University: Cairo Faculty: Engineering Department: Aerospace Engineering

Course Specifications

Programme on which the course is given: B.Sc. in Aerospace Engineering

Major or minor element of programme: Major

Department offering the programme: Aerospace Department

Department offering the course: Aerospace Department

Academic year / Level: 4th year

Date of specification approval: March 2015.

A- Basic Information

Title:	**Fundamentals of Thermodynamics (3+2)**	**Code:**	**AER 105**		
Credit Hours:	**(3+2)**	**Lectures:**	3		
Tutorials:	2	**Practical:**	included		

B- Professional Information

1- Overall Aims of Course

- Be able to recognize the relevancy of fundamental thermal principles
- Develop an understanding of the concepts underlying the first and second laws of thermodynamics
- Provide experience in using prerequisite knowledge and/or skills in solving problems
- Develop problem-solving skills in energy-related areas
- Be able to describe the differences in design for systems intended for different applications
- Provide experience in using the computer to aid in solving problems
- Be able to function in a group or as an individual to study and learn specific thermal aspects of a engine system that have not been covered in the class (self-learning). Be able to present finding to fellow students through an oral presentation in a formal classroom setting (learning through teaching).Publish facts found in a final report.

2- Intended Learning Outcomes of Course

a- Knowledge and Understanding

a1- The students successfully completing this course will understand the thermodynamic considerations for different cycle analysis

a2- the knowledge of thermodynamic laws to help in evaluating the operation and overall engine performance

a3- This course introduces students to the design and analysis of thermal systems. Students learn to formulate and solve thermal systems problems, and integrate this analysis into the optimal design of thermal systems. Students shall be able to communicate solutions in a manner consistent with engineering practice.

b- Intellectual Skills

b1- Hypothesizing and synthesizing the modeling process.

b2- The ability to analyze results and draw conclusions.

c-Professional and Practical Skills

c1- Construct and use software codes.

c2- Be able to present finding to fellow students through an oral presentation in a formal classroom setting

d- General and Transferable Skills

d1- The capability to split complicated systems into model-able modules.

d2- The capability to choose a convenient model rigorous to employ.

d3- To have an over view of the physical process.

3- Contents

Topic	**No. of hours**	**Lectures**	**Tutorial**
Introduction	1	1	0
Concepts and Definitions	4	2	2
Work	5	3	2
Heat	5	3	2
Properties of Pure Substances	5	3	2
First Law of Thermodynamics	5	3	2
Applications on First Law	5	3	2
Second Law of Thermodynamics,	6	4	2
Applications on Second Law	5	3	2
Entropy	5	3	2
Applications on Entropy	3	2	2
Irreversibility and Availability	2	1	2
	∑ 81	47	34

4- Teaching and learning Methods

4.1 Lecturing in a dynamic way and using teaching aids (slides and overhead projector).
4.2 Assignments including closed and open ended problems and projects.
4.3 Oral presentation in a formal classroom setting (learning through teaching).

5- Student Assessment Methods

5.1	Quizzes	to asses	design tools
5.2	Reports	to asses	small preliminary design problems
5.3	Exams	to asses	the ability to cast inputs and use analysis techniques to produce specific outputs

Assessment Schedule

Assessment 1	Quiz 1	Week	3
Assessment 2	Report 1	Week	4
Assessment 3	Quiz 2	Week	5
Assessment 4	Report 2	Week	7
Assessment 5	Midterm exam	Week	8
Assessment 6	Report 3	Week	9
Assessment 7	Quiz 3	Week	10
Assessment 8	Report 4	Week	12
Assessment 9	Project	Week	13
Assessment 10	Report 5	Week	15
Assessment 11	Final Exam	Week	16

Weighting of Assessments

Mid-term Examination	15 %
Final-term Examination	60 %
Semester work	10%
Project	15%

6- List of References

6-1 Course Notes

Not available

6-2 Essential Books (Text Books)

- Sonntag, R. E.; Borgnakke, C. and Van Wylen, G. J., Fundamentals of Thermodynamics, John Wiley and Sons Inc., 1998.
- Cengel, Y. A. and M. A., Thermodynamics: An Engineering Approach, WCB/McGraw Hill, 1998.

6-3 Recommended books

- Eastop & McConkey; Applied Thermodynamics for Engineering Technologists; Longman, 1996.
- Milton; Thermodynamics, Combustion and Engines; Chapman & Hall, 1995.
- Van Wylen, Gordon J. and Sonntag, Richar E., Fundamentals of Classical Thermodynamics, John Wiley and Sons Inc., 1965.

6-4 Periodicals, Web sites, …. etc

7- Facilities Required for Teaching and Learning

- Lecture rooms
- Projector and overhead projectors
- PC computer and internet connection

Course Coordinator: Dr. Ola Rashed

Head of Department: Prof. Ayman H. Kassem

Date: March, 2015.