non-flow and Flow processes. Laboratory experiments and/or exercise problems support the theoretical classes. The course is introduced through two classes weekly. They are 2 classes (1 hour each) for theoretical part and 2 hours class for laboratory for which students apply and implement the concepts of the lectures..					
5. Pre-requirements for this course (if any): **191 PHY**					
6. Co- requirements for this course (if any): None					
7. Course Main Objective(s) The main purpose for the course to demonstrate the main concepts of thermodynamics including the units & dimensions provides students with the thermodynamics laws including: zeroth, first and second law and their applications, estimation of work and heat transfers during thermodynamic processes and properties of pure substances. It also includes pVT surface diagram.					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	48	100
2.	E-learning	--	--

No	Mode of Instruction	Contact Hours	Percentage
3.	Hybrid • Traditional classroom • E-learning	--	--
4.	Distance learning	--	--

2. Contact Hours **(based on the academic semester)**

No	Activity	Contact Hours
1.	Lectures	24
2.	Laboratory/Studio	24
3.	Field	--
4.	Tutorial	--
5.	Others (specify)	--
	Total	48

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Explain thermodynamics concepts: system, boundaries, surroundings, units and dimensions etc.	K1	• Lectures/Presentations • Lectures	• Quizzes/ • Mid exam • Assignment • Class Activity • Final Exam
2.0	Skills			
2.1	Compare the three basic laws of thermodynamics (Zeroth, First, and Second), and types of thermodynamics systems and forms of energy.	S1	• Lectures / • Presentations • Lectures	• Quizzes/ • Mid exam • Assignment • Class Activity • Final Exam
2.2	Compare closed system, open system and types of thermodynamics systems.	S1	• Lectures / • Presentations • Lectures	• Quizzes/ • Mid exam • Assignment • Class Activity • Final Exam
2.3	Determine changes in the properties of gases, fluids and solids undergoing changes in	S4	• Lectures / • Presentations • Lectures	• Quizzes/ • Mid exam • Assignment

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	temperature and volume.			• Class Activity Final Exam
2.4	Explain the similarity between heat and work and calculate the efficiency of Carnot cycle and coefficient of performance for the heat pump using the Second law of thermodynamics.	S2	• Lectures / • Presentations • Lectures	• Quizzes/ • Mid exam • Assignment • Class Activity Final Exam
3.0	Values, autonomy, and responsibility			
3.1	Contribute in a team to achieve successful analysis of phase change processes of pure substance.	V1	• Group Discussion • Active learning	• Lab Exercise • Marks will be given according to participation in classroom, Lab exam
3.2	Show independent timeliness, work in classroom with effective contribution with classmates	V1	• Group Discussion • Active learning	• Lab Exercise • Participation in classroom
3.3				

C. Course Content

No	List of Topics	Contact Hours
1.	The scope of thermodynamics, units and dimensions	6
2.	Types of thermodynamics system-Open system, closed System, Isolated system, Properties of the system, Types of energy, Thermodynamics equilibrium	8
3.	Zeroth law of thermodynamics, First law of thermodynamics-Applications	6
4.	Energy balance concepts and form of energy, Energy balance applications – steam boiler etc.	4
5.	Energy analysis of closed systems, closed system first law.	4
6.	The second law of thermodynamics, heat engines, thermal efficiency, the Carnot cycle, heat pump, and coefficient of performance COP.	6
7.	Pure substance, process, and phase change processes of pure substance, and saturation temperature and saturation pressure.	8
8.	Property diagram for phase change processes, the P-V diagram	4
9.	Review of theoretical content	2
10.	Self Study (few selected topics)	--
Total		48

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Class activities (Quiz-1/Assignments/Labs)	Week 2 till Week 11	10%
2.	Oral discussion/Homework and participation in classroom/BB/Assignment/	All weeks	10%
3.	Midterm	Week 6	20%

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
.4	Quiz-2/ Self study	--	10%
5.	Final Term Exam	As scheduled	50%
6.	***Total***		**100%**

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	• Classroom policy • Soft and hard copies of lecture notes and some of sections from the following books: • ''Introduction to Chemical Engineering Thermodynamics'', Smith J.M., Van Nees H.C., Abott M.M ، 7th ed. *Mc.Graw-Hill*, (2005). • "The Principles of Thermodynamics" by N.D. Hari Dass, *CRC Press, Taylor & Francis Group, London,* (2014).
Supportive References	• "Fundamentals of Engineering Thermodynamics" by Michael J Moren & Howard N Shapiro, *John Wiley & Sons Inc. England,* (2006).
Electronic Materials	https://sites.google.com/site/santhirajupilli/lecture-notes_jazan-university/chet-222-chem-engg-thermodynamics (url for some of my classroom lecture notes)
Other Learning Materials	• Virtual lab Videos/LAB demos

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Classroom equipped with projector and whiteboard and enough seating arrangements. • Laboratory with required equipment setups and with a lab instructor. • Appropriate Seating arrangements
Technology equipment (projector, smart board, software)	• Smart Board • Internet connectivity • Speakers (for audio)
Other equipment (depending on the nature of the specialty)	• Whiteboard of good quality (to be used as a screen for playing videos as well) • Whiteboard markers • Paper for photocopying • Photocopying and printing facilities for the teachers and the students

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Quality Assurance and Accreditation Unit/Faculty	Quizzes, Assignments, exams **Direct**
Effectiveness of students assessment	CRC / QAU / HoD	Direct/ Indirect
Quality of learning resources	Track leaders / CRC	Indirect
The extent to which CLOs have been achieved	HoD / committee nominated by HoD	Random re-checking of evaluated answer sheets Surveys designed by the CHET dept. faculty/ University - distributed among the course instructors. **Direct/ Indirect**
Other	Course Instrcutor / QAU	CLO assessment template that is further verified at course coordinator and QAU level.

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	*Chemical Engineering Technology*
REFERENCE NO.	CAITCET24012
DATE	17/04/2024