Course Syllabus

Degree Program:

☐ECE-Electrical & Computer Engineering
■ME -Mechanical Engineering
☐General Courses for Both ECE & ME Degree Programs

Course Name: Combustion
Course Code: VM432
Course Credits: 3
Course Category: ☐ Required ■ Elective

Terms Offered:
☐Fall _____2014-2015_____ (YYYY-YYYY)
☐Spring _____ (YYYY-YYYY)
☐Summer_____ (YYYY-YYYY)

Course Pre/Co-requisites:
fluid mechanics

Textbook & References
1. Combustion physics, by C.K. Law, 2006
2. Combustion theory, 2nd ed., by F. Williams, 1985

Instructors: (Email, office hours and office room No. should be included)
Lipo Wang, lipo.wang@sjtu.edu.cn
Room 209
Office hours: working time

Grading Policy:
- ~20% from homework (with some bonus problems)
- ~45% from one final exam
- ~30% from one oral exam
- ~5% from overall performance

Academic Integrity: (Any types of honor code regulations like class rules, homework policy, exam rules or project collaboration policy could be defined here)
It is very necessary to show up in the class. Homework assignments need to finish independently and submit on time. Frequent discussions and exchanges with the instructor are strongly encouraged. To make a fair judgment of learning, strict rules related to homework assignments and exams need to be formulated without exception. Any honor code violation behavior (e.g. plagiarism) must be recorded with corresponding penalty.

Please attach your course description and detailed teaching schedules here:

Chap.1. Overall review and discussion of fluid mechanics, thermodynamics and chemical kinetics: review of basic fluid mechanics: the derivation of mass, momentum and energy conservation equations based on the Reynolds transport theorem; thermodynamics and chemical equilibrium, mixture fraction, the adiabatic flame temperature (the Burke-Schumann solution); reaction kinetics: the Arrehenius rate expression, the order of reaction, chain reactions (initiating, branching, propagating, breaking)

Chap. 2. Premixed combustion: Hugoniot relation (detonation, deflagration); the laminar flame structure, theoretical expression of the flame speed based on the Zeldovich theory, ignition, extinction and stability limits.

Chap. 3. Nonpremixed combustion: Stefan flow, droplet vaporization and burning, analysis of the flame location.

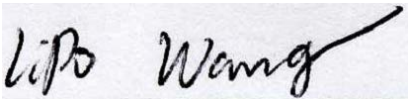
Chap. 4. Introduction to turbulence and turbulent combustion (premixed and nonpremixed case): the combustion regimes,

Chap.5. Combustion of nonvolatile fuels: coal combustion case. Carbon combustion at different limits, metal particle combustion, multicomponent droplet combustion; introduction of nitric oxides (formation mechanism, environment and combustion); application of combustion in auto-engines.

Chap.6 Brief introduction of combustion instability

Course objectives:

1. To understand the principal concepts and physics.
2. To relate the relevant theories to real application examples



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