2021-2022	Chemical and Petrochemical Engineering	Year 5 - Sem. 9
PCHM504	**Petrochemical Synthesis Technology**	Mandatory
Credits ECTS : 3 Credits : 3	Responsible: W. Hamd, N. Hobeika, M.N. Kaydouh	Language : English
Total Hours students: 39 h	Term: Fall	

Course Description

This course will provide a thorough introduction to the petrochemical industry, its structure, product slate and the processes employed to convert feedstocks and intermediates into finished products. Production technologies of synthesis gas, olefins, aromatics and important polymers and plastics will be discussed. This course also provides major insights into both catalytic and thermal cracking processes like steam reforming, steam cracking, catalytic reforming, and polymerization in a typical petrochemical industry.

Learning outcome of the teaching unit (LOTU) and correlation with the major learning outcome (MLO)

LOTU	Correlation with the MLO
Define the Feedstocks from Crude Oil and Natural Gas	(1)
Explain the Integration Between Refinery and Petrochemical Plants	(1), (2)
Discuss the Major Petrochemicals and the Economic Importance of Petrochemical Industries.	(1), (7)
Connect the Core Building Blocks of the Petrochemical Process Systems	(1),(3)
Discuss the Production of Petrochemicals from Syngas, Light Olefins, and Aromatics (BTX).	(1)
Explain the Synthesis Technologies of Thermoplastics	(1), (2)
Recognize Safety and Environmental Issues in Petrochemical Operations.	(1), (9)

Teaching Methodology

The course consists of a theoretical part (24 hours) and tutorials (15 hours). The material shall be structured by chapters and delivered through a power point presentation. The presentation shall describe the knowledge required in this chapter (objective - methodology - theories - tests - parameters - calculation - results). The sequence of each presentation shall follow the outline of each chapter. During the sessions, practical exercises shall be discussed, and discussions shall be developed with the students. In parallel, quick assessments (quizzes) shall be conducted to test the degree of assimilation of knowledge required by each student.

Prerequisites

Petroleum Refining Processes, Chemical Processes Engineering

References

1. R.A. Meyers, Handbook of Petrochemical Production Processes ANDBOO, Mc Graw–Hill, New York, (2005)
2. A. Chauvel, G. Lefebvre, Petrochemical Processes, Technical and Economic Characteristics, Vol. I. Synthesis gas derivatives and major hydrocarbons, Vol. II. Major oxygenated, chlorinated and nitrated derivatives, Technip, Paris, (2001)
3. Sami Matar, Lewis F. Hatch, Chemistry of Petrochemical Processes, Elsevier, (2001)

Course Outline

Week 1	Profile of Petrochemical Industry and Its Structure
Week 2	Mass and Energy Balance on Single and Multi-Units in Petrochemical Processes
Week 3-4	Synthesis Gas and its Derivatives: Hydrogen, CO, Methanol, Formaldehyde, MTO Technology
Week 5	Design of Steam Reformer Unit for Syngas Production
Week 6	Naphtha and Gas Cracking for Production of Olefins
Week 7	Design of Steam Cracker Unit
Week 8	Recovery of Chemicals from FCC and Steam Cracker
Week 9-10	Ethylene, Propylene and its derivatives: Ethylene Oxide, Ethylene Glycol, Ethylene Dichloride, Vinyl Chloride, Propylene Oxide and Isopropanol
Week 11-12	Polyethylene (PE), Polypropylene (PP) and PolyVinyl Chloride (PVC) Polymers
Week 13	Aromatics Product Profile: Ethyl Benzene &, Cumene & Phenol, Bisphenol, Aniline
Week 14	Safety in Petrochemical Plants
Week 15	**Final Exam**

Evaluation

The evaluation will be done through:

Attendance (AT)	10%
A partial exam (PE)	40-50 %
A final exam (FE)	40-50 %
Final grade: 0.1 * (AT) + 0.4 * Min (PE,FE) + 0.5 * Max (PE,FE)	100%