UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Fondamenti di Tecnologie Chimiche Industriali

2425-3-E2702Q109

Learning area

science of chemical processes and technologies

Learning objectives

Give the tools to understand the motivations for the technologies adopted and the plant choices in the chemical industry. Provide the elements for the sizing of the solutions identified. Propose a course of study, through the subjects covered, which shows the interdisciplinarity of the choices that the graduate in Chemical Sciences and Technologies daily has to face in the exercise of their functions.
To consolidate the relationship between the University and industry structurally complementary for intellectual and industrial development.
The objectives are also broken down as follows:

Knowledge and understanding
At the end of the course, the student acquires the basic knowledge of the technological paths for the definition of industrial chemical processes and the interpretation of flow diagrams that highlight the basic operations
Applied knowledge and understanding
The approach is such as to guarantee the student the basic knowledge and logic of the sequences of the technologies constituting a chemical process up to analyze more complicated schemes encluding strategies of technological choices / processes focus on the environmental / technical economic sustainability
Making judgements
On the basis of the knowledge and skills acquired with the understanding of the fundamental issues, the student will be able to independently evaluate the technological choices required by the chemical process and identify the most suitable simplified scheme
most appropriate to the criteria of sustainability
Communication Skills The involvement in the classroom with analysis of specific cases, the identification of

critical issues and the interdisciplinarity of the topics will allow the student to express himself adequately with technical terms in a simple and direct way, facilitating communication with other interlocutors
Learning skills At the end of the course the student will have the ability to interpret, analyze and understand the motivations of the technological choices of industrial processes, the strategic choices of the industrial sector and technical/economic drivers

Contents

Oil (hints) and refinery structure, main chemical processes of the Petroleum industry

Formulations of automotive fuels

Petrochemicals, references to polymers, polyethylene, polypropylene, polyesters and polycarbonates and industrial applications

Thermal and energy diagrams and balance sheets

Transport phenomena (mass and energy transfer) heat exchange and fluid dynamics

Detailed program

Characterization of oil, valorization of crude oil, definition of refinery margin, netback of crude oil, variables that influence the price of oil.

Configuration of refineries, high conversion refineries, fuel formulation and their commercial specifications. Petroleum products.

Primary distillation of crude, vacuum distillation, desulphurisation, hydrocracking, thermal cracking (visbreacking, coker), catalytic cracking (FCC), alkylation, etherification, reforming, residual gasification, production of first, second and new generation biofuels.

Schemes and balance of matter and energy, purging and recycling in industrial chemistry

Petrochemistry, Francis diagram, steam-forming, aromatic production, physical separation or, m, p xylene, ethylene, propylene, polyethylene, polypropylene, polyethylene terephthalate, polycarbonate .Catalyse Ziegler Natta, metallocene catalysts

Liquid vapor equilibrium, distillation of straight grinding lines and determination of the number of theoretical plates of a column, Flash operation, heat exchange, equi / counter-current exchangers, condensers, fluid dynamics, Bernoulli equation, Reynolds number, fluid motion through solid masses (fluid and fixed bed), pressure drops, pumps (NPSH, head, absorbed power) compressors

Prerequisites

Fundamentals of thermodynamics of chemical equilibria, organic chemistry, catalysis and chemical kinetics

Teaching methods

Theoretical lectures with explanations on the blackboard and use of slides, in-depth studies with complementary notions during the exercises activities

Assessment methods

Written exam.

The written test of 90-120 minutes inclusive of (at least) one question to elaborate and 2-3 exercises.

Required skills: ability to re-elaborate the concepts acquired in the classroom in the field of problem solving; resolution of short quali-quantitative questions in the industrial field. Clear presentation of the concepts learned during the course.

The test is normally made up of one or two open questions of industrial chemistry in which the path for a very short essay is suggested, e.g.: description of the chemical process and purpose, thermodynamic aspects, kinetics and mechanisms of reactions involved, catalysts.
In addition to these, there are two or four exercises on the technologies covered in the frontal part of the course and which have been the subject of in-depth study during the exercise hours. The text contains all the information necessary for the execution of the exercise and is aimed at verifying knowledge and understanding of the topics.
Each question and exercise clearly reposts the value of the score that contributes to the 30/30 evaluation so that the student has direct feedback and understanding of his performance.
Generally, the subdivision of the scores gives an objective contribution to the identification of the preparation, the evaluation follows a scheme that provides:

Two exercises out of five: insufficient
Three exercises out of five: 18-22
Four exercises out of five: 22-27
Five exercises out of five: 27-30
Any additions consistent with the requirements of the exam text and particular expositions for clarity and precision allow honors (lode).
Particular attention will be given to the expository order, to the correct use of units of measurement and to the demonstration of a logical approach based on the concept of balance (energy and mass)
Synthesis, clarity and coherence are further elements taken into consideration for the evaluation of the writing.
All evaluations, both positive and negative, are supported by comments provided by the teachers

Textbooks and Reading Materials

Jacobs A. Moulijn,Michiel Makkee,Annelies Van Diepen

Chemical Process Technology

Ed Wiley

Carlo Giavarini

Guida allo studio dei processi di raffinazione e petrolchimica

Ed Efesto

Forni Rossetti

fenomeni di trasporto

Ed Cortina Milano

Gian Berto Guarise

Lezioni di impianti chimici

Ed Cleup

Natoli Calatozzolo

Tecnologie chimiche industriali

Ed Edisco

F.Di Benedetto

Oil and Bio trading

Ed FrancoAngeli

Sustainable Development Goals

INDUSTRY, INNOVATION AND INFRASTRUCTURE | RESPONSIBLE CONSUMPTION AND PRODUCTION | CLIMATE ACTION