هيئة تقويم التعليم
Education Evaluation Commission
المركز الوطني للتقويم والاعتماد الأكاديمي
National Center for Academic Accreditation and Evaluation

COURSE SPECIFICATIONS
(CS)

Thermal Physics

PHYS 241

June 2018

Course Specifications

Institution: **King Saud University**	Date: **December 2017**
College/Department : **College of Science / Physics and Astronomy Department**	

A. Course Identification and General Information

1. Course title and code: **Thermal Physics - PHYS 241**			
2. Credit hours: **3(3+0+0)**			
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) **BSc program in Physics**			
4. Name of faculty member responsible for the course			
5. Level/year at which this course is offered: **Fifth Level**			
6. Pre-requisites for this course (if any) **MATH 111**			
7. Co-requisites for this course (if any)			
8. Location if not on main campus			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	yes	What percentage?	100
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	
Comments:			

B Objectives

1. What is the main purpose for this course? 1. The student should be able to establish a good understanding of the basic principles and concepts of thermal physics. 2. The student should be able to outline the concepts in order to use them as predictive tools. 3. The student should be able to apply the thermodynamics in physics and technology 4. The student should be able to improve his/her generic skills such as: knowledge – interpersonal – communication – problem solving – IT.
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field) 1. Lecture notes. 2. Use of IT by incorporating applets to demonstrate physics concepts. 3. Use of powerpoint and both online and book references. 4. The material should be available on the instructor webpage.

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **General definitions and basic concepts of thermal Physics- thermal equilibrium and temperature-The zeroth law of thermodynamics-The first law of thermodynamics (heat and work, internal energy function, reversible and irreversible thermal processes in ideal and real gases isochoric and isobaric processes, adiabatic processes, Carnot cycle and thermodynamic performance, Otto and Diesel thermal engines, refrigerators)-The second law of thermodynamics (Entropy function and its various applications in thermal systems)-The third law of thermodynamics-Phase transformations-Free energy-The thermodynamic functions U, H, S, F and G-The Maxwell relations.**

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
General definitions and basic concepts of thermal Physics. The concept of thermal equilibrium and temperature.	**2**	**6**
The zeroth law of thermodynamics	**1**	**3**
The Laws of Equilibrium Thermodynamics	**4**	**12**
Enthalpy, Entropy, Helmholtz/Gibbs Free Energy, Phase changes	**4**	**12**
Heat engines / Cycles (Carnot, Otto, Diesel)	**3**	**9**

Chemical Potential	**2**	**6**

2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**45**					**45**
Credit	**45**					**45**

3. Additional private study/learning hours expected for students per week. 6

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Describe the basic concepts and principles of thermal physics: The laws of thermodynamics, make connections with modern technology Deal with microstates and macrostatets, find their probabilities. Free energy and Helmholtz-Gibbs functions and Maxwell's equations in thermodynamics Basic definitions and concepts of heat and classical thermodynamics	Lectures Tutorials/Workshops Student led presentations Homework Assignments, which include readings and problem sets,	Quizzes Classroom assessment Question and Answer Sessions on a weekly basis Discussion of applets and concepts as well as techniques in problem solving.
1.2	Applications of thermodynamics laws in thermal	Lectures	Quizzes

	systems (first and second laws) Make the connections between classical equilibrium thermodynamics and the basic statistical mechanics Define Third law of thermodynamics and absolute zero.	Tutorials/Workshops Student led presentations Homework Assignments, which include readings and problems solving.	Classroom assessment Question and Answer Sessions on a weekly basis Discussion of applets and concepts as well as techniques in problem solving.
2.0	**Cognitive Skills**		
2.1	Concentration Perception		
2.2	Memory Logical Thinking		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Punctual Responsible Respectful Honesty Able to work in a group		
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1	Being able to work confidently with integration and differential equations. Even though these skills are not taught within this course, they are enhanced by usage. Students ask questions within the lesson, they work in groups and also communicate with each other and myself online. They access frequently material on recommended websites, as well as creating excellent power points using online videos.		
4.2			
5.0	**Psychomotor**		

5. Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes (Use Program LO Code #s provided in the Program Specifications)**								
	1.1	**1.2**		**2.1**		**3.2**		**4.1**	
1.1									
2.1									

6. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group	Week Due	Proportion of Total

	project, examination, speech, oral presentation, etc.)		Assessment
1	Class activities: presentations, reports, Quizzes +HWs+ Attendance	Once or/and Weekly	20%
2	Mid-exam I	Around 6	20%
3	Mid-exam II	Around 12	20%
4	Major Final-exam	Around 16	40%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Office hours: 3 hours per week
Contact via email (not restricted)

E Learning Resources

1. List Required Textbooks

Physical Chemistry
Authors: R. A. Silbey, R. A. Alberty, M. G. Bawendi
4th ed., 2005, John Wiley & Sons

Fundamentals of Statistical and Thermal Physics
Author: Reif F. (1985), Mc Graw-Hill, Int. Edition, Physics Series, USA.

2. List Essential References Materials (Journals, Reports, etc.)

W. Rosser, *An Introduction to Statistical Mechanics* (2nd edition.), 1985, John Wiley and Sons Publisher

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

There are huge number of web sites that provide so much information and of great interest for thermodynamics. Will be provided by the course instructor

5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

Multi media materials and software. Many computer programs that can be used for Statistical Mechanics calculations are available and can be used (such as using Mathematica, Maple, Matlab)

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) • Lecture room with max 25 students seats + Projector • Library
2. Computing resources (AV, data show, Smart Board, software, etc.) Smart board and data show
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching • Course evaluation by the students. • Students- faculty/instructor meetings. • Electronic Student evaluation organized by the University (KSU-Edugate system)
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department Assessment Techniques as described above, as well as meeting with students during office hours for any concerns and discussing with level leaders any issues
3 Processes for Improvement of Teaching • Course and program reports evaluation • Attending workshops, organized by KSU, dealing with teaching new approaches and strategies. • By writing a course report each term and setting targets. • Periodical departmental revisions of the adopted methods of teaching • Monitoring of teaching activities by senior faculty members

4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) Suggestions: Provide Samples of all kind of assessment in the departmental course portfolio of each course Assigning a group of faculty members marking some homework samples Setting standardized exams: approved by internal and external faculty members specialized in the specific field.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • The course material and learning outcomes should be periodically reviewed and hence changes can be taken and approved (by the departmental and higher councils). • The head of department and faculty take the responsibility of implementing the proposed changes. • Improvement: known Faculty in the field from other institutions can be invited to review the accuracy of the teaching and evaluation processes

Name of Instructor: _____

Signature: _____ Date Report Completed: _____

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received: _____