هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Thermodynamic**
Course Code:	**PHYS 222**
Program:	**Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Jazan University**
Version:	**2022**
Last Revision Date:	**20 December 2022**

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	3				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered: **Level 6 / Year 2**					
4. Course General Description The course deals with the basic properties of steam and gases. The course discusses different processes in thermodynamics and their applications. It gives details of thermodynamic laws and their applications. The course also focuses on Carnot engine and its efficiency as well as other engine types. Some details on entropy, Gibbs free energy, Clapeyron equation and their calculations are given.					
5. Pre-requirements for this course (if any): **221PHYS**					
6. Co- requirements for this course (if any): **NIL**					
7. Course Main Objective(s) **This course is designed to provide students with the following:** - Concepts of a system, heat, work, Process, a cycle, internal energy, enthalpy and entropy. - Fundamentals of water vapor, steam tables and perfect gasses. - Applications of the first law of thermodynamics, general law of ideal gases and the second law of thermodynamics. - Skills to solve problems regarding the physical principles included.					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	28	85%
2.	E-learning		
3.	Hybrid ● Traditional classroom ● E-learning	5	15%
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours

1.	Lectures	**30**
2.	Laboratory/Studio	**-**
3.	Field	**-**
4.	Tutorial	**3**
5.	Others (specify)	
	Total	**33**

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	**Define** various concepts of a system, heat, work, processes, cycle, internal energy, enthalpy, entropy, and matter phases.	**PLO1.1**	Lectures, Open discussion, interactive comparisons	In class interactive questioning, Quizzes, mid-term, and final exam
1.2	**Identify** various thermodynamic processes and their related formulae, laws of thermodynamics, system properties, Enthalpy of a system, entropy of processes, and Carnot engine efficiency.	**PLO1.1**	Lectures, applets illustrations, group discussion, visualization	In class interactive questioning, Quizzes, mid-term and final exam
1.3	**Discuss** the general law of ideal gas, internal energy, laws of thermodynamics, enthalpy, various processes in thermodynamics, Carnot engine, entropy, water phases and Gibbs free energy.	**PLO1.2**	Lectures, blackboard and visualization, brainstorming, group and interactive discussion, Interactive illustrations	In class interactive questioning, group assignments, Quizzes, mid-term, and final exam
2.0	Skills			
2.1	**Solve** problems related to various thermodynamic processes, work & heat in thermodynamic cycles, system enthalpy, entropy, and efficiency of heat engines as well other systems.	**PLO2.1**	Lectures, blackboard and diagram illustration, group discussion, Interactive illustrations- Student contribution	Project work, Group discussion, Mid-term exams and final exam
2.2	**Derive** the important expressions of various systems and thermodynamic processes and their works, Carnot engine efficiency, Clapeyron equation	**PLO2.2**	Lectures, visualization, brainstorming, Individual and group practices	HW assignments, In class inspection for formative assessment – mid and final exams

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.3	**Develop** communication and critical thinking competencies during an interactive discussion, group assignments, essays, or web-based activities.	**PLO2.4**	Interactive discussion- Case study, group project, open discussion - reviews	Case study, assignments, discussion
3.0	Values, autonomy, and responsibility			
3.1	**Show** effective collaboration and bear individual responsibility during group work and/or assignments	**PLO3.1**	Individual and group practices- Brain storming – free related small web-based topics	Case study, assignments, discussion
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C. Course Content

No	List of Topics	Contact Hours
1.	Concepts of: system, heat, work, Thermodynamic processes.	**4**
2.	Zeroth and First law of thermodynamics	**3**
3	Calculation of work for different processes and cycles as well as the internal energy and enthalpy of gas.	**4**
4	Ideal gas state equation and real gas and problems	**4**
5	Applications of the first law on the ideal gas.	**4**
6	Derivation of specific heats and related relations for ideal gas	**3**
7	The second law of thermodynamics, heat engines, and refrigerators	**3**
8	The Carnot Engine	**2**
9	Entropy calculations for the Carnot cycle and other thermodynamic systems	**3**
10	Water vapor phases and state of matter, Gibbs free energy, Clapeyron equation	**3**
Total		**33**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Mid-term exam**	**6**	**20** (20%)
2.	**Course work activities (HW, Quizzes, group work and other assignments)**	**Distributed**	**30** (30%)

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
3.	**Final Exam**	**12**	**50** (50%)
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*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	Thermodynamics, an Engineering Approach; Yunus A. Cengel and Michael A. Boles, McGraw – Hill, Inc., 2015
Supportive References	• Applied Thermodynamics for Engineering Technologists; T. D. Eastop and A. Mcconkey, 5th edition, Amazon.com, 1996. • Thermodynamics, Kinetic Theory and Statistical Thermodynamics; F.W.Sears and G. L Salinger, John Wiley& Sons, Inc., 1975. • Fundamentals of Classical Thermodynamics; J. Gordon, V. Wylen and R. Sonntag, 1985.
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom- if possible room for interactive discussion (round table)
Technology equipment (Projector, smart board, software)	Data show- smart board
Other equipment (Depending on the nature of the specialty)	none

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peers, and program leader	Indirect (CES)- Indirect peer evaluation
Effectiveness of students assessment	Students, Program assessment committee	Direct/ Indirect
Quality of learning resources	Students, Faculty members	Indirect
The extent to which CLOs have been achieved	Instructor	Direct/Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	DEPARTMENT BOARD
REFERENCE NO.	PHYS2304
DATE	28/02/2023