



# LANDMARK UNIVERSITY, OMU-ARAN

## COURSE COMPACT

<b>COLLEGE:</b>	College of Science and Engineering
<b>DEPARTMENT:</b>	Mechanical Engineering
<b>PROGRAMME:</b>	B.Eng (Mechanical Engineering)
<b>COURSE COMPACT FOR:</b>	MCE 313

### Course

Course code:	MCE 313
Course title:	Manufacturing Process I
Credit unit:	3 Units
Course status:	Compulsory

### Lecturer's Data

#### **Engr. Agboola O. O**

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College of Science and Engineering  
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**Consultation Hours:** 2:00 – 5:00PM Tuesday and Thursday

### INTRODUCTION TO THE COURSE

**Course Description:** MCE 313 – Manufacturing Process 1 – is one of the basic courses that undergraduate Mechanical Engineering students must take. It is the fundamentals of manufacturing process in Mechanical Engineering. The course starts with mechanical testing, properties of materials such as tensile, compressive, and hardness testing with an evaluation of the properties of materials from tensile testing curves. It also considers the true stress versus true strain curves in metal forming. The analytical and descriptive principles of metal forming processes such as forging, rolling, rod and wire drawing, extrusion and sheet metal forming will be discussed too. Some areas not covered may however be given as assignment to students to explore at leisure.

**Course Justification:** Manufacturing and workshop practices have become important in the industrial environment to produce products for the service of mankind. The knowledge of manufacturing practices is highly essential for all engineers and technocrats for familiarizing themselves with modern concepts of manufacturing technologies. The basic need is to provide theoretical and practical knowledge of manufacturing processes and workshop technology to all the engineering students. Therefore, an attempt has been made to present both the theoretical and practical knowledge of these subjects. Considering the general needs of engineering students in the country and the fact that they hardly get any exposure to hand tools, equipments, machines and manufacturing setups, a basic course in manufacturing science remains a core subject for all the branches of engineering. This covers most of the syllabus of manufacturing processes/technology for engineering students..

**Course Objectives:** This course was designed to allow the students to understand the concept of manufacturing processes in engineering, to choose a suitable manufacturing process for a particular product design and to know the economic consideration in manufacturing a product using these various manufacturing processes.

**Course Content:** Mechanical testing and properties of materials: Tensile, compressive and hardness testing. Evaluation of the properties of materials from tensile testing curves. True stress versus true strain curves in metal forming. Analytical and descriptive principles of metal forming processes such as forging, rolling, rod and wire drawing, extrusion and sheet metal forming (shearing, extrusion, bending and deep drawing and blanking).

**Course Expectations:** On completion of this course, students should be able to:

- i. identify manufacturing based challenges in the industry, immediate environment and prescribe adequate solutions.
- ii. solve or recommend a lasting solution to manufacturing based processes.

S/N	GRADING	SCORES (%)
1.	Continuous Assessments	
	• C.AI	7%
	• C.AII (Mid-Semester Test)	15%
	• C.AIII	8%
2.	Assignment	
3.	Practical (Laboratory work)/ Case Studies	
4.	Final Examination	70%
5.	Total	100

**Course Delivery Strategies:**

- Lecture Notes.
- Provision of detailed explanation on each Engineering Workshop.
- Provision of adequate illustration on the board.
- Making the practical class interactive.
- Giving the students projects to work on.

**Course Duration:** 30 hours

**Reading List**

- i. A Text book on Manufacturing Technology: Manufacturing Processes by R K Rajput.
- ii. Manufacturing Process I by H S Bawa.
- iii. Manufacturing Processes by M L Begeman and B H Amstead.
- iv. Serope Kalpakijan and Steven Schmid (2006), "Manufacturing Engineering and Technology", 5th Edition, Pearson Education South Asia Pte Ltd, John Wiley & Sons Ltd, UK, ISBN 0-13-197639-7

# LECTURE CONTENT

**WEEK 1:** Design Process

**Objectives:** This week’s work is set to introduce the students to what manufacturing is all about, its role in our daily lives and the vividly look at the product design process in manufacturing.

**Description:**

First hour: Definition of manufacturing, the interrelation of the word manufacturing and production.

Second hour: The product design process shall be highlighted such as definition of product need, conceptual design and evaluation, design analysis etc. Each of the

highlighted processes shall be critically considered.

### **Study Questions**

1. What is manufacturing?
2. List and explain the product design process

### **WEEK 2: Materials: Properties and Selection**

**Objectives:** Students should be able to differentiate the various materials available for manufacturing. They should also be able to explain the characteristics, applications, advantages, limitations and costs of the materials to be selected in manufacturing different kind of products.

#### **Description:**

First hour: Grouping of various engineering materials into their respective groups such as ferrous metals, non-ferrous metals, plastics or polymers, ceramics, composite materials, nano-materials etc.

Second hour: Properties of materials: Mechanical properties, Physical properties, chemical properties etc. in selecting materials. Evaluation of the properties of materials from tensile testing curves.

### **Study Questions**

1. What are the properties required in selecting a material in manufacturing?
2. Explain the terms strength, ductility, hardness, elasticity, fatigue, malleability and creep as related to engineering.

### **WEEK 3: Manufacturing Processes**

**Objectives:** Students should be able to explain the processes involved in manufacturing such as; forming and shaping, machining, joining and finishing processes.

#### **Description:**

First hour: Forming and shaping (Rolling, forging, extrusion, drawing, sheet forming etc)

Second hour: Machining processes (Turning, boring, drilling, milling, planing, shaping etc.) Joining processes (Welding, brazing, soldering, diffusion, bonding, adhesive bonding and mechanical joining) and finishing processes (deburring, surface treating, coating and plating)

### **Study Questions**

1. Briefly explain any three processes you know in the machining process
2. List and explain the temporary and permanent ways of joining engineering materials.
3. Explain the finishing processes in manufacturing.

### **WEEK 4: Processing of composites**

**Objectives:** Students should be able to explain composite meant and to explain the processes involved in making composite materials.

#### **Description:**

First hour: Composite materials in engineering and some examples of composite materials.

Second hour: Methods involved in processing composites.

### **Study Questions**

Discuss the term 'composite'  
List various methods involved in

### **WEEK 5: Processing of plastics**

**Objectives:** Identifying how plastics (polymers or elastomers) can be processed into the desired product needed in manufacturing.

**Description:**

First hour: Plastic as an engineering material and some examples of plastics

Second hour: Processing of plastics with various processes.

**WEEK 6:** Deep drawing

**Objectives:** Students should be able to explain the processes involved in drawing and the mechanism behind it

First hour and Second hour: Schematic representative of a deep drawing and blanking processes, principles involved.

**Study Questions**

1. Explain the processes involved in deep drawing and blanking.

**WEEK 7:** Extrusion Processes (forming of metals)

**Objectives:** Students should be able to explain in details the processes involved in metal forming.

Description:

First hour: Definition of extrusion process; materials used for extrusion process

Second hour: Areas of application of extruded profiles, definition of extrusion ratio and other parameters.

**Study Questions**

1. What is extrusion process?
2. Describe vividly the extrusion parameters.

**WEEK 8:** Powder Metallurgy processing

Objectives: Students should be able to explain the powder metallurgy process involved in making a product from powdered metal.

**Description:**

First hour: Characterization of engineering powders. Production of metallic powders. Explanation of the processes involved in powder metallurgy.

Second hour: Pressing and sintering, Materials and Products of PM

**Study Questions**

Discuss the processes involved in powder metallurgy.

**WEEK 9:** Forming of Metals (as well as the mid-semester examination)

Objectives: Students should be able describe the various ways of forming metals. To examine the students' knowledge of concepts learnt in the past nine (9) weeks.

**Description:**

First hour: The mid-semester examination attracts a maximum obtainable mark of twenty (20) which will be part of the continuous assessment score of thirty (30).

Second hour: Corrections of mid-semester examination

**WEEK 10:** Process improvement techniques

**Objectives:** Students should be able to describe the process improvement techniques required in manufacturing.

**Description:**

First hour: Process improvement techniques

Second hour: Different process involved and effects

**WEEK 11: Hot working and processes**

Objectives: The students should be able to describe the hot working process and its mechanical effect on the metal.

**Description:**

First hour: Hot working processes

Second hour: The effect of the hot working process on the metal.

Study question: Highlight the effect of hot working process on metals.

**WEEK 12: Cold working and processing**

Objectives: The students should be able to explain the cold working process and its effects on the metal.

**Description:**

First hour: Cold working process

Second hour: Effect of cold working on metals.

Study question: Briefly explain the micro-structural effect that happens to metal during cold working process.

**WEEK 13: Mechanical working of metals**

**Objectives:** The students should be able to describe the mechanical working of metals processes such as rolling, cutting operations, bending operations, drawing etc.

Description:

First hour and Second hour: Rolling, definition of rolling, functions of rolls, roll mill configuration

**Study question:**

Discuss the principle of rolling

State the main functions of rolls

Mention the types of rolling operation

**WEEK 14: Forging**

Objectives: The students should be able to give concise description of the forging process.

**Description:**

First and second hour: The forging process, classification of forging operations, types of forging dies

**WEEK 15: Revision**

Objectives: By the end of the week 14, students' should have grasped the basis of manufacturing processes and be able to apply these processes in their workshop practices.

Description: To revise all the important concepts that has been treated during the semester.

Reading List

Everything that has been taught in the semester, all examples, all tutorials, and review of past questions.

**WEEK 16: Examination**

**Objectives:** To examine the students on all that has been taught during the semester.

**FURTHER READING**

A Text book on Manufacturing Technology: Manufacturing Processes by R K Rajput

Manufacturing Process I by H S Bawa

Manufacturing Processes by M L Begeman and B H Amstead

Serope Kalpakjian and Steven Schmid (2006), "Manufacturing Engineering and Technology", 5th Edition, Pearson Education South Asia Pte Ltd, John Wiley & Sons Ltd, UK, ISBN 0-13-197639-7

Mikell P. Groover (2007), "Fundamentals of Modern manufacturing: Materials, Processes and Systems", 3rd Edition

HOD's Comments: \_\_\_\_\_

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