

Mechanical Engineering 432: Internal Combustion Engines

Designation: Elective course

Course Description: 3 Cr. U/G., Thermodynamic principles of internal combustion engines; cycles, combustion, engine operation; carburation, ignition, performance analysis; engine balancing; super charging.. Prereq: Jr St; Mech Eng 301(P)

Textbook: *Engineering Fundamentals of the Internal Combustion Engine*, Pulkrabek, Prentice Hall, 1997.

Prerequisites by Topics:

- 1st and 2nd laws of Thermodynamics
- Basics of heat transfer modes
- Fundamentals of fluid flow

Course Objectives:

- Apply the principles of thermodynamic analysis to IC engine cycles
- Learn fundamentals of combustion analysis
- Understand the principles behind the basic steps in engine operation
- Consider the environmental factors affecting engine design
- Improve written communication skills.

Topics Covered:

- Basics engine terminology
- Ideal engine cycles
- Combustion and fuels
- Induction processes
- In-cylinder fluid motion
- Combustion processes
- Exhaust processes
- Emissions
- Engine heat transfer and lubrication

Project

A comprehensive engine design project is required. This project is proposed by the student and must involve a complete design of some aspect of an internal-combustion engine.

Written Communications

The students improve their written communication skills through the preparation of the design project proposal and through the design project report.

Class/Laboratory Schedule:

Three hours lecture per week

Contribution of Course to Meeting the Professional Component:

Category: Engineering Topics with Design, 3 credits.

This course contributes to the engineering science component of the curriculum by students learning how to apply principles of physics to analyze engine performance. It also contributes to the engineering design component (1 cr.) through the comprehensive design project.

Relationship of Course to Program Outcomes:

- i, iii The students will be using basics of thermodynamics and heat transfer to analyze and
iv design practical engineering processes in engines. In addition, fundamental topics such as
 combustion will be taught in this course.

- vii & The design project will provide the students with an appreciation of design problems, and
xi will hone their written communication skills.

- ix Material from other courses, such as thermodynamics and heat transfer, are synthesized in
 the problem solving in this course.

- xv, & By considering non-technical aspects, as well as environmental aspects, of engine design
xvi and production, the students will gain an awareness of societal issues.

Prepared by: John R Reisel, 8/30/01

Methods of Assessment:

- Course evaluations by students
- Graded homework
- Graded project
- Graded examinations
- Instructor judgement

Resources Commonly Available:

- The instructor is available for assistance in the course.
- Numerous engines are available for students to deconstruct/reconstruct if desired.

Desirable Student Competencies:

- Knowledge of thermodynamics, fluid mechanics, and some heat transfer
- Analytical problem solving skills