UCL Université catholique de Louvain

LMAPR2141

2014-2015

Metals Processing and Recycling

5.0 credits	30.0 h + 30.0 h	2q

Teacher(s) :	Proost Joris ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=LMAPR2141
Prerequisites :	It is assumed that the fundamentals of thermodynamics, kinetics, electrochemistry and inorganic chemistry, as taught in the majeure/mineure FYKI, are known.
Main themes :	In this course, the basic principles of electrochemistry, chemical thermodynamics and kinetics are applied to the description of the physico-chemical principles and technological aspects of metals processing and recycling. The course is divided into three main parts. In the first part, an overview is given of the different metallurgical unit operations, dealing with their thermodynamic, chemical and thermodynamic basis. A distinction will be made between pyro- and hydrometallurgical unit operations. In a second part, these operations will be used to discuss different industrially applied processes for the extraction and refining of metals, including pig iron, steel and the non-ferrous metals. In a last part, metallurgical and economical aspects of recycling will be discussed.
Aims :	Contribution of the course to the program objectives In view of the learning outcomes of the Master programme in Chemical and Materials Engineering (KIMA), this activity contributes to the developpement and acquisition of the following learning outcomes (LO) : -- 1.1. -- 2.3. -- 4.4. -- 5.1., 5.3., 5.5., 5.6. Specific learning outcomes of the course At the end of this learning activity, the student will be able to -- describe the different pyro- and hydrometallurgical unit operations, dealing with their thermodynamic, chemical and technological basis ; -- based on these operations, discuss different industrially applied processes for the extraction and refining of metals, including pig iron, steel and the non-ferrous metals ; -- understand the economical aspects of recycling, as well as the intimate link with primary materials processing. -- integrate, into a metallurgical process or flow-sheet, the thermodynamic concepts to predict the equilibrium state of a reaction, as well as the kinetics needed to dimension the reactor. -- at the end of the project linked to this course and conducted in close collaboration with an industrial partner, write a report, and present its content before the industrial partner who has initially specified the objectives and the technological constraints. *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 evaluated individually during an oral examination with written preparation. The degree of participation during the lab sessions, as well as the quality of the written report and presentation will also constitute a significant part of the final mark.
Teaching methods :	The course is organised around 12/13 lectures and 6 half-day laboratory sessions, during which students will apply and decide themselves on the different steps needed for the extraction, refining or recycling of specific metals from a given, industrially relevant base material.
Content :	-- Description of the thermodynamic, kinetic and technological aspects of hydro-metallurgical unit operations (+ lab sessions) -- Description of the thermodynamic, kinetic and technological aspects of pyro-metallurgical unit operations -- Iron and steel metallurgy : blast furnace processes - converter processes - alternative iron-and steelmaking processes --

	Non-ferrous metallurgy (+ plant tour) : non-reactive (Cu, Zn, Pb) and reactive metals (Al, Ti, Mg) -- Metals recycling
Bibliography :	Besides the on-line documents on i-Campus, copies of the slides are available as well at the students print service SICI. Hand-outs for the lab sessions will be distributed to the students directly, and made available on i-Campus. The total contents of matter that is subject to examination is not limited to the course support, but includes everything that has been said or shown during the course, either orally, on screen or by other media.
Cycle and year of study :	> Master [120] in Chemical and Materials Engineering
Faculty or entity in charge:	FYKI