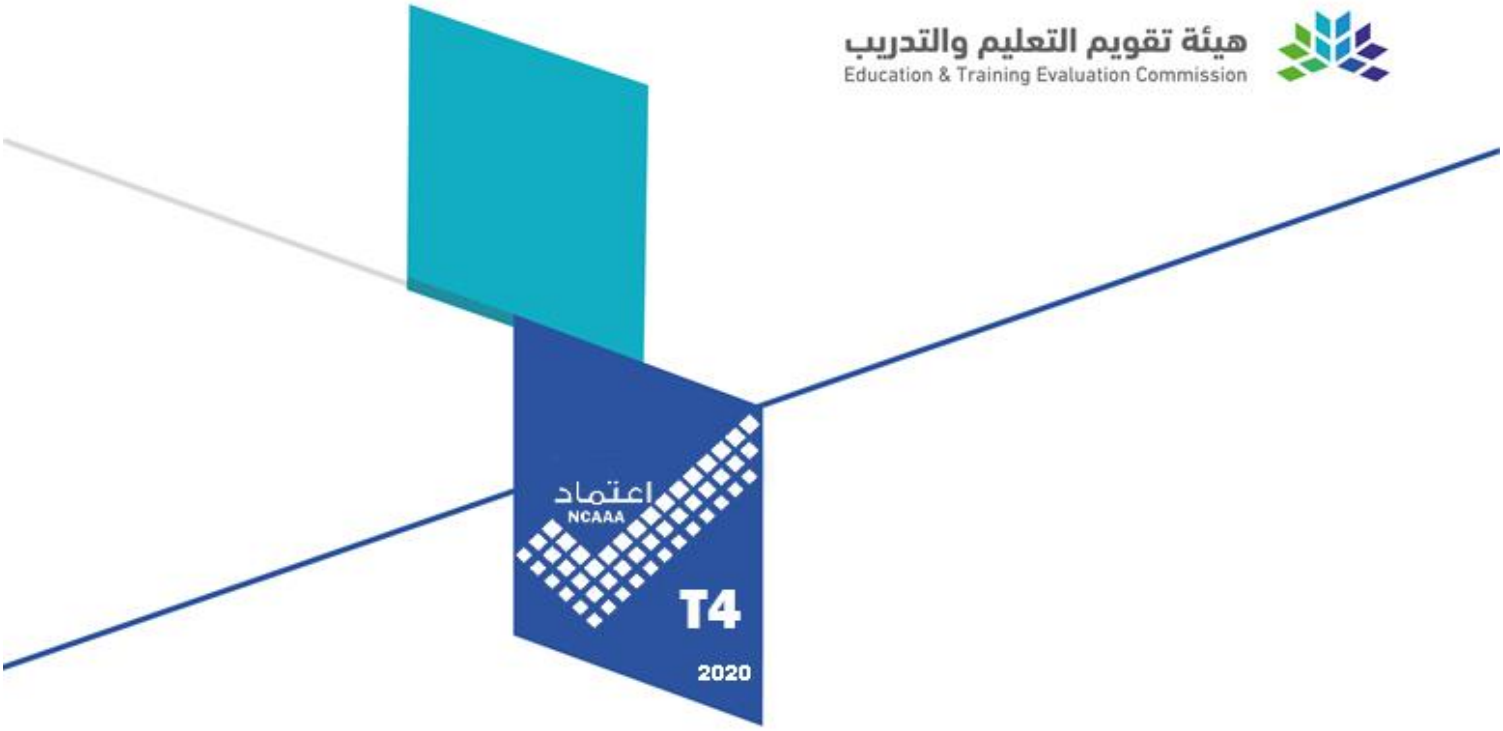
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Thermodynamic**
Course Code:	**222Phys**
Program:	**Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Jazan University**

Table of Contents

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☐ Department ☒ Others ☐ **b.** Required ☒ Elective ☐
3. Level/year at which this course is offered: Level 4 / Year 2
4. Pre-requisites for this course (if any)**: 221PHYS**
5. Co-requisites for this course (if any)**: NIL**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**36**	**80%**
2	**Blended**	**9**	**20%**
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**42**
2	**Laboratory/Studio**	**--**
3	**Tutorial**	**3**
4	**Others** (specify)	
	Total	**45**

B. Course Objectives and Learning Outcomes

1. Course Description

The course is dealing 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 focuses also 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.

2. Course Main Objective

This course is designed to provide students with:

- Concepts of a system, heat, work, Process, a cycle, internal energy, enthalpy and entropy.
- Fundamentals of water vapour, 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.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Define** various concepts of a system, heat, work, processes, cycle, internal energy, enthalpy, entropy, and matter phases.	**PLO1.1**
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**
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**
2	**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**
2.2	**Derive** the important expressions of various systems and thermodynamic processes and their works, Carnot engine efficiency, Clapeyron equation	**PLO2.2**
2.3	**Develop** communication and critical thinking competencies during interactive discussion, group assignments, essays or web-based activities	**PLO2.4**
3	**Values:**	
3.1	**Show** effective collaboration and bear individual responsibility during group work and/or assignments	**PLO3.1**

C. Course Content

No	List of Topics	Contact Hours
1	Concepts of: system, heat, work, Thermodynamic processes.	**4.5**
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 gases.	**6**
4	Ideal gas state equation and real gases and problems	**4.5**
5	Applications of the first law on the ideal gas.	**4.5**
6	Derivation of specific heats and related relations for ideal gases	**4.5**
7	The second law of thermodynamics, heat engines, and refrigerators	**4.5**
8	The Carnot Engine	**3**
9	Entropy calculations for the Carnot cycle and other thermodynamic systems	**4.5**
10	Water vapor phases and state of matter, Gibbs free energy, Clapeyron equation	**3**
11	Review & tutorial	**3**
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	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.	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	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	Lectures, blackboard and visualization, brain storming, 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	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	Lectures, visualization, brain storming, Individual and group practices	HW assignments, In class inspection for formative assessment – mid and final exams
2.3	**Develop** communication and critical thinking competencies during interactive discussion, group assignments, essays or web-based activities	Interactive discussion-Case study, group project, open discussion - reviews	Case study, assignments, discussion
3.0	**Values**		
3.1	**Show** effective collaboration and bear individual responsibility during group work and/or assignments	Individual and group practices-Brain storming – free related small web-based topics	Case study, assignments, discussion

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Homework assignment- Contribution in interactive discussion- Group work**	**3**	**3** (3%)
2	**Lecture Quiz 1**	**4**	**5** (5%)
3	**First Mid-term exam**	**6**	**15** (15%)

4	**Homework assignment- Contribution in interactive discussion- Group work or Project**	**10**	**3** (3%)
5	**Lecture Quiz 2**	**11**	**5** (5%)
6	**Second mid-term exam**	**12**	**15** (15%)
7	**Homework assignment- Contribution in interactive discussion- Group work-essay or Project discussion**	**11**	**4** (4%)
8	**Final Exam**	**16**	**50** (50%)

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each group of students is assigned to a staff member who will be available for help and academic guidance office hours at specific 2h on daily basis.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• **Thermodynamics, an Engineering Approach; Yunus A. Cengel and Mic A. Boles, McGraw – Hill, Inc., 2015**
Essential References Materials	• **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	**http://www.wikipedia.org/**
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Class room- if possible room for interactive discussion (round table)
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show- smart board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	none

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (CES)- Indirect peer evaluation
Assessment	Students, Program assessment committee	Direct/ Indirect
Extent of achievement of course learning outcomes	Instructor	Direct/Indirect
Quality of learning resources	Students, Faculty members	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**Council of Physics Department**
Reference No.	8
Date	16/4/1442