King Fahd University of Petroleum & Minerals
MECHANICAL ENGINEERING DEPARTMENT
ME 432: Internal Combustion Engines

Catalogue Description: (3-0-3)

Introduction to laws of thermodynamics, Engine design and their operation, Engine design and performance parameters, Thermochemistry of fuel air mixtures, Air standard engine cycles, Types of fuels and fuel air cycle analysis, Carburetor and fuel injection systems, Combustion in SI engines , Combustion in CI engines, Introduction to Engine heat transfer, Engine emissions and control.

Status in Curriculum (Required or Elective): Elective

Prerequisites:ME 203, ME 204

Co-requisites: None

Prerequisites by Topics:

- First and second laws of thermodynamics, Ideal gas model (ME203)
- Gas power cycles (ME204)
- Combustion Stoichiometry, Chemical Equilibrium (ME 204)

Textbook:**Internal Combustion Engine Fundamentals**,1th Edition, by John B. Heywood, McGRAW Hill.

References:

1) **Engineering Fundamentals ofInternal Combustion Engine**, Willard W. Pulkrabek, Prentice Hall of India, 2002.

2) **Internal Combustion Engines**, Colin R. Ferguson, Allan T. Kirkpatrick, John Wiley & Sons, 2001.

Coordinator:**Dr. Abdul Khaliq, Associate** Professor in Mechanical Engineering

Goals:(general objectives)

Goals*:* The purpose of the course is to introduce the means by which the energy transfer is achieved in the main types of Internal Combustion Engines and the different behaviors of individual types in operation. The course aims at introducing preliminary design fundamentals of IC Engines including Gasoline Engines, Diesel Engines, and some alternative fuelled Engines.

Course Outline (Lecture Topics):

1. Introduction (1 class)
2. Engine design and their operation (3 classes)
3. Engine design and performance parameters (*4* classes)
4. Thermochemistry of fuel air mixtures (6 classes)
5. Air standard engine cycles (4 classes)
6. Types of fuels and fuel air cycle analysis (4 classes)
7. Carburetor and fuel injection systems (5 classes)
8. Combustion in SI engines (3 classes)
9. Combustion in CI engines (3 classes)
10. Introduction to Engine heat transfer (4 classes)
11. Engine emissions and control. (6 classes)
12. Tests (2 classes)

Design Activities/Projects:

Design analogy introduced in the course is utilized by students in computer assignments and project(s) in which students learn modeling practices necessary to obtain reliable results. One open-ended alternative fuelled engine design project is assigned

Computer Usage:

Design analogy introduced in the course is utilized by students in computer assignments and project(s) in which students learn the proper role of computer simulations in industrial problems.

Laboratory: Engine Laboratory

Assessment Tools:

i- Mid-term Examinations
ii- Homework Assignments
iii- Quizzes and Class Tests
iv- Final Exam
v- Design project

Course Learning Outcomes:

I- Demonstrate a basic understanding of laws thermodynamics in association with the Internal Combustion Engines
II- Tackle Internal Combustion Engine problems associated with industry
III- Design some parts in gasoline engine.
IV- Develop computational skills to analyze and design the components and overall engine from Thermodynamic point of view.

Course Learning Outcomes mapped to Student Outcomes:

Student Outcomes	*a*	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*
Course-to-Student outcome mapping	I, II, III, IV	III	III, IV	II	II, III, IV	IV	III, IV	II, IV		IV	II, III
Emphasis*	**S**	M	**M**	M	**S**	L	M	L	L	M	M

* **L**:: Little/None **M**: Moderate **S**: Strong

Status of Continuous Improvement review of this Course:

Date reviewed: ----------
Prepared by: Dr. Abdul Khaliq
Reviewed by: Thermofluids Group
Date prepared: March 02, 2015