

1. PETROLEUM REFINING

GENERAL SCHEME

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I.- IDENTIFICATION

Subject:	Refino de petróleo
Type:	Libre elección
Degree:	Ingeniero Químico
Semester:	9
Departament:	Ing. Química y TMA
Professor/s:	Juan García Serna Rafael Mato Chaín

II.- INTRODUCTION

Oil is one of the basic sources of energy in today's society and the forecasts are that it will remain for at least several decades.

The Chemical Engineer and Process Engineer must have knowledge of the oil refining technology with all its special features. Oil, unlike petro-chemical compounds and fine chemicals, is composed of mixture of compounds that usually can not be treated individually. This implies a large difference in the methods of calculation and simulation process.

This course will introduce students to the world oil providing an overview and the necessary design tools.

III.- WORK VOLUME

This subject correspond to 4.5 ECTS

	Hours/course
THEORICAL CLASSES PRESENCE	15
PRACTICAL CLASSES PRESENCE	15
PREPARATION OF WORK FOR THEORICAL CLASSES	0
PREPARATION OF WORK FOR PRACTICAL CLASSES	42
STUDY BEFORE CLASS	0
PREPARATION OF PROBLEMS AND PRACTICS	10
STUDY BEFORE EXAMINATION	10
TAKING EXAMINATION	3
TUTORIAL PRESENCE	5
SEMINARIES AND ACTIVITIES PRESENCE	10
TOTAL WORK VOLUME	110

This subject has 48 h (44%) of presence hours and 62 h (66%) of non-presence classes.

IV.- AIMS

The student after taking this course must be able to:

- Understand the importance and difficulty of petroleum as raw material for design.
- Analyze the possibilities of use of crudes and petroleum fractions.
- Conceive, design, develop, interpret and evaluate different processes for separation, reaction and conversion of petroleum crude.
- Simulate petroleum fractions and processes using a process simulator.

V.- CONTENTS

This subject is structured in three different parts:

➤ **PART I. Petroleum fundamentals**

➤ **PART II. Petroleum processes**

➤ **PART III. Simulation of petroleum processes**

VI.- SKILLS ACQUIRED

The student after taking this course must be able to:

- Understand the importance and difficulty of petroleum as raw material for design.
- Analyze the possibilities of use of crudes and petroleum fractions.
- Conceive, design, develop, interpret and evaluate different processes for separation, reaction and conversion of petroleum crude.
- Simulate petroleum fractions and processes using a process simulator.

Every lecture will have specific skills to be acquired.

VII.- SOCIAL SKILLS

Communication skills

Leadership and planification

Ethic compromise

Social sensibility

VIII.- LECTURES AND PLANIFICATION

This subject is structured in three different parts:

☞ **PART I. Petroleum fundamentals**

- Lecture 1. Survey and extraction of petroleum crude
- Lecture 2. Properties of petroleum fractions and distillation curves
- Lecture 3. Equipment for petroleum operations (I): storage, pumping, heat transfer, reaction and separation.

☞ **PART II. Petroleum processes**

- Lecture 4. Previous operations for refining. Atmospheric distillation. Vacuum distillation.
- Lecture 5. Transformation processes: hydrocracking, FCC, catalytic reforming and isomerisation.
- Lecture 6. Desulfuration processes: hydrodesulfuration and gas cleaning.
- Lecture 7. Addition processes: alkylation.
- Lecture 8. Biorefineries: the future.

☞ **PART III. Simulation of petroleum processes**

- Lecture 9. Assay specification, properties and blending.

- Lecture 10. Thermodynamic considerations for petroleum fractions
- Lecture 11. Simulation of a petroleum unit using Aspen Plus.

IX.- BIBLIOGRAPHY

- Gary, J.C.; Handwerk, G.E., "Petroleum Refining", 1994
- Meyers, R.A. "Handbook of Petroleum Refining Processes". McGraw-Hill, Nueva York, 1986.
- Nelson, W.L. "Refinación de Petróleo". Ed. Reverté, Barcelona, 1958.
- Ramos Carpio, M.A. "Refino de Petróleo, Gas Natural y Petroquímica". Fundación Fomento Innovación Industrial, Madrid, 1997.
- Revista Hydrocarbon Processing.
- Revista Oil & Gas Processing
- Revista Petroleum Technology Quarterly.
- HPI Boxscore

DIRECCIONES WEB

www.uop.com www.api.org www.epa.gov www.ifp.fr www.clh.es

www.chiyoda-corp.com www.aspentech.com

X.- METHODOLOGY

This subject combines:

- Theoretical classes using the Blackboard, PowerPoint presentations and paperback activities.
- Computer simulations using process simulators, namely Aspen Plus.
- Practical case studies done by the students and discussed in class.
- Technical visit to a refinery (when possible according to schedule).

XI.- EVALUATION

15% participation in class, 85% mini-project for a refining application (20% oral presentation and defence, 15% written and 50% contents).