

<p>Kingdom of Saudi Arabia Ministry of Higher Education Qassim University College of Engineering</p>		<p>المملكة العربية السعودية وزارة التعليم العالي جامعة القصيم كلية الهندسة</p>
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Advanced Thermodynamics

College: College of Engineering

Department: Mechanical Engineering

First: Course Definition

1- Course Code: ME 672

2- Units : 3 credit hrs

3 – Semester

4 –Prerequisite : ME371 & ME372

5- Co-requisite: -

6- Location (if not on main Campus):

Second: Course Objectives

- To extend in-depth knowledge in application the laws of thermodynamics
- To clarify availability concept and analyze availability cycles
- To explain multi-component systems.
- To provide broad knowledge to analyze HVAC and combustion Systems
- To develop design and optimization procedures for thermodynamic systems

- Provide a practice-based knowledge founded on application of advanced techniques in analysis and design

Third: Course Specifications

1- Topics to be covered		
Subject	No of Weeks	Units
- First Law of thermodynamics , Second Law of thermodynamics and entropy (review)	1	3
- Availability Analysis and Availability-Cycles.	2	6

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- Multi-Component Systems	2	6
- HVAC Systems	3	9
- Combustion Systems	3	9
- Optimization of Systems	2	6
- Thermodynamic Design	2	6

2- Course components (Total hrs in the Semester)

Lecture	tutorial	Other
45	--	---

3- Intended Learning Outcomes of the Course (ILO's)

a. Knowledge

i) Description of the knowledge to be acquired:

- Apply the first and second laws of thermodynamics to different advanced systems
- Evaluate the useful work and the non-recovered energy of a system during different processes.
- Analyze multi-components systems.
- Outline HVAC System components and operation and evaluate heating as well as cooling loads.
- Understand combustion process in practical systems and compare these systems on the basis of different criteria (pollutant emission,...)
- Design and optimize thermodynamic systems (cycles).

ii) Teaching strategies to be used to develop that knowledge

- Lectures
- Assignments, at home
- Discussions in the Class
- Reading (books, internet search)

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<p>iii) Methods of assessment of knowledge acquired</p>
<ul style="list-style-type: none"> • Assignment reports: to assess ability to answer some comprehensive questions. • Midterm Exams: to assess understanding of the course knowledge. • Final Exam: to assess understanding of the course knowledge
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b- Cognitive (Intellectual) Skills

<p>i) Cognitive skills to be developed</p>
<ul style="list-style-type: none"> • The ability to apply first and second laws of thermodynamics to energy systems • The ability to determine the exergy of a system and the useful work recovered during a process • The ability to analyze multi-components and combustion systems • The ability to design and optimize a thermodynamic system (cycles).

<p>ii) Teaching strategies to be used to develop these cognitive skills</p>
<ul style="list-style-type: none"> • Lectures • Assignments, at home • Discussions in the Class • Reading (books, internet search)
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<p>iii) Methods of assessment of students cognitive skills</p>
<ul style="list-style-type: none"> • Assignment reports: to assess ability to answer some comprehensive questions. • Midterm Exams: to assess understanding of the course knowledge. • Final Exam: to assess understanding of the course knowledge.
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c. Interpersonal Skills and Responsibility

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i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- Team work
- Ideas development and sharing with others

ii) Teaching strategies to be used to develop these skills

- Assignments, at home
- Discussions in the Class
- Reading and reporting (books, Internet search)

iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- Encouraging question raising: to assess the student ability in dialog and problem discussion.
- Organizing presentations: to assess the student ability in developing systematic work and defending his ideas.
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d. Communication, Information Technology and Numerical Skills

i) Description of the skills to be developed in this domain

- Use of the internet search
- Report writing

ii) Teaching strategies to be used to develop these skills

- Assignments, at home
- Assignment Reports (reading books, Internet search)

iii) Methods of assessment of students numerical and communication skills

- Assignment Reports: to assess technical report writing abilities
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e. Psychomotor (if applicable) & Other Non-cognitive Skills

i) Description of the psychomotor or other skills to be developed and the level of performance required

- Not applicable

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- ii) Teaching strategies to be used to develop these skills-*
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- iii) Methods of assessment of student's psychomotor skills*
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4- Student Assessment Schedule

<i>Serial</i>	<i>Assessment tool (test, group project, examination etc.)</i>	<i>Week due</i>	<i>Weight</i>
1	Group project	End of term	20%
2	Homework for each part of the program	One week after finishing the related part of the program	10%
3	Two Mid-term exams	Seventh and thirteenth weeks respectively	30%
4	Final Exam	End of term	40%
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5- Student Support

- 4 office hours are offered by the instructor in addition to extra assistance if necessary.

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6- Learning Resources

i) Essential Books (References)

- M. Moran & H. Shapiro, Fundamentals of Engineering Thermodynamics, 5th edition John Wiley and Sons Inc., 2004.
- Kalyan Annamalai, Ishwar K. Puri, Milind A., Advanced Thermodynamics Engineering, Jog Taylor & Francis Books, 2010.

ii) Course Notes

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iii) Recommended Books

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iv) Electronic Books & Web Sites:

- course materials are uploaded on college web-site (www.qec.edu.sa)
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v) Periodicals

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7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionnaires
- Observing the students opinions presented in student site and in meetings
- Appeal box
- Graduation questionnaire, especially filled by distinguished graduate students
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ii) Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Periodical review of the teaching methods by both the department council and the education affairs vice dean
- other special questionnaires
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iii) Processes for Improvement of Teaching

- Evaluation of the course outlines by other qualified staff members from other institutions
- Periodical contact with the different engineering authorities and industries for evaluating and getting their feedback and suggestions concerning the course outlines.
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iv) Processes for verifying standards of student achievement

- check marking by an independent faculty member of a sample of student work
- periodic exchange and remarking of a sample of assignments with a faculty member in another institution)
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v) Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- Assessment and evaluation of the level of achieving the course outcomes through a continuous improvement process (part of a quality assurance system established by the university.
- Consequently, actions are to be taken to improve the course delivery when necessary.
- Review of the course objectives, outcomes and curriculum each 2 years
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