***Birzeit University – Faculty of Engineering and Technology***

***Mechanical and Mechatronics Engineering Department***

***Internal Combustion Engines- ME 535***

***Course Outline***

Instructor : Dr. MOHAMMAD M. AL- KARAEEN First semester 2018/2019

***Goals :***

To teach the students the main theory that internal combustion engine based on.

To differentiate between types engines .

To know how to test engine.

To make preliminary design & selection of an engine.

(Satisfies the e, h, and i outcomes of Abet)

***Topics :***

1. **Introduction to ICE**

Main Parts, Shapes, 4 Stroke Engines, 2 Stroke Engines.

1. **Air Standard and Actual Thermodynamic Cycles**

 Otto Cycle, Diesel Cycle, Dual Cycle, Comparison between ideal and actual Cycles, Mean Effective Pressure, Efficiencies, Specific Fuel Consumption. (Homework will be submitted)

1. **Combustion and Fuels in ICE**

Combustion, Fuel , Combustion Equations, Calorific Value of Fuels, Self Ignition Temp, Combustion in SIE, Combustion of CIE, Characteristics of Petrol, Characteristics of Diesel Oil, Engine Emissions. (Homework will be submitted)

***FIRST HOUR EXAM***

1. **Spark Ignition Engine**

Introduction, Combustion Chambers, Ignition Systems.

1. **Compression Ignition Engines**

Introduction , Combustion Chambers, Fuel System is CIE, Valves, Valve timing.

1. **Testing And Performance of ICE**

Measured of air/fuel ratio, Indicated Power , Indicator diagrams (Homework will be submitted)

***SECOND HOUR EXAM***

1. **Supercharging**

Introduction, Mechanical Supercharging, Turbocharging, Constant Pressure, Turbocharging, Puls Turbocharging, Charge Cooling , Turbocharging Systems, Turbocharging Thermodynamics. (Homework will be submitted)

1. **Engine Design**

Basic Decisions and Preliminary Analysis, Diesel Cylinder Arrangement, Some Basic Performance Factors of an Engine.

***Text Book***

Internal Combustion Engine Fundamentals, By : John B.Heywood.

***References***

1. Introduction of Internal Combustion Engines, By: Richard Stone.
2. Internal Combustion Engines Applied Thermodynamics, BY: Ferguson .

***Helpful Books***

1. Charging the internal combustion engine .
2. Internal combustion engine handbook:

Basics, components, systems, and perspective.

***Evaluation :***

2 Hour exams 40%

Home works 5%

Reports & tasks 10%

Presentation 5%

Final Exam 40%