



Course Specifications of: Combustion MEP 607

Program(s) on which the course is given : Post Graduate M. Eng. in Mechanical Power Engineering

Compulsory or Elective element of program: Elective

Department offering the program: Mechanical Engineering/ Power

Academic year / Level: year/ 2014/2015

Date of specification approval: 2012

A. Basic Information

Title: Combustion

Code: MEP 607

Credit Hours: 3

Lecture: 3

Tutorial:

Practical:

Total: 3

B- Professional Information

1- Overall aims of course:

This course introduces students to:

- 1- Demonstrate knowledge of combustion thermodynamics, chemical equilibrium calculations, types of fuels and flames in addition to applications on industrial furnaces
- 2- Solve problems in combustion and flame temperature in various engineering applications
- 3- Calculation and predict necessary combustion parameters

2- Intended learning outcomes of course (ILOs)

By completion of the course, the student should be able to:

2.1 Knowledge and understanding

- a1. List the governing equations of chemical equilibrium, energy equations involving combustion and mechanism of combustion of fuel types. (2.1.2)
- a2. Know and understand the meaning of flame speed and the various parameters affecting the variation of flame dimensions and speed. (2.1.3)
- a3. Define the basics and the ethics of scientific research. (2.1.4)
- a4. Describe the current combustion problems in critically evaluated manner. (2.1.6)

2.2 Intellectual skills

- b1. Analyze problems and conclude appropriate solutions based on analytical thinking. (2.2.1)
- b2. Exploit different knowledge sources to solve combustions problems. (2.2.3)
- b3. Assess risks in professional practices in the area of combustion engineering. (2.2.5)
- b4. Assess and evaluate the characteristics and performance of the combustion system Components (2.2.8)

2.3 Professional and practical skills

- c1. Exchange knowledge and skills with engineering community and industry. (2.3.1)
- c2. Design and perform experiments with proper technical, safety and ethical framework.(2.3.4)
- c3. Use the different instruments for measuring the combustions properties safely and according to the specified accuracy.(2.3.7)



2.4 General and transferable skills

- d1. Communicate effectively using different means.(2.4.1)
- d2. Asses and identify the required learning needs. (2.4.3)
- d3. Write reports in accordance with the standard scientific guidelines. (2.4.5)
- d4. Manage time effectively. (2.4.7)

3- Contents

No.	Topic	No. of weeks	Total No. of Hours
1	Thermodynamics of combustion, Dynamics of combustion	2	6
2	Fundamentals of chemical kinetics: Rate of reaction, reaction order, complex reaction, chain reaction, theories of reaction kinetics	1	3
3	Laminar flame propagation: Premixed flames, the structure of laminar flame, theories of laminar flame propagation, the properties of the premixed flame	2	6
4	Diffusion flames: Gaseous diffusion flames , theory of diffusion flames, theory of turbulent diffusion flames, confined diffusion jet flames- the characteristics of diffusion flames	2	6
5	Flame stability: Flame stabilization, characteristic stability diagram, mechanism of flame stabilization, flame stretch theory, quenching distance.	1	3
6	Fuel resources - specification of engine fuels - specification and testing of volatile fuels - the properties of heavy fuel oil	2	6
7	Fuels and their characteristics: Fuel resources, Principles of classification of fuels, solid fuels liquid fuels, gaseous fuels, Properties of heavy fuel oil, various tests to determine the properties of fuel.	2	6
8	Various tests to determine the properties of the fuel	1	3
9	Pollution caused by combustion: Types of air pollution, combustion generated air pollution, effects of air pollution, pollution from combustion of fossil fuels and its control.	1	3
10	Exam	1	3
	Total	15	45

4- Course Matrix

ILO's code number	Teaching/learning methods and strategies	Assessment methods and strategies
2.1.2 2.1.3 2.1.4 2.1.6	Formal lectures	Individual coursework assignments, quizzes, oral discussions and reports. Mid-year and /or final written examination is given.
2.2.1 2.2.3 2.2.5 2.2.8	Analysis and problem-solving skills are developed through tutorial/problem sheets and small group exercises.	Analysis and problem-solving skills are assessed through oral and written examinations.
2.3.1 2.3.4	Experiments demonstrations, practical work.	Coursework exercises and reports, project reports and presentations.



2.3.7		
2.4.1 2.4.3 2.4.5 2.4.7	Those skills are not explicitly taught; however, along the course study the student will acquire those skills to be able to perform his obligations.	Project presentation

5- Assessment schedule

Assessment 1	Assignments	on weeks	1, 3, 6
Assessment 2	Quizzes	on weeks	2, 4, 9, and 13
Assessment 3	Mid-term exam	on weeks	8
Assessment 3	Oral exam	on week	14
Assessment 4	Final exam	on week	15

6- Weighting of assessments

- 20% (60 marks) Home assignments, Quizzes, and reports
- 20% (60 marks) Mid-term examination and Oral examination
- 60% (180 marks) Final-term examination
- 100% (300 marks) Total

7- List of References**7.1 Essential books (Text books)**

- Fawzy EL-Mahallawy, Saad H. "Fundamentals and Technology of Combustion" Elsevier Science Ltd Kidlington Oxford OX51GB, UK, 2002
- Charles E. Baukal, Jr. "Industrial Combustion Testing" CRC Press Taylor Francis Group, 2011
- Turns, S.R. "An Introduction to combustion Concepts and Applications" McGraw Hill Inc., New York, USA, 1996

7.2 Recommended books; Periodicals & Websites.

- Yahoo email group
- www.4shared.com
- www.sciencedirect.com

8- Facilities required for teaching and learning

- Lecture room equipped with overhead projector
- Presentation board, computer and data show

Course coordinator: Ass.Prof. Kairy Hussien , Ass.Prof.Ahmed Attia

Course instructor : Ass.Prof. Kairy Hussien , Ass.Prof.Ahmed Attia

Head of Department: Prof. Dr. Osama Ezzat Abdellatif



Matrix of course content and ILO's

Course Title: Combustion

Code: MEP 607

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Course content	ILO's A	ILO's B	ILO's C	ILO's D
1- Combustion process and the first law.	a1,a4	b1	c1	d1
2- Fundamentals of chemical kinetics.		b2	c1	d2
3- flame propagation: structure of laminar flame, theories of laminar flame propagation, the properties of the premixed flame	a2	b4		d4
4- Diffusion flames: Gaseous diffusion flames , theory of diffusion flames	a1	b2	c2	
5- Flame stability: Flame stabilization, characteristic stability diagram.	a3	b3		d3
6- Fuel resources - specification of engine fuels - specification and testing of volatile	a2,a4		c3	
7- Various tests to determine the properties of the fuel	a1	b1		
8- Pollution caused by combustion: Types of air pollution, combustion generated air pollution	a2	b4		d1,d4



Benha University



Mechanical Engineering Dept
Course Specification- M. Eng. (2014-2015)



Faculty of Engineering

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1- Demonstrate knowledge of combustion thermodynamics, chemical equilibrium calculations, types of fuels and flames in addition to applications on industrial furnaces.	a1,a2	b1	c1	d1,d4
2- Solve problems in combustion and flame temperature in various engineering applications.	a1,a3	b1,b3	c1,c2	d1,d3
3- Calculation and predict necessary combustion parameters.	a4	b2	c3	d2