كلية العلوم التطبيقية
Faculty of Applied Sciences

Kingdom of Saudi Arabia
The National Commission for Academic Accreditation & Assessment

T6. Course Specifications (CS)

Course title: **Statistical thermodynamics**

Course code: **23063212-3**

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Kingdom of Saudi Arabia
National Commission for
Academic Accreditation & Assessment

Course Specifications

Institution: **Umm AL – Qura University**	Date : **18/1/1439**
College/Department : **College of Applied Science – Department of Physics**	

A. Course Identification and General Information

1. Course title and code: **Statistical thermodynamic (code: 23063212-3)**
2. Credit hours: **3 Hrs**
3. Program(s) in which the course is offered. **BSc Physics.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course
Dr. Ahmed Mohamed El-Hadi
5. Level/year at which this course is offered : **3st Year / Level 6**
6. Pre-requisites for this course (if any) : **Heat and thermodynamics (4033110-3)**
7. Co-requisites for this course (if any) : ---
8. Location if not on main campus: **Main campus and Alzaher**
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	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. Realize the difference between the energy levels and energy states.
    2. Define the concept of the thermodynamic probability and how to deal with some physical applications through this concept.
    3. Differentiate between distinguishable and indistinguishable particles.
    4. Compare between the different distribution functions and the different cases in use every one.
    5. Define the concept of the partition function and redefine the thermodynamic quantities in terms of the partition function.
    6. apply some statistics and some quantum statistics to the systems.

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- Outlines of the physical laws, principles and the associated proofs.
2. Highlighting the day life applications whenever exist.
3. Encourage the students to see more details in the international web sites and reference books in the library.
4- Encourage the student to build an example of different experiments related to course
5- Frequently check for the latest discovery in science

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

Course Description:
The course will give the new mathematical treatment in the concept of probability for some physical quantities for a system consists of a large number of particles such as a monatomic or diatomic ideal gas or steam of electrons or quantity of photons radiated from black body radiation. These quantities are given according to classical or quantum treatment.
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1 Topics to be Covered

Topic	No of Weeks	Contact hours
❖ **Introduction:** -Energy states and energy levels, macro states and microstates, thermodynamic probability.	2	6
The three statistics and its distribution functions: -The Bose-Einstein statistics, the Fermi-Dirac statistics , the Maxwell-Boltzmann statistics, The statistical interpretation of entropy, The Bose-Einstein distribution function, the Fermi-Dirac distribution functions, the classical distribution function, comparison of distribution functions for indistinguishable particles, the Maxwell-Boltzmann distribution function.	3	9
❖ **The partition function:** Thermodynamic properties of a system.	1	3
❖ **Applications of statistics to gases:** - The monatomic ideal gas, the distribution of molecular velocities, The principle of equipartition of energy, the quantized linear oscillator and specific heat capacity of a diatomic ideal gas.	4	12
❖ **Applications of quantum statistics to other systems :** The Einstein and Debye theories of the specific heat capacity of a solid, Black body radiation, Para magnetism and the electron gas.	4	12
	14 weeks	42hrs

2 Course components (total contact hours per semester):

Lecture : 42	**Tutorial: 12**	**Practical: 0**	**Other:** Office hours 12

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week): 12h (reports & essay)

3. Additional private study/learning hours expected for students per week.	4

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	Define the physical quantities, physical phenomena, and basic principles.	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. 3. Lecturing method: Board, Power point. 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it.	Solve some example during the lecture. Discussions during the lectures Exams: a) Quizzes (E-learning) b) Short exams (mid- term exams) c) Long exams (final) d) Oral exams .
1.2	Describe the physical laws and quantities using mathematics		
2.0	**Cognitive Skills**		
2.1	Apply the laws of physics to calculate some quantities.	1. Preparing main outlines for teaching.	1. Exams (Midterm, final, quizzes)

2.2	Solve problems in physics by using suitable mathematics.	2. Following some proofs. 3. Define duties for each chapter 4. Encourage the student to look for the information in different references. 5. Ask the student to attend lectures for practice solving problem.	2. Asking about physical laws previously taught 3. Writing reports on selected parts of the course. 4. Discussions of how to simplify or analyze some phenomena.
2.3	Analyse and interpret quantitative results.		
2.4	Apply physical principle on day life phenomena.		
2.5	Derive the physical laws and formulas.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Show responsibility for self-learning to be aware with recent developments in physics	• Search through the internet and the library. • Small group discussion. • Enhance self-learning skills. • Develop their interest in Science through : (lab work, visits to scientific and research institutes).	• Evaluate the efforts of each student in preparing the report. • Evaluate the scientific reports. • Evaluate the team work in lab and small groups. • Evaluation of students presentations.
3.2	Work effectively in groups and exercise leadership when appropriate.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicate effectively in oral and written form.	• Incorporating the use and utilization of computer, software, network and multimedia through courses • preparing a report on some topics related to the course depending on web sites	• Evaluating the scientific reports. • Evaluating activities and homework
4.2	Collect and classify the material for the course.		
4.3	Use basic physics terminology in English.		
4.4	Acquire the skills to use the internet communicates tools.		
5.0	**Psychomotor (NA)**		

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**	**1.3**	**2.1**	**2.2**	**2.3**	**2.4**	**2.5**	**3.1**	**3.2**	**4.1**	**4.2**	**4.3**	**4.4**	**5.1**	**5.2**
1.1	✓															
1.2		✓														
1.3																
2.1				✓												
2.2					✓											
2.3						✓										
2.4							✓									
2.5								✓								
3.1									✓							
3.2										✓						
4.1											✓					
4.2												✓				
4.3													✓			
4.4														✓		
5.1																
5.2																

6. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Exercises & Home works	All weeks	15 %
2	Participation in activities lectures and labs	All weeks	5 %
3	Midterm Exam (theoretical)	8th week	30%
6	Final Exam (theoretical)	16th week	50%

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)

1- 12-office hours per week in the lecturer schedule.

2- The contact with students by e-mail.

E Learning Resources

1. List Required Textbooks

1. Thermodynamics, Kinetic theory, and statistical thermodynamics, 3rd edition, Francis W. Sears and Gerhard L. Salinger.
2. An introduction to thermodynamics and statistical mechanics second edition(2007).
3. Fundamentals of Statistical and Thermal Physics, by R. Reif, (2008).
4. Concepts in thermal physics, Stephen J.Blundell and Katherine M.Blundell,2006

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Recommended Reading List

1. M.D. Sturge, Statistical and Thermal Physics, Fundamentals and Applications (A.K. Peters, Natick, Massachusetts, 2003) ISBN 1-56881-196-9..

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

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

www.uqu.sa/Ahmed El-hadi
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

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.) There are enough classrooms provided with a good accommodation, including good air condition, good Data show, suitable white board. Lecture room and a board to write on The area of class room is suitable concerning the number of enrolled students (30) and air conditioned.
2. Computing resources (AV, data show, Smart Board, software, etc.) In each class room and laboratories, there is a data show, and board.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Each Class room has smart, and double layer white board. Questionaries Open discussion in the class room at the end of the lectures

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching • Course reports • Course evaluation.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Revision of student answer paper by another staff member. • Analysis the grades of students.

3 Processes for Improvement of Teaching • Preparing the course as PPT. • Using scientific flash and movies. • Coupling the theoretical part with laboratory part • Periodical revision of course content.
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) • The instructors of the course are checking together and put a unique process of evaluation. • Check marking of a sample of papers by others in the department. • Feedback evaluation of teaching from independent organization. • Independent evaluation by another instructor that give the same course in another faculty. • Evaluation by the accreditation committee in the university.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. 1- The following points may help to get the course effectiveness • Student evaluation • Course report • Program report • Program Self study 2- According to point 1 the plan of improvement should be given.

Name of Instructor: _____Assoc. Dr. El-hadi, Ahmed

Signature: _____ Date Report Completed: _____

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received: ____12/3/1439_____