NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF PETROLEUM AND PETROCHEMICAL ENGINEERING
PETROCHEMICAL ENGINEERING PROGRAM

HC515 - PETROLEUM REFINING PROCESSES II

I. GENERAL INFORMATION

CODE	**:**	HC515 – Petroleum Refining Processes II
SEMESTER	**:**	9
CREDITS	**:**	3
HOURS PER WEEK	**:**	4 (Theory–Practice)
PREREQUISITES	**:**	HC424 Petroleum Refining Processes I
CONDITION	**:**	Compulsory

II. COURSE DESCRIPTION

The course prepares the student in the understanding and analysis of different process for hydrocarbon treatment and refining. Students analyze and design heat interchangers, distillation columns, filling columns and catalyzer satisfying requirements of petroleum refining plants. Analysis of risk conditions and safety measures are presented and analyzed.

III. COURSE OUTCOMES

At the end of the course, students:

1. Learn the basics of the main processes that are used in oil refining, aimed at the production of fuels and special products.
2. Difference oil organic compounds and its derivatives, and analyze different transforming processes in the petrochemical industry.
3. Design heat interchanger appropriate to the particular application of the petrochemical industry.
4. Design distillation columns to be used in hydrocarbon refining plants.
5. Design catalyzer to be used in hydrocarbon refining plants.
6. Understand the importance of the oil industry as a component of the country's energy

IV. LEARNING UNITS

1. DISTILLATION PROCESSA AND HEAT TRANSFER EQUIPMENT

Petroleum primary distillation / Energy balance / Distillation process calculations / Heat interchangers / Pipeline equipment and heat transfer / Double pipeline interchanger / Pipe-case interchangers / Design of heat interchangers.

2. TRANSFER COEFFICIENT, REFRIGERANT, CONDENSERS AND PIPE FURNACES

Transfer coefficient / Pressure losses. Calculation / Refrigerant election. Economic issues / Counter-flow heat interchangers / Parallel-flow interchangers / Condensers. Calculations / Condensation of hydrocarbon mixture with water steam / Re-heaters. Calculations / Pipe furnaces in refining plants. Characteristics. Efficiency. Thermal calculation. Radiation.

3. **DISTILLATION COLUMNS**
   Plate distillation columns / Plate calculations / Orifice equations and chute equation / Load losses, drag, efficiency, performance / Fooding / Construction and functioning.

4. **FILLING COLUMNS AND BY-SOLVENT EXTRACTION**
   Filling column (patching) / Load losses / Hold up / Efficiency / HETP estimation / By-solvent extraction / Apparatus / Classification / Dimensioning of a liquid extractor / Limit capacity.

5. **CATALIZER AND DESIGN PROJECT**
   Solid catalyzers / Definition and equivalence / Load losses through the stratum / Fluid stratum / Gas-solid systems / Mobile stratum / Pneumatic transport.
   Design projects: heat interchangers, reactors, pipe furnaces, distillation columns.

V. METHODOLOGY

The course takes place in theory and practice sessions. In theory sessions, faculty presents the concepts, processes, methods and principles of different operation units. In practice sessions, students solve diverse problems related to heat transfer, distillation process, distillation columns, catalyzers and their use in oil refinery plants. At the end of the course, students present and defend a project. Student's active participation is promoted.

VI. GRADING FORMULA

The Final Grade PF is calculated as follow:

PF = (EP + EF + PP) / 3

EP: Mid-term Exam EF: Final Exam
PP: Average grade of Practical Works

VII. BIBLIOGRAPHY

1. **P. WUITHIER.**
   Petroleum, Refinery and Chemical Treatment. Prentice Hall, 2005.

2. **W.L. NELSON.**
   Petroleum Refining Engineering. Alfa Omega Ed., 2004.