

ME 165

Internal Combustion Engines

Sem/AY:	2nd Sem 1617	Instructor:	Job Immanuel Encarnacion
Time:	WF 1600-1730	Office:	ME Faculty Room
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Consultation Hours: Wednesday and Friday, 1300-1500, Monday and Saturday by appointment

Course Description: This course explores the world of combustion, its mechanisms, application, and effects in the environment. The course is focused in the use of internal combustion engines. This course aims to:

- Introduce students to the field of combustion and the importance of its study in the world today.
- Provide the mathematical fundamentals for analyzing combustion processes and technology.
- Establish the importance of combustion in everyday processes and expose its environmental implications.
- Develop the student's analytical and practical skills through assignments, quizzes, papers, and projects.

Student Outcomes: After this course, the students should be able to:

- Define and explain the fundamental concepts in combustion engineering.
- Identify and describe usual applications of combustion processes and technology.
- Mathematically model combustion processes.
- Analyze and determine the characteristics of combustion processes and technologies.
- Systematically solve engineering problems involving combustion.
- Explain the importance and implications of the usage of combustion technologies.
- Love the field of mechanical engineering (and combustion).

References

- **ST:** *An Introduction to Combustion: Concepts and Application, 3rd Edition*, Stephen Turns (2012) [Available in Library]
- **CB:** *Thermodynamics: An Engineering Approach, 8th Edition*, Y.Cengel, M. Boles (2015) [Available in Library (Older Version)]
- **CF:** *Internal Combustion Engines: Applied Thermosciences, 3rd Edition*, C.R. Ferguson, A.T. Kirpatrick (2015) [Available in the Library (Old Version)]
- **VG:** *Internal Combustion Engines, 4th Edition*, V. Ganesan (2012) [Available in the Library]
- **JH:** *Internal Combustion Engine Fundamentals*, John Heywood (1988) [Available in the Library]
- **WP:** *Engineering Fundamentals of the Internal Combustion Engine*, William Pulkrabek (1997) [Additional Text]

Grade Equivalentents

Final Grade	Equivalent Grade	Final Grade	Equivalent Grade
92 - 100	1.00	68 - below 72	2.50
88 - below 92	1.25	64 - below 68	2.75
84 - below 88	1.50	60 - below 64	3.00
80 - below 84	1.75	55 - below 60	4.00
76 - below 80	2.00	0 - below 55	5.00
72 - below 76	2.25		

Course Outline

Week	Topic	Reference
0	Course Introduction Overview of the Study of Combustion	ST 1.1-1.4
Combustion Processes		
1	Fundamentals of Thermodynamics Combustion Stoichiometry	ST 2.1-2.3 , CB 4-6 ST 2.4 , CF 3.1-3.4, JH 3.3-3.4
2	Thermodynamics of Combustion	ST 2.4-2.5 , CF 3.1-3.4, JH 3.5-3.6
3	Exergy and Availability	CB 7.1-7.2, 7.4, 7.9-7.10, 8.1-8.6 , CF 4.3, JH 3.6
4	Chemical Equilibrium	ST 2.6-2.7 , CF 3.6-3.7, JH 3.7
Introduction to Internal Combustion Engines		
5	Air-Standard Engine Cycles	CB 9.1-9.6 , CF 2.1-2.4, JH 5.1-5.4
6	Engine Classifications Fuel-Air Engine Cycles	CF 1.1-1.6 , JH 1.1-1.9 VG 4.1-4.7 , CF 4.4-4.9
<i>Midterm Exams</i>		
Engine Operation and Combustion		
7	Engine Operating Parameters	VG 17.1-17.9 , CF 13.1-13.8, JH 2.1-2.15, 15.1-15.7
8	Fuel and Airflow	CF 5.1-5.5, 6.1-6.4 , JH 6.1-6.8, 8.1-8.7
9	Combustion in Spark-Ignition Engines	JH 9.1-9.6 , CF 7.2-7.3
10	Combustion in Compression-Ignition Engines	JH 10.1-10.7 , CF 7.4
11	Engine Emissions	CF 8.1-8.6 , VG 15.1-15.5, 15.9-15.12
Environmental Aspects of Combustion		
12	Emission Formation	ST 5.1-5.8 , VG 15.6-15.8, 15.18-15.20
13		
14	Emission Control	VG 15.13-15.17
<i>Finals</i>		

Course Evaluation

- **Long Exams** **70%**
Exams are 35% each. Open books, open notes but the usage of electronic devices are prohibited.
- **Assignments** **30%**
There will be an 10 assignments for this course at 3% each. Submission of assignments will be online unless otherwise stated. The deadline for each assignment is on Monday the following week, 11:59PM GMT+8.