UCL Université catholique de Louvain

LMAPR2430

2014-2015

Inorganic industrial chemical processes

5.0 credits	30.0 h + 22.5 h	2q

Teacher(s) :	De Wilde Juray ; Saeys Mark (compensates De Wilde Juray) ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=LMAPR2430
Main themes :	The production of base chemicals is addressed. After an introduction and overview of the chemical industry, some important processes are studied in detail, analyzing as well the flow-sheets, kinetic and catalytic aspects, the reactor concepts, aspects related to the separation and purification of reactants and products, the energy requirements and the environmental impact, and the process safety.
Aims :	Contribution of the course to the program objectives Referring to the LOs of the KIMA diploma, the following LOs are aimed at: -- Axe 1: 1.1, 1.2; -- Axe 2: 2.2, 2.3, 2.4, 2.5; -- Axe 3: 3.1, 3.2, 3.3; -- Axe 4: 4.1, 4.2, 4.4; -- Axe 5: 5.3, 5.5, 5.6; -- Axe 6: 6.1, 6.2, 6.3. Specific learning outcomes of the course Disciplinary learning outcomes At the end of this course the student will be able to: - Give an overview of the basic chemical industry, the most important processes and their interactions. - Describe in detail: -- the process flow sheet (species and heat) and the interaction with other processes, -- the process safety, -- the feedstock and product requirements, -- the process conditions, -- the chemistry and reaction thermodynamics and kinetics, -- the catalyst if used, -- the reactor types used and their design, i.e. the appropriate reactor model(s), -- the measures taken to increase the energy efficiency and to reduce the environmental impact - for the following production processes: sulphuric acid, phosphoric acid, sodium carbonate, hydrogen, ammonia, methanol. - Interpret flow sheets of chemical processes in general. - Take a variety of measures to increase the energy efficiency and to reduce the environmental impact of chemical processes. Transverse learning outcomes At the end of this course the student will be able to: -- Study independently the different aspects of a chemical process. --

	Present and explain the different aspects of a chemical process to a professional audience, in writing and orally. -- Look up and use scientific and technical information from various sources, including reference text books and the web. -- To use a corpus of scientific and technical knowledge, allowing to solve given problems in the discipline studied. -- To analyze, organize and develop an engineering approach for process development responding to specific needs or a given problem, the analysis of a given physical phenomenon or a system. -- To contribute, as a team member, to the realization of a project with a given discipline or multiple disciplines according to a well described approach. -- To efficiently communicate by writing and presentation, in English or French, the results of a well-defined project. -- To show a rigorous behavior and critical thinking in carrying out scientific or technical tasks with respect for ethical issues. *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods :	The students will be individually graded based on the objectives indicated above. The theoretical exam is with a written preparation and oral defense/discussion. It counts for 60% of the mark. Evaluation of the mini-projects Two mini-projects (defined in the section on Learning methods) are evaluated. They count for 40% of the mark.
Teaching methods :	This course combines ex-cathedra teaching and projects with tutoring. The theoretical courses are ex-cathedra. The students are encouraged to ask questions. In the context of the course, a number of scientific papers have to be read, analyzed and questioned by the students. Two mini-projects are foreseen to train the students in independently studying and understanding the different aspects of a chemical process. Mini-project 1:"Sulphuric acid production: global process design and SO2 oxidation into SO3" allows the students to design an industrial process and model and simulate a multi-bed adiabatic reactor. Furthermore, the sensitivity of the process performance to a number of variables is studied. Apart from developing the technical skills of the students, the mini-project also aims at teaching the students how to report a typical technical study in a scientific and concise way, both in writing and orally in front of an audience. Mini-project 2:The students are asked to study a basic chemical process of choice and present its main characteristics (flow sheet, safety aspects, reactor type, etc.), both in writing and orally in front of an audience.
Content :	-- INTRODUCTION ON THE CHEMICAL INDUSTRY -- SULFURIC ACID -- SODIUM CARBONATE -- PHOSPHORIC ACID -- MALEIC ANHYDRIDE -- SYNGAS & mp; AMMONIA -- METHANOL -- NITRIC ACID
Bibliography :	Course notes are provided to the students and available via iCampus.
Other infos :	This course requires basic knowledge in chemistry and chemical engineering (thermodynamics, kinetics, reactor design and transport phenomena)
Cycle and year of study :	> Master [120] in Biomedical Engineering > Master [120] in Chemical and Materials Engineering
Faculty or entity in charge:	FYKI