Course Description

Course Overview
This course is designed to give students an understanding of the principles and design concepts associated with important fuel – engine aspects of modern and advanced mobility power systems. Emphasis is given to state of the art and emerging IC engine and fuel cell technologies such as those applied to modern and advanced automotive (i.e. self-propelled) vehicles.

Prerequisites
Undergraduate course in thermodynamics, heat transfer, and fluid mechanics; or ENPM 672 (Fundamentals of Thermal Systems).

Course Requirements
Six homework assignments will enable students to practice quantitative and qualitative analysis related to engines. Four virtual labs will allow students to explore relationships among real engine operational data and synthesize results. Learning will also be assessed through two mid-course exams, each of which will have an open-book analysis portion and a timed, closed-book portion.

Required Technology
Students will find the using software tools such as Excel, EES, and/or MATLAB helpful, though not required. We will utilize Java-based online applications (free and openly available on the internet) based at Colorado State University (http://www.engr.colostate.edu/~allan/engines.html). These applications were developed by one of the authors of the optional text for the course, and will facilitate interesting engine calculations.

Instructor
Patrick Caton, Ph.D., P.E.
UMD OAEE Lecturer, Mechanical Engineering
USNA Assoc. Prof. Mechanical Engineering

Meeting Times
January 25, 2016 – May 9, 2016
Lectures: M 1900-2140 hrs, JMP TBD (DETS), College Park, MD (plus online).
Required Text  Caton, P., Cowart, J., and Hamilton, L. Piston Power, 2011. This is an unpublished set of course notes arranged in book format which pulls from many popular textbooks. It is provided freely to enrolled students.


Grading  Homework Assignments-10%, Virtual Labs-40%, Exams-50% (25% each).

Required/Recommended Textbooks

Required Text  Caton, P., Cowart, J., and Hamilton, L. Piston Power, 2011. This is an unpublished set of course notes arranged in book format which pulls from many popular textbooks. It is provided freely to enrolled students.


Course Outline

1. Overview of Engines
2. Engine Type and Function
3. Engine Thermodynamics and Metrics
4. Flames and Fuels in Engines
5. HCSI-Gasoline Engines
6. Emissions
7. SCCI-Diesel Engines
8. Engine Breathing
9. Friction and Losses
10. Modern Controls
11. Advanced Concepts