

GENERAL INFORMATION

Course Description:

- ME 140 – Combustion Processes (3 units)/ME 255 – Advanced Combustion Processes (3 units)
 - Fundamentals of combustion, thermodynamics, chemical kinetics, ignition, flame structure, flame speed, flammability, pollutant formation. Application to engines, energy production, and fire safety.
 - The course provides an introduction to the subject of combustion, covering a broad range of topics of importance to the fields of energy conversion, engines, pollution, and fire.

The course consists of classroom lectures, demonstration laboratories, homework assignments, two mid-term examinations and a final examination. The graduate level course (ME 255) will have additional or different assignments and will be graded separately.

Prerequisites for ME 140: ME 40, ME 106, and ME 109 (ME 106 and 109 may be taken concurrently).

Prerequisites for ME 255: ME 40, ME 106, and ME 109 (or their equivalents).

Instructor: Carlos Fernandez-Pello, ferpello@me.berkeley.edu

Office Hours: Tu, Th 11:00-12:30, and by appointment in 6105A Etcheverry Hall.

Graduate Student Instructor: TBA

Office Hours: TBA

Find our class page at: [bcourse](#)

Demonstration Laboratory: Schedule to be decided. 45 Hesse Hall, bring protective eyewear. Divided into two sections: Section #1: 11:00 am - 11:45 am, Section#2: 11:45 am-12:30pm. There are no formal lab reports, but lab material will be incorporated into some homework assignments.

Technical Staff: Michael Neuffer, Alex Jordan.

Website: The course website will be at <https://bcourse/berkeley/fall2018/me140/home>. Check regularly for announcements, homework, labs, and other materials. Please speak with us (or email us) ASAP if you are not automatically sent an enrollment email the first week of class.

Homework: Homework are assigned weekly and due one week after they are assigned

Exams:

- Midterm#1 – **Thursday , October 6** (During Lecture)
- Midterm#2 – **Thursday, November 10** (During Lecture)
- Final Exam – **Tuesday, December 11, 8:00 – 11:00 am**

Grading: Course grades will be weighted as follows:

ME 140:

Homework / Laboratory and Class Participation 10%
Midterms 40% (each 20%)
Final Exam 50%

ME 140/255 – Combustion Processes: 2

ME 255:

- Homework / Laboratory and Class Participation 10%
- Midterms 30% (each 15%)
- Final Exam 40%
- Final Project 20%

Class participation is strongly encouraged. Homework presentation (readable, neat, clear, etc.) will be taken into account when grading.

Book:

S. McAllister, J.Y. Chen, and C. Fernandez-Pello. [*Fundamentals of Combustion Processes, Springer, 2011*](#)

Additional readings:

- Glassman: Glassman, I. *Combustion*, Academic Press, 1996. On reserve.
- Strahle: Strahle, W.C. *Introduction to Combustion*, Gordon & Breach Science Publishers Ltd., 1993. On reserve.
- Turns: Turns, S.D. *An Introduction to Combustion*, 2nd Edition, McGraw-Hill, 2000. On reserve.

ME 140/255 – SYLLABUS FALL 2015

WEEK #	LECTURE TOPICS	LAB	READING
1 Aug. 23	Introduction: The nature of combustion. Fuels.	None	Book 1
2 Week of Aug. 27	Thermodynamics of Combustion: Thermodynamics review. Heat of reaction and formation.	None	Book 2
3 Week of Sept. 3	Thermodynamics of Combustion: Heat of Combustion. Adiabatic flame temperature.	#1: Cantera intro: Heat of Combustion/ Flame temperature Sept. 7	Book 2
4 Week of Sept. 10	Chemical kinetics: Chemistry of combustion. Reaction rates	#2: Cantera: Chemical kinetics/ Ignition delay September 14	Book 3 Glassman 2
5 Week of Sept. 17	Conservation Laws: Open and closed control systems. Mass, energy, and momentum.	None	Book 4 Turns 7
6 Week of Sept. 24	Ignition: self heating, spontaneous ignition, piloted ignition spontaneous combustion	#3: Ignition of premixed gases Sept. 21	Book 5 Glassman 7
7 Week of Oct 1	Review: chapters 1-5 Midterm 1: Thursday October 4	None	

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8 Week of Oct. 8	Premixed combustion: Laminar flame propagation. Flammability Limits. Flame Quenching	#4: Premixed flame propagation Oct. 12	Book 6 Strahle 4
9 Week of Oct. 15	Non-premixed gas fuel combustion: Gaseous diffusion jets and flames. Liquid fuel combustion: Liquid fuel ignition and pool burning.	#5: Non-premixed flames: Gas Jet Oct. 19	Book 7 Turns 15 Golden
10 Week of Oct. 22	Droplet and Spray Combustion: Droplet burning. Droplet sprays.	#6: Pool Fires and Fire Storm Oct. 26	Book 8
11 Week of Oct. 29	Environmental Aspects of Combustion: Combustion emissions and ameliorations	None	Book 9
12 Week of Nov. 5	Environmental Aspects of Combustion Review: chapters 6-9 Midterm #2: Thursday Nov. 8	None	Book 10 Borman 7
13 Week of Nov. 12	Premixed Charge Engines: Spark-Ignition Engine Combustion. Emissions. Alternative engines.	8: Gas turbine combustor Nov16	Book 10 & 11 Borman 11-12
14 Week of Nov. 19	Diesel Engines: Operating parameters, Fuel injection. Combustor and chamber design. Gas turbines: operation & emissions	None Thanksgiving Break	Book 11 Strahle 7 Notes
15 Week of Nov. 28 th	Solid fuel combustion: Liquid and solid fuel ignition and burning. Material Flammability Wildfires: Ignition of wildfires and fire propagation	None	Notes
16 Week of Nov 26	Course Review		