MEC 3103 Production Engineering 1

Hours per semester				Weighted total mark	Weighted exam mark	Weighted continuous assessment mark	Credit unit
LH	PH	TH	CH				CU
60	00	60	60	100	60	40	4

Description

This course introduces the various metal manufacturing processes. The importance of the manufacturing sector to the Ugandan economy is highlighted. Steel being a major material in various metallic products, the course introduces the student to the process of production of steel from iron ore. The various non material removal processes of forming different shapes of metal products, including casting, powder metallurgy, forging, rolling, drawing, extrusion, sheet metal working processes, etc are covered.

Course Objectives

The aims of this course are to:

- Ensure that students appreciate the role of the manufacturing sector to the economy
- Guide students through the procedures and requirements of various metal manufacturing processes
- Guide students on selection of manufacturing processes for various metal product shapes and properties.

Learning Outcomes

At the end of the course, students should be able to:

- Identify the importance of the manufacturing sector to the Ugandan economy
- Explain the processes of production of steel from iron ore
- Identify and specify the right manufacturing process for particular component shape, material and properties.
- Choose a process for producing metal products of particular properties.
- Match metal product shapes to their forming processes

Course content

The course will be taught as follows

Introductory Lecture (2 hours)

- Manufacturing processes
- Specialities and trends

Manufacturing Trends in Uganda (2 hours)

- Economic growth
- Historical review
- Successes
- limitations

Iron and steel processing (4 hours)

- Industrial Melting furnaces and classifications
- Iron production from the Ore; blast furnace and Direct reduction Processes
- Furnaces and Processes for converting pig iron to Cast Iron and steel
- Ingot casting
- Continuous Casting

Metal casting (2 hours)

Basic requirements of casting processes Casting terminology Casting processes

Analysis of heating and pouring processes Fluidity of molten metal Solidification of metal **Sand Casting (4 hours)**

- Patterns and cores : design requirements, materials, allowances, types
- Moulds: types, materials, moulding processes Moulding sand control and testing Sand casting defects Shell moulding Vacuum moulding Expended polystyrene processes Investment casting

Permanent mould casting processes (2 hour)

General process capabilities and limitations Slush casting Low pressure casting Vacuum permanent mould casting process Die casting Centrifugal casting **Project Work (3 hours)**

Tutorials (4 hours)

Project Work (3 hours)

Tutorials (4 hours)

A study trip to a Metal production facility e.g Steel Rolling Mills, Roofings, UGMA, Cable Corporation. (8 hours)

Delivery Methods:

The course will be taught by using lectures and tutorials

Assessment Methods:

Course work (assignments and tests) and final examination and their relative contributions to final grade are shown as follows:

Requirement	***Percentage contribution***
Course work	40%
Final examination	60%
Total	**100%**

References

1. Groover, M.P (2007). Fundamentals of Modern Manufacturing: Materials, Systems. 2nd Ed. John Wiley & Sons, Inc. ISBN-13: 978-0-471-74485-6

2. Kalpakjian, S. Schmid, S. (2006). Manufacturing Engineering and Technology. Education Inc. ISBN: 0-13-148965-8

3. Degarmo, E.P., Black, J.T and Kohser, R.A. (2003). Materials and Processes in 9th Ed. John Wiley & Sons, Inc. ISBN: 0-471-03306-5

4. Uganda Investment Authority Website, www.ugandainvest.com

5. Background to the Budget of Uganda (Most recent version)