GAU, Faculty of Engineering

Course Unit Title	Internal Combustion Engine
Course Unit Code	ME304
Type of Course Unit	Mechanical Engineering students
Level of Course Unit	3rd Year BSc
National Credits	3
Number of ECTS Credits Allocated	5 ECTS
Theoretical (hour/week)	3
Practice (hour/week)	
Laboratory (hour/week)	
Year of Study	3
Semester when the course unit is delivered	6
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisities and co-requisities	ME301
Recommended Optional Programme Components	An adequate background in calculus, physics, and thermodynamics

Objectives of the Course:

- To understand the fundamentals of most types of internal combustion engines, with a major emphasis on reciprocating engines.
- To drive performance characteristics of internal combustion engines.
- To improve the power output of the engine, reduce the exhaust emissions and fuel consumption of internal combustion engines

Learning Outcomes

When this course has been completed the student should be able to		Assesment.
1	Learn terminology, definitions, and basic operating characteristics	1
2	Learn and perform a detailed analysis of basic engine cycles	1,2,3
3	Learn fundamental thermochemistry as applied to engine operation and engine fuels.	1,2,3
4	Understand intake, motion within a cylinder	1,2
5	Learn how to analyze combustion and exhaust process in IC engines	1,2
6	Learn about engine main emissions and explain the mechanisms of emission formation.	1,2
7	Describe methods for reduction of exhaust emissions, and their relations to fuel quality and engine performance.	1,2,4
8	Describe and explain engine friction, wear and lubrication.	1,2

Assesment Methods: 1. Written Exam, 2. Assignment 3. Project/Report, 4.Presentation, 5 Lab. Work

Course's Contribution to Program

		CL
1	Ability to understand and apply knowledge of mathematics, science, and engineering	5
2	Ability to design and conduct experiments as well as to analyze and interpret data	2
3	Ability to work in multidisciplinary teams while exhibiting professional responsibility and ethical conduct	1
4	Ability to apply systems thinking in problem solving and system design	3
5	Knowledge of contemporary issues while continuing to engage in lifelong learning	4
6	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice	4
7	Ability to express their ideas and findings, in written and oral form	3
8	Ability to design and integrate systems, components or processes to meet desired needs within realistic constraints	3
9	Ability to approach engineering problems and effects of their possible solutions within a well structured, ethically responsible and professional manner	3
10	Ability to get technical knowledge as to engineering, mathematics and natural science with a view to mechanical engineering, which allows students to perform scientifically demonstrated work	5
11	Ability to improve the overall efficiency of mechanical systems	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate 4: High, 5:Very High)

Course Contents

Week			Exams
1		Introduction to Internal Combustion engine (1 Week)	
2		Operating Characteristics (2 Weeks)	
3			
4		Engine Cycles(2 Weeks)	
5			
6		Thermochemistry and Fuels(2 Weeks)	
7			
8		Air and Fuel Induction(2 Weeks)	Quiz
9			Midterm
10		Fluid Motion Within Combustion Chamber (1 Week)	
11		Combustion (1 Week)	
12		Exhaust flow (1 Week)	
13		Emissions and Air Pollution (1 Week)	
14		Frictionand lubrication (1 Week)	Quiz
15			Final

Recommended Sources

Textbook: Engineering Fundamentals of the Internal Combustion Engine, Willard W. Pulkrabek, Prentice Hall, First Edition 1997

Supplementary Material (s): The Internal-Combustion Engine in Theory and Practice, Vols.1 & 2 - Charles Taylor, MIT Press

Assessment

Project/ Assignments	10%	
Presentation/Report Writing	5%	
Midterm Exam (Written)	35%	
Quiz (Written)	10%	
Final Exam (Written)	40%	
Total	100%	

ECTS Allocated Based on the Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including the Exam week)	15	3	45
Labs and Tutorials	-	-	-
Assignments	2	4	8
Project/Presentation/Report Writing	1	15	15
E-learning Activities	-	-	-
Quizzes	2	10	20
Midterm Examination	1	18	18
Final Examination	1	24	22
Self Study	14	2	28
Total Workload			157
Total Workload/30 (h)			5.23
ECTS Credit of the Course			5