

LANDMARK UNIVERSITY

COLLEGE: COLLEGE OF SCIENCE AND ENGINEERING

DEPARTMENT: MECHANICAL ENGINEERING

PROGRAMME: MECHANICAL ENGINEERING

COURSE CODE: MCE 435

UNITS: 2

COURSE TITLE: EXTRACTIVE METALLURGY

SEMESTER: ALPHA

COURSE DURATION: Two hours per week for 15 weeks

Lecturer Data

Makanjuola Oki

Qualifications obtained: PhD, MSc, BSc

Department: Department of Mechanical Engineering

Faculty: Engineering

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Office Location: Room C 117 New College Building.

Consultation Hours: Monday to Friday 2-5p.m

A. BRIEF OVERVIEW OF COURSE

Sources of metal, dressing, crushing, gravity concentration, spiral concentration, floatation and magnetic separation. Classification of metals: ferrous and non-ferrous, heavy, light, minor, noble, refractory and radioactive metals. Classification of smelting processes; Pyro-metallurgy, hydrometallurgy and electrometallurgy. Extraction of non-ferrous metals such as copper, aluminium, lead, zinc, etc. Iron production using the L/D converter and electric arc furnace. Fuels and refractory. By-products in extractive metallurgy.

B. COURSE JUSTIFICATION

Extraction of metals is of utmost benefit for industrialization of nations and their extent of industrialization can be measured in terms of quantum of iron and steel produced and consumed. Thus engineers should know the different processes leading to extraction of metals and formation of alloys for diverse applications.

C. COURSE OBJECTIVES

- To know sources of metals and their classification.
- To understand different smelting processes
- To acquire basic skills and understand unit operations employed in ore dressing.
- To have an understanding of fuels and refractory's used in smelting processes.

D. COURSE REQUIREMENT

In order to maximize the benefits of this course, the student is required to have knowledge of Materials and Raw material studies especially materials related to metals and alloys.

E. METHOD OF LECTURE DELIVERY / TEACHING AIDS

- Provision of detailed explanation in class on the topic.
- Provision of adequate illustration on the board.

- Making lecturing periods interactive.
- Giving the students class work during the lecture period.
- Giving take-home assignments at the end of each lecture.

COURSE OUTLINES

Module 1

Week 1: Introduction – What is extractive metallurgy?

Week 2: What are the sources of metals?.

Week 3: Resources of metals in Nigeria and in the world and types of ores.

Module 2

Week 3: Commercial production of metals and their challenges.

Week 4: Unit operations/unit processes – flow sheets for various metal extraction.

Week 6: Various types of reactors and classification of unit operations/processes

Module 3

Week 7: Mineral processing-crushing/grinding, separation, agglomeration etc.

Week 8: Pyrometallurgy and blast furnace production of iron

Week 9: Other high temperature processes – metallothermic reduction, solid state reduction

Module 4

Week 10: Extraction of Ni, Zn, Cu and Pb from sulphide ores

Week 11: Electrometallurgy of aluminium

Week 12: Hydrometallurgy of copper

Module 5

Week 13: Metal refining processes.

Week 14: Energy and furnace

Week 15: Revision.

Tutorials: Questions will be given to the student at the end of each lecture.

STRUCTURE OF PROGRAMME/METHOD OF GRADING: Regular assignment constitutes a part of the continuous assessment (10%), mid semester examination (10%), test (10%) and semester examination (70%).

RECOMMENDED BOOKS

Principles of extractive metallurgy by Ahindra Ghosh and Hem Shanker Ray.

Principles of extractive metallurgy by Terkel Rosenqvist.