NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF MECHANICAL ENGINEERING
MECHANICAL ENGINEERING PROGRAM

MN136 – INTERNAL COMBUSTION ENGINES

I. GENERAL INFORMATION

CODE	: MN 136 Internal Combustion Engines
CYCLE	: 8
CREDITS	: 5
HOURS PER WEEK	: 7 (Theory - Laboratories)
PREREQUISITES	: Thermodynamics II and Fluids II
CONDITION	: Required

II. COURSE DESCRIPTON

The course is theoretical and practical, which includes the study of thermodynamic cycles, fuels, admission, processes in the cylinder and exhaust, combustion, formation and reduction of toxic components, operational characteristics of MCI, from tank to wheel and well comparisons to wheel. We perform laboratories on construction, performance and diagnostic parameters in ICMs.

III. COURSE OUTCOMES

The student:

1. Identifies the different performance characteristics in MCI
2. Analyzes the criteria governing combustion and emissions in ICMs.
3. Identifies and interprets the parameters, which define the performance of MCI
4. Identifies and examines the technology, operation and application of ICMs.

IV. LEARNING UNITS

1. HISTORY, CURRENT DEVELOPMENT, CONTROL, THERMODYNAMIC CYCLES OF MCI AND COMBUSTIBLES / 12 HOURS

Historical development of internal combustion engines (MCI): Gasoline engines (SI) and diesel engines (CI) / Current development MCI / Engine control and diagnostics / Main construction parameters, performance and MCI emissions / MCI thermodynamic cycles / Fuels and stoichiometry.

2. PROCESS OF ADMISSION AND COMPRESSION IN THE MCI / 16 HOURS

Admission process: admission process in gasoline engines, admission process in diesel engines, quantity of fresh mixture, coefficient of excess air, pressure and temperature at the end of the intake, volumetric efficiency (intake manifold dynamics) , Parameters that influence the volumetric efficiency.

3. COMBUSTION PROCESS IN ICS, FUEL SUPPLY AND INJECTION SYSTEMS, COMBUSTION / 8 HOUR PROCESS ANALYSIS

Combustion in SI engines / Combustion in CI engines / Homogeneous charge compression ignition combustion (HCCI) / Fuel supply and injection systems / Combustion process analysis.

4. **EMISSIONS OF TOXIC COMPONENTS, TECHNOLOGY FOR MEASURING TOXIC COMPONENTS, EXPANSION AND EXHAUST PROCESSES; AND INDICATED AND EFFECTIVE PARAMETERS OF THE MCI / 8 HOURS**
   Pollutant Formation and Reduction / Emission Measurement Technologies / Expansion and Exhaust Process / Indicated Parameters, Mechanical Losses and Effective MCI Parameters.

5. **TYPES OF ENERGY CONSUMERS, MOTOR MAPS, MCI OPERATIONAL CHARACTERISTICS, STABLE AND TRANSITORY PROCESSES OF MCI OPERATION; AND THERMAL BALANCE / 12 HOURS**
   Types of energy consumers / Engine mapping / MCI operational characteristics: Load, speed, vacuum, emission, idle and multiparameter characteristic curves / Stable and transient operating processes in MCI / Thermal balance (From tank to wheel).Zlibre)

V. METHODOLOGY

The course is developed in sessions of theories in classroom and laboratory in the institute of engines. In theory sessions, the teacher develops the criteria that govern design, combustion and emissions, and performance in MCI. In the laboratory sessions tests are performed related to the design, performancy in a test bench (Test Bench) and diagnosis of the MCI. In all the sessions the active learning methodology based on evidences with spaces for the development of collaborative learning in teams is used.

VI. EVALUATION FORMULA

Evaluation System "F". Calculation of the Final Average: PF = (1 EP + 2EF + 1 PL) / 4
EP: Partial Exam
EF: Final Exam
PL: Laboratory
PF= Average
LAB 1, Laboratory 1: LAB 2 Laboratory 2: LAB 3 Laboratory 3: LAB 4 Laboratory 4: LAB 5 Laboratory 5: LAB 6 Laboratory 6.

VII. BIBLIOGRAPHY

1. REIF, Konrad. Gasoline Engine Management: Systems and Components. Editorial Springer, 2015.
2. REIF, Konrad. Diesel Engine Management: Systems and Components. Editorial Springer, 2015.
3. PAYRI, F. and DESANTES J. M. Alternative Internal Combustion Engines. Editorial Reverte S. A, 2011