

AME 514 – Applications of Combustion and Reacting Flows - Spring 2017

Instructor: Paul Ronney

Office: OHE 430J

Phone: (213) 740-0490

Email: ronney@usc.edu

Website: <http://ronney.usc.edu>

Office hours: 9:00 am – 12:00 noon Thursdays

Grader: To be announced.

Purpose: The objective of the course is to enable students to apply fundamental understanding gained in AME 513 (Principles of Combustion) to new and rapidly evolving science and technology areas including microscale reacting flows, microgravity combustion, supersonic and hypersonic propulsion, and turbulent combustion.

Textbook: None required; course will be taught from lecture notes and handouts. However, a good general combustion textbook is S. R. Turns, *An Introduction to Combustion*, 3rd Ed.: <http://www.mheducation.com/highered/product/introduction-combustion-concepts-applications-turns/M0073380199.html>

Schedule: 1 lecture per week, Wednesdays 6:40 – 9:20 pm, OHE 132.

Midterm exams: None

Final exam date: Wednesday, May 3, 7:00 pm – 9:00 pm

Distance learning: Lectures and course credit are available through the USC Distance Education Network: <https://gapp.usc.edu/den>

Credit: 3 units

Prerequisite: AME 513 (Principles of Combustion) or equivalent or permission of instructor

Grading: 5 homework assignments (60%), final exam (40%). Late homework is marked down at a rate of 10 points (out of a maximum possible of 100) per working day late. Each homework assignment will consist of two parts: (1) a report/review on a scientific paper chosen from an approved list and (2) the conventional type of homework problems.

Further information: <http://ronney.usc.edu/courses/ame-514/>

Tentative course outline
(some sections may be changed by vote of registered students)

- 1) Advanced fundamental topics (3 lectures)
 - i) Scaling considerations
 - ii) Microscale internal combustion engines
 - iii) Microscale gas turbine and rocket propulsion
- 2) Microscale reacting flows and power generation (3 lectures)
 - i) Scaling considerations
 - ii) Microscale internal combustion engines
 - iii) Microscale gas turbine and rocket propulsion
 - iv) Thermoelectrics
 - v) Fuel cells – PEM, solid oxide
 - vi) Thermal transpiration
- 3) Turbulent combustion (3 lectures)
 - i) Premixed-gas flames
 - ii) Non premixed flames
 - iii) Edge flames
- 4) Advanced propulsion systems (3 lectures)
 - i) Thrust and compressible flow
 - ii) Hypersonic propulsion
 - iii) Pulse detonation engines
- 5) Emerging technologies in reacting flows (3 lectures)
 - i) Applications of combustion (aka “chemically reacting flow”) knowledge to other fields
 - (1) Biofilms & microbial fuel cells
 - (2) Frontal polymerization
 - (3) Inertial confinement fusion
 - (4) Astrophysical combustion
 - ii) New research fields
 - (1) HCCI/RCCI engines
 - (2) Plasma assisted combustion
 - (3) Microbial fuel cells
 - iii) Current needs in combustion research

5 homework sets will be assigned (1 per section). Each assignment will consist of a paper review and a conventional problem set, except for the last section, which will consist of a paper review and a two-page “white paper” (<http://ronney.usc.edu/AME514/SampleWhitePaper.pdf>) outlining a potential research topic.

Academic integrity

SCampus, the Student Guidebook, (www.usc.edu/scampus or <http://scampus.usc.edu>) contains the University Student Conduct Code (see University Governance, Section 11.00).

- For AME 101 you may
 - Work with others to find solutions to lecture and lab homework assignments
 - Study with others for exams
- For AME 101 you may NOT
 - Copy lecture and lab homework assignments from others – even if you work together, you must prepare and turn in assignments that were created by you only
 - Work together during exams
 - Sit in on both midterm exams (for the 8:00 am and 9:30 am sections) or both sections of the final exam
- **Violators will be reported to the Office of Committee for Student Judicial Affairs and Community Standards** (<http://www.usc.edu/student-affairs/SJACS/>)

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, Behavior Violating University Standards <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity <http://equity.usc.edu/> or to the Department of Public Safety <http://capsnet.usc.edu/departments/departments-public-safety/online-forms/contact-us>. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

Violation	USC - Recommended Sanction for Undergraduates*	AME - Recommended Sanction for Undergraduates and Graduates
Copying answers from other students on any course work.**	F for course.	First offense: F on assignment. Second offense: F for course.
One person allowing another to cheat from his/her exam or assignment.	F for course for both persons.	If assignment: First offense: F on assignment. Second offense: F for course. If exam: F for course.
Possessing or using material during exam (crib sheets, notes, books, etc.) which is not expressly permitted by the instructor.	F for course.	First offense: F on exam. Second offense: F for course.
Continuing to write after exam has ended.	F for course.	F on exam
Taking exam from room and later claiming that the instructor lost it.	F for course and recommendation for further disciplinary action (possible suspension).	F for course
Changing answers after exam has been returned.	F for course and recommendation for further disciplinary action (possible suspension).	F for course
Fraudulent possession of exam prior to administration.	F for course and recommendation for suspension.	F for course
Obtaining a copy of an exam or answer key prior to administration.	Suspension or expulsion from the university; F for course.	F for course
Having someone else complete course work for oneself.	Suspension or expulsion from the university for both students; F for course.	F for course
Plagiarism — Submitting other's work as one's own or giving an improper citation.	F for course.	First offense: F on assignment. Second offense: F for course.
Submission of purchased term papers or papers done by others.	F for course and recommendation for further disciplinary action (possible suspension).	F for course
Submission of the same assignment to more than one instructor, where no previous approval has been given.	F for both courses.	F for both courses
Unauthorized collaboration on an assignment.	F for the course for both students.	First offense: F on assignment. Second offense: F for course.
Falsification of information in admission applications (including supporting documentation).	Revocation of university admission without opportunity to reapply.	Revocation of university admission without opportunity to reapply.
Documentary falsification (e.g., petitions and supporting materials; medical documentation.)	Suspension or expulsion from the university; F for course when related to a specific course.	Suspension or expulsion from the university; F for course when related to a specific course.
Plagiarism in a graduate thesis or dissertation.	Expulsion from the university when discovered prior to graduation; revocation of degree when discovered subsequent to graduation.***	Expulsion from the university when discovered prior to graduation; revocation of degree when discovered subsequent to graduation.***

*Assuming first offense

**Exam, quiz, tests, assignments or other course work.

***Applies to graduate students