

Spring 2018
ME-525: Combustion
TTh 10:30 to 11:45 a.m.
Mechanical Engineering Building Room 1052

Instructor: Jay P. Gore and Sameer V. Naik
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Office Hours: TTh 12 to 1:30 p.m. (Gore) and MW 8:30 to 10:00 a.m. (Naik)

If you cannot see the instructors during regular office hours, please email to arrange an appointment at another time. The use of email to ask questions is strongly encouraged. For email questions of general interest, the question and answer will be sent via email to the entire class after the name of the person who asked the original question has been removed.

TA: Vikrant Goyal
Office: ME-1030C
Email: goyal21@purdue.edu
Office Hours: MW 3 to 5 p.m.

Textbook: An Introduction to Combustion Concepts and Applications, Stephen R. Turns
3rd Edition, McGraw Hill, 2012

Grading:

Homework	20%
Project	10% or 20%
Exam 1	20%
Exam 2	20%
Final Exam	30% or 20%

Academic dishonesty will not be tolerated. Penalties include failing the course and will be reported to the university.

Emergency: Schedule and grading policy are subject to change in case of campus emergencies.

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Lectures and Reading Assignments

Textbook: An Introduction to Combustion Concepts and Applications, Stephen R. Turns

Session	Date	Topics	Reading
1	Jan. 9	Introduction, Motivation, Energy, Fuels and Alternate Fuels	1-11, 638-679
2	Jan. 11	Review of Property Relations, Ideal Gas Mixtures, 1 st Law of Thermodynamics	12-21
3	Jan. 16	Reactant and Product Mixtures, Enthalpy and Heating Values, Adiabatic Flame Temperature	21-37
4	Jan. 18	Chemical Equilibrium, 2 nd Law of Thermodynamics, Products of Combustion	38-66
5	Jan. 23	Chemical Kinetics, Global and Elementary Reactions, Rates and Types of Reactions	107-123
6	Jan. 25	Chain Reactions, Time Scales, Catalysis, COSILAB Tutorial and Demonstration	123-140, Handout
7	Jan. 30	Chemical Kinetic Mechanisms	149-170
8	Feb. 1	Coupling of Chemical and Thermal Analyses, Constant Volume Reactor, Constant Pressure Reactor	183-193
9	Feb. 6	Well-Stirred Reactor and Plug Flow Reactor	194-211
10	Feb. 8	Mass and Species Conservation Equations	79-94, 220-226
11	Feb. 13	Binary and Multi-component Diffusion	226-233
12	Feb. 15	Momentum and Energy Conservation Equations	233-245
13	Feb. 20	Exam 1, Lectures 1 to 11, 6 to 8 p.m. in ME-1061	
14	Feb. 22	Conserved Scalars and Mixture Fraction	245-254
15	Feb. 27	Laminar Premixed Flame	258-276
16	Mar. 1	Laminar Premixed Flame Properties	276-287
17	Mar. 6	Quenching, Flammability, Ignition, Stabilization	287-303
18	Mar. 8	Detonations and Deflagrations: C-J Analysis	616-630
19	Mar. 20	Detonations and Deflagrations: ZND Structure	630-635

20	Mar. 22	Non-reacting Laminar Jet, Laminar Jet Diffusion Flame Structure	311-346
21	Mar. 27	Soot Formation, Counter-flow Flame Structure	346-359
22	Mar. 29	Pollutants and Emissions	170-175, 556-602
23	Apr. 3	Exam 2, Lectures 1 to 20, 6 to 8 p.m. in ME-1061	
24	Apr. 5	Introduction to Turbulent Flow	427-452
25	Apr. 10	Turbulent Non-premixed Flames	486-526
26	Apr. 12	Turbulent Premixed Flames	453-485
27	Apr. 17	Carbon Particle Combustion	527-554
28	Apr. 19	Droplet Evaporation and Burning	94-104, 366-382
29	Apr. 24	Droplet Evaporation and Burning (contd.)	383-419
30	Apr. 26	Spray Combustion	
Final Exam, Comprehensive, April 30 – May 5 (Date, Time, Location TBD)			