Metals technology and recycling

Academic Year: (2019 / 2020) **Review date: 08-05-2019**

Department assigned to the subject: Materials Science and Engineering and Chemical Engineering Department

Coordinating teacher: MARTINEZ CASANOVA, MIGUEL ANGEL

Type: Electives ECTS Credits : 6.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Chemical Basis of Engineering

OBJECTIVES

The student to complete the course, you must know the physical-chemical fundamentals and basic operations of extractive metallurgy from both natural products and the recycling of scrap metal processing. Should be able to propose a process for obtaining metals and be able to assess their feasibility.

DESCRIPTION OF CONTENTS: PROGRAMME

UNIT 1. INTRODUCTION TO THE EXTRACTION METALLURGY
Pyrometallurgical and hydrometallurgical. Extraction and processing of natural ores
UNIT 2: PIROMETALLURGICAL REACTIONS
Physical conditions of the reactions. Reaction rate. Effect of temperature. Impure materials. Ellingham and Richardson diagrams. Reduction processes.
UNIT 3: PYRIMETALLURGY
Reduction of oxides: lead metallurgy. Roasting of sulphide ores: copper metallurgy. Fused salt electrolysis: aluminum metallurgy.
UNIT 4: STEEL
Steelmaking. Blast furnace. Electric furnace. Steel refining.
UNIT 5: HYDROMETALLURGY REACTIONS
Solubility product. Redox reactions. Electrolysis, Pourbaix diagrams. Diffusion in the liquid state.
UNIT 6: HYDROMETALLURGY
Lixiviation. Concentration. Purification. Precipitation. Processes examples.
UNIT 7: METAL RECYCLING
Extraction of metals from industrial and urban waste. Recycled steel. Recycling of lead, aluminum, copper and zinc. Highly polluting metalsDeveloping recycling processes.
UNIT 8: NUCLEAR WASTE MANAGEMENT
Waste Management of low and high activity. Recycling processes.

LEARNING ACTIVITIES AND METHODOLOGY

Problems are analyzed for obtaining metals and alloys in different media and subsequent individual presentation and analysis results. Troubleshooting on the thermodynamics and electrochemical reactions of metal and metallurgical process design.

ASSESSMENT SYSTEM

Evaluation and development of practical problems (40%) and final exam (60%) which were valued knowledge and skills acquired by the student

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- A. Ballester, L.F. Berdeja, J. Sancho Metalurgia extractiva. Vol. 1 y 2, Sintesis, 2000
- J. Apraiz Aceros especiales y otras aleaciones, Dossat., 1986
- J.J. Moore Chemical metallurgy, Butterworth Hesnemann, 1994

- J.M. del Barrio, E. Garcia Metalurgia del acero, Sidenor. , 1995
- M. Rey Cours de metallurgie extractive des métaux non-ferreux, ENSMP. , 1962
- Varios Recicling Handbook, Mac Graw-Hill, 1993