University Of California, Berkeley  
Department of Mechanical Engineering  

ME 256 -- Combustion (3 Units)  
Graduate Course  

Syllabus  

CATALOG DESCRIPTION  


COURSE PREREQUISITES  

ME 40, ME 106, and ME 109 (106 and 109 may be taken concurrently) or their equivalents. ME 140/ME255 is recommended.  

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL  

Sample:  

Other Useful Reference Textbooks:  

COURSE OBJECTIVES  

This course provides students a solid foundation in combustion sciences and technologies relevant to current and future energy conversion devices using combustion.  

DESIRED COURSE OUTCOMES  

Students will have the ability to perform critical analyses of current and future reacting systems using analytical and numerical methods. For practical combustion systems with complex geometries, students will have gained sufficient background to further their capabilities of using advanced numerical models.  

TOPICS COVERED  

Topics include: Review of thermochemistry, Chemical Kinetics (explosion limits, negative temperature dependence, NOx formation), Conservation Equations for Reacting Flows, Computer modeling of combustion processes, Premixed flames (deflagration and detonation), and Nonpremixed flames. Applications using advanced combustion systems for energy efficiency and low emissions will be discussed.
CLASS/LABORATORY SCHEDULE

3 hours of lecture and 0-1 hour of discussion. (Variable).

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

To provide essential knowledge of combustion theory and models for practical designs of reacting systems.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

1) Homework (30%)
2) Midterm (30%):
3) Final (40%)

TOPICS COVERED/WEEKLY AGENDA

Sample

<table>
<thead>
<tr>
<th>Topic Text Ref.</th>
<th>(Warnatz 6th edition)</th>
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<tbody>
<tr>
<td>Introduction, Fundamental Definitions</td>
<td>Chap. 1</td>
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<tr>
<td>Experimental Investigation of flames</td>
<td>Chap. 2</td>
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<tr>
<td>Review of Thermodynamics</td>
<td>Chap. 4</td>
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<tr>
<td>Chemkin (Computer modeling)</td>
<td>Handout</td>
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<tr>
<td>Chemical Kinetics, Reaction Mechanisms</td>
<td>Chaps. 6, 7</td>
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<tr>
<td>Chemkin Applications</td>
<td>Chaps. 6, 7, 8</td>
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<tr>
<td>H2-O2 Combustion /Explosion Limits</td>
<td>Chap. 10</td>
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<tr>
<td>CH4 Oxidation</td>
<td>Chap. 7</td>
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<tr>
<td>Combustion of higher hydrocarbon fuels</td>
<td>Chaps. 10,11</td>
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<tr>
<td>Detonation</td>
<td>Chap. 10</td>
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<tr>
<td>Transport Phenomena /Conservation Equations</td>
<td>Chaps. 5,12</td>
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<tr>
<td>Laminar premixed flames</td>
<td>Chaps. 3,8</td>
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<td>Laminar Nonpremixed Flames</td>
<td>Chap. 9</td>
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<tr>
<td>Opposed jet flames: computer modeling</td>
<td>Handouts</td>
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<tr>
<td>Turbulent Combustion</td>
<td>Chaps 14 &amp; 15</td>
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<td>Emission from combustion Nitric Oxides</td>
<td>Chap. 17</td>
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Assignments:
Homework, Computer projects using computer programs (Chemkin or Cantera)

PERSON(S) WHO PREPARED THIS DESCRIPTION
Professor Jyh-Yuan Chan, Oct 1st, 2015

ABBREVIATED TRANSCRIPT TITLE (19 SPACES MAXIMUM):
TIE CODE: [Shareena Enters]
GRADING: Letter and/or Pass Not Pass

Thursday, November 05, 2015
SEMESTER OFFERED: Fall and Spring
COURSES THAT WILL RESTRICT CREDIT: None
INSTRUCTORS: Staff
DURATION OF COURSE:
EST. TOTAL NUMBER OF REQUIRED HRS OF STUDENT WORK PER WEEK:
IS COURSE REPEATABLE FOR CREDIT?
CROSSLIST: None