هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	*Physical Chemistry*
Course Code:	CHEM 230
Program:	Chemical Engineering
Department:	Chemistry
College:	Science
Institution:	King Saud University
Version:	3
Last Revision Date:	17 December 2023

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3 hours)					
2. Course type					
A.	☒ University	☒ College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (4)					
4. Course general Description:					
Chem 230 is an introduction to physical chemistry focusing on the applications of thermodynamics laws.					
5. Pre-requirements for this course (if any)**:**					
Chem 101					
6. Pre-requirements for this course (if any)**:**					
Chem 101					
7. Course Main Objective(s):					
Chem 230 is an introduction to chemical thermodynamics focusing on the mathematical description of state and path functions as they apply to the changes of energy and equilibrium in molecular systems.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	13.5	30%
2	E-learning	13.5	30%
3	Hybrid • Traditional classroom • E-learning	18	40%
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	0

5.	**Others (specify)**	0
Total		45

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	*Understand the nature and role of the following thermodynamic properties of matter: internal energy, enthalpy, entropy, temperature, and pressure.*	**K1**	*Lectures*	*Homework & inside class exams*
1.2	*Distinguish the system from its surrounding, and identify work and/or heat interactions between the system and surrounding*	**K2**	*Lectures*	*Homework & inside class exams*
1.3	*State the first, second and third laws of thermodynamic.*	**K3**	*Lectures*	*Homework & inside class exams*
1.4	*Relate spontaneity with entropy change and free energy change.*	**K2**	*Lectures*	*Homework & inside class exams*
1.5	*Recognize the conversion of energy in heat engine.*	**K1**	*Lectures*	*Homework & inside class exams*
1.6	*To be able to apply ideal cycle analysis to simple heat engine cycles to estimate thermal efficiency.*	**K3**	*Lectures*	*Homework & inside class exams*

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.7	*Understand implications of the second law of thermodynamics and limitations placed by the second law on the performance of thermodynamic systems.*	**K2**	*Lectures*	*Homework & inside class exams*
2.0	**Skills**			
2.1	Master the manipulation of partial derivatives applied to thermodynamics		*Team work answering questions*	*homework*
2.2				
3.0	**Values, autonomy, and responsibility**			
3.1	*Students are expected to apply team-working skills to achieve group assignments.*		*Team work answering questions*	*homework*
3.2	*Students are expected to be capable to calculate thermodynamic functions and illustrate them by graphs in MS Excel spreadsheet.*		*Team work answering questions*	*homework*
...	*Students are expected to be capable to solve some problems graphically in MS Excel spreadsheet*		*Team work answering questions*	*homework*

C. Course Content

No	List of Topics	Contact Hours
1.	*Reviewing Ideal Gas Laws*	**3**
2.	*Molecular kinetic theory of gases*	**6**

3.	*First law of thermodynamics*	**6**
4.	*Thermochemistry*	**6**
5.	*Second and third laws of thermodynamics*	**12**
6.	*Free energies*	**6**
7.	*Chemical equilibrium*	**6**
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	1 midterm exams (90 min)	6th weeks	30 %
2.	2 midterm exams (90 min)	12th weeks	30 %
3.	Final exam (3 hours exam)	End of semester	40 %

*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	*9th Edition of "Physical Chemistry" book , by P.W. ATKINS*
Supportive References	*Student's Solutions Manual to Accompany Atkins' Physical Chemistry*

Electronic Materials	• *E-content on LMS (Blackboard).*
	  ○ *PowerPoint presentations*
	  ○ *Handout notes*
	  ○ *Homework*
	  ○ *Old exams*
	• *Web Sites:*
	  ○ *http://chemwiki.ucdavis.edu/Physical_Chemistry/Thermodynamics*
	  ○ *http://www.thebigger.com/section/chemistry/thermodynamics*
	  ○ http://chemistry.about.com/od/physicalchemistrythermo
	  ○ *http://academic.pgcc.edu/~ssinex/excelets/chem_excelets.htm*

Other Learning Materials	Microsoft Excel

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	*Classroom of 30 seats (with **smartboard** when possible)*
Technology equipment (projector, smart board, software)	*Smart Board with Internet connection*
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	*Online Survey on **LMS**.* *Online Survey on **Edugate**.* *Direct consultation in class*	
Effectiveness of Students assessment	*At the end of each semester and after consultation of students' survey, some minor changes are made, after discussion in physical chemistry group, to improve the teaching effectiveness*	
Quality of learning resources		
The extent to which CLOs have been achieved	Attending workshops organized periodically by Deanship of Skills Development on the teaching and learning methodologies. Attending workshops related to e-learning.	
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	