Cairo University
Faculty of Engineering

Aerospace Engineering Department

Course Specifications

Program(s) on which this course is given:	Aerospace Engineering
Department offering the program:	**Department of Aerospace Engineering**
Department offering the course:	**Department of Aerospace Engineering**
Academic Level:	MSc
Date	March 29 2015
Semester (based on final exam timing)	☐x Fall ☐ Spring

A- Basic Information

1. Title:	Combustion in Propulsive Systems (I)			**Code:**		AER 670		
2. Units/Credit hours per week:	Lectures	27	Tutorial	15	Practical	**3**	Total	45

B- Professional Information

1. Course description:

This course aims to teach the basic principles of combustion highlighting the role of chemical kinetics, fluid mechanics, and molecular transport in determining the structure of flames. Students will become familiar with laminar and turbulent combustion of gaseous and liquid fuels including the formation of pollutants. They will also be introduced to various applications such as internal combustion engines, gas turbines and fires.

2. Intended Learning Outcomes of Course (ILOs):

a) Knowledge and Understanding

Learning the basis of chemical kinetics
Understand reacted flow equations and their parameters.
Understand combustion aerodynamics, shock waves, and detonation and deflagration subjects.
Understand the physics of premixed flames.
Understand the physics of diffusion flames.
Understand the physics of droplet combustion.
Understand the turbulent flame problems.

b) Intellectual Skills

The ability to analyse combustion phenomenon and its stability and the formation of pollutants in practical combustion devices

c) Professional and Practical Skill

1. An understanding of the fundamental theory of the combustion of non-premixed and premixed flames, laminar and turbulent flames, droplets and the theory of ignition.
2. An understanding of the role of detailed chemical kinetics in combustion and the ability to calculate the equilibrium compositions of reacting system
3. An understanding of pollutant formation in practical devices such as internal combustion engines and gas turbines

d) General and Transferable Skills

Combustion in propulsive system analysis

3. Contents

Topic	Total hours	Lectures hours	Tutorial/ Practical hours
Introduction and terminology and thermochemistry		2	
Chemical kinetics		3	
Thermochemical coupling - reactor models		3	3

Premixed flames.		3	
Non- premixed flamed		3	6
Droplet combustion and sprays		3	
Turbulent flames		1	
Turbulent premixed flames		3	
Turbulent non-premixed flames		3	
Pollutant formation		3	6
4. Teaching and Learning Methods	Lectures (27)	Tutorial (15)	Seminar/Workshop (3)
	Class Activity (4)	Case Study (1)	Projects (1)
	E-learning (2)	Assignments /Homework (6)	Other:

5. Student Assessment Methods

• **Assessment Schedule**	**Week**
-Assessment 1;Class test	4,5,6
-Assessment 2; Project Assignment	7
-Assessment 3; Presentations	10
-Assessment 3; Midterm Exam	9
-Assessment 4; Final Exam	16
• **Weighting of Assessments**	
-Mid-Term Examination	20
-Final-term Examination	40
-Project	20
-Class Test	15
-Presentation	5
-Total	100

6. List of References

Stephen R. Turns, 2000, An Introduction to Combustion, Mc Graw Hill.

(Other References)

K. K-Y. Kuo, 2005, Principles of Combustion, Wiley.

7. Facilities Required for Teaching and Learning

advanced combustion lab

Course Coordinator:	**Ola M.I. Rashed**
Head of Department:	**Ayman H. Kassem**