



American University of Ras Al Khaimah

## AURAK Syllabus

**Course Title: Thermodynamics 1 (Core Course)**

**Course Code: MENG 211**

**Credit Hours: 3**

**Semester and Academic Year: Fall 2019**

**Prerequisite course(s) and/or co-requisite courses, if applicable: CHEM 211**

**Faculty Name: Prof. Ahmad Sakhrieh**

**Contact Information and Office Hours:**

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Office Hours: MW 12:30-2:00pm; T 12:00-1:00pm

### **Course Description:**

This course will consider the fundamental science of classical thermodynamics and its practical applications. Problem solving will be emphasized, including problem formulation, analytic, and computational solutions. Topics include the first law of thermodynamics, work, heat, properties of substances and state equations, the second law of thermodynamics and applications to engineering systems.

### **Course Textbooks and Materials:**

Thermodynamics an engineering approach, Y. Cengel and M. Boles, 9 edition, 2018, McGraw-Hill Book Company, USA

### **Other Resources:**

Fundamentals of Thermodynamics, R. Sonntag, C. Borgnakke, and G. Van Wylen, 8 edition, 2012, John Wiley and Sons, Inc. USA.

### **Web Resources:**

### **Course Learning Outcomes (CLOs)**

#### **Course Learning Outcomes**

**At the end of this course, students should be able to:**

<b>CLO 1</b>	Apply the concept of energy and its various forms and energy conversion efficiencies
<b>CLO 2</b>	Apply the concept of working fluid, the physics of pure substance and phase-change processes, and use of thermodynamic tables
<b>CLO 3</b>	Use the basic concepts of thermodynamics to the solution of practical problems
<b>CLO 4</b>	Identify and analyze new terms such as: reversible and irreversible processes, entropy generation, irreversibility, and availability

### Assessment Activities

The dates for quizzes, exams, and submission of assignments are specified in the schedule. You will be graded in this class based on the number of points you earn for quizzes, exams written assignments, or other activities, including your class participation. Keep track of your scores in Blackboard.

<b>Assessment Activities and Grading Weight</b>	<b>Assignments 25%</b>	<b>Quizzes 25%</b>	<b>Mid-term Exam 30%</b>	<b>Final Exam 20%</b>
<b>CLO 1</b>	X	X	X	X
<b>CLO 2</b>	X	X	X	X
<b>CLO 3</b>	X	X		X
<b>CLO 4</b>	X	X		X

### Mapping Course to Program Outcomes: (PO)

<b><i>ABET Standards (1-7)</i></b>	<b><i>Program Outcomes</i></b>	<b><i>Program Outcomes Addressed in Course</i></b>
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	X
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
3	An ability to communicate effectively with a range of audiences.	
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	

5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

### Grading Scale:

The grading system and scale for AURAK, as established by the Board of Trustees, is as follows:

<b>AURAK Grading System and Scale</b>		
<b>Grade</b>	<b>Percentage Scores</b>	<b>Grade Points</b>
<b>A</b>	<b>95-100</b>	<b>4</b>
<b>A-</b>	<b>90-94</b>	<b>3.7</b>
<b>B+</b>	<b>86-89</b>	<b>3.3</b>
<b>B</b>	<b>83-85</b>	<b>3</b>
<b>B-</b>	<b>80-82</b>	<b>2.7</b>
<b>C+</b>	<b>76-79</b>	<b>2.3</b>
<b>C</b>	<b>73-75</b>	<b>2</b>
<b>C-</b>	<b>70-72</b>	<b>1.7</b>
<b>D+</b>	<b>66-69</b>	<b>1.3</b>
<b>D</b>	<b>60-65</b>	<b>1</b>
<b>F</b>	<b>0-59</b>	<b>0</b>

<b>Schedule of Course Topics, Required Reading, and Assignments and Assessments</b>				
<b>Week</b>	<b>Topic</b>	<b>Required Readings</b>	<b>Assignment, Assessment (with grade weighting) &amp; Due Date</b>	<b>Mapping of CLO's to Assessments</b>
1-2	Thermodynamics concepts and definitions; states, properties, systems, control volume, processes, cycles, units, work and	Text book- Chapter 1		

	heat			
3-4	first law of thermodynamics	Text book- Chapter 2	HW#1, Quiz#1	CLO 1
5	Internal energy and enthalpy	Text book- Chapter 3	HW#2, Quiz#2	CLO2
6	conservation of mass	Text book- Chapter 4	Quiz#3	CLO2
7-9	steady-state and uniform state processes	Text book- Chapter 5	HW#3, Midterm Exam	CLO 3
10	Second law of thermodynamics	Text book- Chapter 6	HW#4,	CLO 4
11-12	Heat engines and refrigerators	Text book- Chapter 6	HW#5, Quiz#4	CLO 4
13	Reversible processes	Text book- Chapter 6		
14	Entropy, principle of the increase of entropy	Text book- Chapter 6	Quiz#5	CLO 4
15	Efficiencies, irreversibility and availability	Text book- Chapter 7	HW#6	CLO 4
16	Final Exam		Final Exam (Tuesday 17 December, 2019, 11:00- 13:00)	CLO 1-4

### Attendance Policy

University policy is that students are to attend all classes and to arrive on time. Students are required to:

- Attend all learning and teaching sessions associated with their program of study.
- Notify their course instructors in advance (in person, by phone or e-mail) that they will be absent from time-tabled class sessions.
- Obtain prior permission from their instructor or course manager, for planned absences of two or more consecutive class sessions during the semester.
- Provide a medical certificate or other corroborating evidence to explain their absence, if required by the University.

Unsatisfactory student attendance includes failure to regularly attend learning and teaching sessions without providing a satisfactory reason to instructors for absence and/or persistent late arrival at, or early departure from, learning and teaching sessions. Where a student fails to attend classes for **four or more weeks cumulatively**, or where a recurring pattern of non-attendance is observed over the course of the semester, the instructor has the option of deeming that the student has failed the course, in which case that student may receive an "F (Fail)" or "U (Unsatisfactory)" grade, as appropriate. At this point, and at the instructor's recommendation, the dean also has the authority to instruct the registrar to remove or withdraw the student from the course.

### **Disability Accommodations**

Students with disabilities may find they require additional support, services, or considerations. AURAK will endeavor to support students with disabilities or special needs where resources are available. Accommodations will be provided, for students with verified needs, allowing equal access to educational facilities, programs, services, and activities at AURAK. Disability Accommodations are never applied retroactively – only students who have previously requested and have been approved for supporting accommodations can have them apply to a given academic semester/course. Students needing support must make the request from the Department of Counseling, Testing, and Disability Services located in Building H.

### **Other Relevant Policies**

#### **A. Academic Integrity**

##### **The Honor Code**

The American University of Ras Al Khaimah strongly supports the concept of academic integrity and expects students and all other members of the AURAK community to be honest in all academic endeavors. The AURAK Honor Code can be found in the AURAK Student Handbook.

The role of the Honor Code and associated Academic Integrity Policy is to protect the academic integrity of the university, encourage consistent ethical behavior among students, and foster a climate of honorable academic achievement. The Honor Code is an integral part of university

life and students are responsible, therefore, for understanding and abiding by the code's provisions. While a student's commitment to honesty and personal integrity is assumed and expected, this Code and associated policy and procedures provides clarity of expectations.

## **Expectations**

Cheating, plagiarism, and all other forms of academic fraud are unacceptable; they are serious violations of university policy. AURAK expects all students to be familiar with university policies on academic integrity. The university will not accept a claim of ignorance – either of the policy itself or of what constitutes academic fraud – as a valid defense against such a charge.

## **Violations of Academic Integrity**

Violations of academic integrity constitute academic fraud. Academic fraud consists of any actions that serves to undermine the integrity of the academic process or that gives the student an unfair advantage, including:

- Inspecting, duplicating or distributing test materials without authorization.
- Cheating, attempting to cheat, or assisting others to cheat – relevant here is the prohibition on being in possession of a mobile telephone or similar electronic device during a test or examination. In case such devices are found with a student, the student will be deemed to have attempted to cheat and will be subject to disciplinary action under the Student Academic Integrity Policy.
- Altering work after it has been submitted for a grade.
- Plagiarizing.
- Using or attempting to use anything that constitutes unauthorized assistance.
- Fabricating, falsifying, distorting, or inventing any information, documentation, or citation.

## **Plagiarism**

One of the most common violations of academic integrity is plagiarism. Plagiarism can be intentional or unintentional. However, since each student is responsible for knowing what constitutes plagiarism, unintentional plagiarism is as unacceptable as intentional plagiarism and thus will bring the same penalties.

Plagiarism – submitting the work of others as one's own - is a serious offense. In the academic world, plagiarism is theft. Information from sources – whether quoted, paraphrased, or summarized – must be given credit through specific citations. When a student paraphrases a work, it is still necessary to cite the original source. Merely rearranging a sentence or changing a few words is not sufficient. The citation style should be appropriate for the discipline and should clearly indicate the beginning and ending of the referenced material. All sources used in the preparation of an academic paper must also be listed with full bibliographic details at the end of the paper, as appropriate in the discipline.

## **Faculty and Student Expectations**

- Every student, faculty member, and administrator is responsible for upholding the highest standards of academic integrity. Every member of the AURAK community shall honor the spirit of this policy by refusing to tolerate academic fraud.
- It is the responsibility of the instructor to provide students with additional guidelines for what constitutes “authorized” and “unauthorized” assistance.
- It is the responsibility of every student to see clarification if in doubt about what constitutes “authorized” and “unauthorized” assistance. In cases involving collaborative work, all students within the collaborative group may be help responsible for violating the code if any member of the group receives, accepts, or utilizes "unauthorized" assistance.
- Students are required to obtain permission prior to submitting work, any part of which was previously or will be submitted in another course. The instructor has the option of accepting, rejecting, or requiring modification of the content of previously or simultaneously submitted work.

A student who suspects that a violation of academic integrity has occurred should report the violation to the dean or to the Office of the Provost. In this report, the student should describe any action taken, such as talking with the person involved or with a faculty or staff member. Every effort will be made to preserve the anonymity of the student reporting the incident;

Possible penalties for academic fraud include: Formal warning, Reduction in grade for the assignment, Reduction in the grade for the course, A failing grade for the assignment, A failing grade (F) in the course, and/or Dismissal or Expulsion from the University.

Please refer to the relevant section in the *Student Handbook* and ensure a clear understanding of the provisions of the University Honor Code and the Student Academic Integrity Policy.

### **B. Concerns about Grades or Other Course Matters**

Students are responsible for their learning experiences. If you are concerned about a class matter, first discuss it with the instructor. If the matter is not resolved, the next step is to meet with the Chair of the department in which the course is taught. If you still have a concern, meet with the Dean of the school in which the course is taught. The matter is likely to be resolved before it reaches that point, but if it is not, then visit the Associate Provost for Academic and Student Affairs. Students who decide to “jump to the top” will be referred “back” to the appropriate next step.

### **C. Assignments**

University policy is that assignments are due on the date assigned. Instructors may refuse to accept late assignments or lower the grade that would be otherwise given.

#### **D. Mobile Phones**

All mobile phones, pagers and/or other communication devices should be turned off before entering the classroom. Students may NOT have mobile telephone or other electronic devices in their possession while completing examinations. Any violation will be deemed as having attempted to cheat.

#### **E. Diversity and the Use of English**

English is the common language of the AURAK campus for everyone. It is the only language to be used in the classroom. AURAK brings together students and faculty from diverse cultural and linguistic backgrounds, which is one of the strengths of the university. This diversity provides an opportunity to share our different experiences and enlarge our understanding of the world.