



LANDMARK UNIVERSITY, OMU-ARAN

## COURSE COMPACT

COLLEGE: COLLEGE OF SCIENCE AND ENGINEERING

DEPARTMENT: MECHANICAL ENGINEERING

PROGRAMME: MECHANICAL ENGINEERING

COURSE COMPACT: 2017/2018 SESSION.

### Course

*Course code: MCE 314*

*Course title: WORKSHOP PRACTICE.*

*Course Units: 2 UNITS.*

*Course status: compulsory.*

### Lecturer Data

*Name of the lecturer: Engr. Aliyu Samuel Jacob.*

*Qualifications obtained: M. Eng. (Thermo-Fluid. Power Plant & Auto. Option.), MNSE, R.COREN.*

*Department: Mechanical Engineering.*

*College: College of Science and Engineering*

*E-mail: [aliyu.samuel@lmu.edu.ng](mailto:aliyu.samuel@lmu.edu.ng)*

*Office Location: New college Building, Wing A, Second floor, Room A 218.  
(Engr. Aliyu Samuel Jacob).*

*Consultation Hours: 24/7 (Days and time).*

*1. Name of the lecturer: Engr. Olabamiji Taye Sola*

*Qualifications obtained: B. Eng. Mechanical Engineering*

*Department: Mechanical Engineering.*

*Faculty: College of Science and Engineering*

*E-mail: [olabamiji.taye@lmu.edu.ng](mailto:olabamiji.taye@lmu.edu.ng)*

*Office Location: First college Building, First floor, Strength of material lab.*

*Consultation Hours: 24/7 (Days and time).*

### Course Description:-

*Introduce the students to general life workshop ethics and machine operations. Workshop activities like determining the amount of material remover using Lathe operations, Milling operations, and type of moulding fabrications are fundamental operations for technical development and brain tasking.*

### Course Justification:-

- The course will introduce workshop operations and establish its relevance in engineering applications.*
- Develop the fundamental principles underlying the subject.*
- Demonstrate how these are used for the design of simple engineering components.*

- *With the wealth of sound, practical and theoretical knowledge, students can fit into organisations handling production engineering projects. In addition, students can be change agents pioneering such projects in their sphere of influence.*

### **Course objectives**

*At the end of this course, students would be able to:*

- *To introduced students on the use of some tools and machines.*
- *To enable each of the students operates and use the equipment on their own.*
- *To understand the dangers in workshop.*
- *To safety conscious in every work.*

### **Course Content :-**

*The topics in this course are: workshop safety; Workshop fitting and measurement; Sheet metal work; lathe work; Milling; Machine Shop and Metal Work Training; Plastic Technology Training; Injection moulding, rotational moulding, compression moulding; CAD and CNC machining; Hands-on-experience of students on all workshop equipment.*

### **Course Expectation**

*To gain maximally from this course, students should be familiar with the various uses of the workshop tools, designs and machine operations; students are also expected to be sound in simple calculations by synthesizing knowledge from various courses they have been exposed to during the cause of study.*

### **Method of Grading- An example below**

<b>S/N</b>	<b>Grading</b>	<b>Score (%)</b>
1.	<i>Continuous Assessments</i>	
	• <i>C.A-I</i>	7%
	• <i>C.A-II</i>	15%
	• <i>C.A-III</i>	8%
2.	<i>Assignment</i>	10%
3.	<i>Practical (work)</i>	
4.	<i>Final Examination</i>	60%
	<b>Total</b>	<b>100</b>

### **Course Delivery Strategies**

1. *Interactive class discussions complimented by lecture notes. Students are also given take-home assignments which further buttresses the course objectives.*
2. *The use of the public address system for audibility during lecture delivery.*
3. *The use of the electronic surface writing medium and the use of a projector and accessories.*
4. *Teaching aids with practical illustrations.*

**Course Duration:** *Two hours per week for 15 weeks (30 hours)*

# LECTURE CONTENT

## **Week 1: Topic for the week**

*Workshop safety*

### ➤ **Objectives (list the objectives)**

- *At the end of the lecture for this week:*
  - *Students should by the way of introduction know what workshop safety rule and regulations are.*
  - *Students should know the type of working tools which are required for a particular operation.*
  - *Students should understand the indebt theoretical (technical) knowledge of the subject matter before embarking on the practical operation.*

### ➤ **Description**

- First hour: *Definition of workshop tool and equipment safety and workshop cleanliness. Workshop practicals will be vigorously utilised during the course delivery.*
- Second hour: *Introduction of to general workshop health and safety rules, fire prevention, general personal safety and hazardous materials.*

### ➤ **Study Question: This section entails study question for the week lecture.**

1. *Outline the effect of refrigerant from an air conditioning system which contact your skin or eyes.*
2. *Mention five reasons why oily materials are separated from air.*

### ➤ **Reading List - Books and materials students can read. Illustration below:**

- *Alex Weiss, 1999, Workshop Materials, Nexus Special Interests Ltd. ISBN 1 85486 192 1.*
- *Les Oldridge, 1988, Basic Bench-work, Argus books Ltd. ISBN 0 85242 920 7.*

## **Week 2:Topic for the week**

*Workshop measurement: linear measurement and error.*

### ➤ **Objectives (list the objectives)**

*The students at the end of the lectures for the week should be able to:-*

1. *Know type of metric systems used in workshop operations*
2. *Know the type of measuring tools and type of operations they can be use.*
3. *Determine what precision measuring tools can be use.*

### ➤ **Description**

- First hour: *Introducing the students to measurement operation.*
- Second hour: *Knowing type of measuring tools.*

### ➤ **Study Question: This section entails study question for the week lecture.**

1. *What is the most versatile precision measuring instrument an engineering can own?*
2. *When reading a small-hole gauge, how is the micrometer reading taken in relation to the split in the ball, on the split or 90<sup>0</sup> to the split?*

3. *Mention an instrument that would be used to measure end play of a shaft.*

➤ **Reading List -**

- *Harold Hall, 2007, Model Engineer's Workshop Projects Special Interest Model Books Ltd. ISBN 978 185486 248 8.*
- *Alex Weiss, 1999, Workshop Materials, Nexus Special Interests Ltd. ISBN 1 85486 192 1.*
- *Les Oldridge, 1988, Basic Bench-work, Argus books Ltd. ISBN 0 85242 920 7.*

**Week 3:** Topic for the week

*Bench fitting and tools.*

➤ **Objectives (list the objectives)**

*The students at the end of the lectures for the week should be able to:-*

1. *Knowing how bench tools are handled and used for an operation.*
2. *Know how to read engineering drawings.*
3. *Knowing how to select working tools and materials.*

➤ **Description**

- First hour: *Introducing the measurement marking out process.*
- Second hour: *Introduction to taps and dies; Files and filing etc. Workshop practice.*

➤ **Study Question: This section entails study question for the week lecture.**

1. *Mention three operations to be carried out before mounting a job on a vice.*
2. *Mention three type of vices which can be use for bench operations.*

➤ **Reading List - Books and materials students can read.**

- *Harold Hall, 2007, Model Engineer's Workshop Projects Special Interest Model Books Ltd. ISBN 978 185486 248 8.*
- *Alex Weiss, 1999, Workshop Materials, Nexus Special Interests Ltd. ISBN 1 85486 192 1.*
- *Les Oldridge, 1988, Basic Bench-work, Argus books Ltd. ISBN 0 85242 920 7.*

**Week 4:** Topic for the week

*Carpentry workshop tools and machines.*

➤ **Objectives (list the objectives)**

*The students at the end of the lectures for the week should be able to:-*

1. *Work with moulds.*
2. *Know how moulds can be constructed for casting of components.*
3. *Know the wood treatment processes i.e from harvesting stage to the required moisture content percentage requirement suitable for use.*
4. *Know the wood conditions under certain weather conditions.*
5. *Know type of working machineries and workshop tools.*

➤ **Description**

- First hour: *Introducing the students to general woodwork operations.*
- Second hour: *Wood treatment and weather working conditions. Carpentry workshop*

will be use for the practical.

➤ **Study Question: This section entails study question for the week lecture.**

1. *Outline ten woodwork workshop operations*
2. *What are the processes of wood log production before usage?*

➤ **Reading List - Books and materials students can read. Illustration below:**

- *Valter Francescato et...al, 2008, Wood Fuels Handbook.*
- *Harold Hall, 2007, Model Engineer's Workshop Projects Special Interest Model Books Ltd. ISBN 978 185486 248 8.*
- *Alex Weiss, 1999, Workshop Materials, Nexus Special Interests Ltd. ISBN 1 85486 192 1.*
- *Les Oldridge, 1988, Basic Bench-work, Argus books Ltd. ISBN 0 85242 920 7.*

**Week 5: Topic for the week**

Sheet metal work

➤ **Objectives (list the objectives)**

*The students at the end of the lectures for the week should be able to:-*

1. *Know fabrication of components from sheet metals.*
2. *Know type of sheet materials and gages.*
3. *Know the operations in sheet metal shops and sheet metal joints.*
4. *Know the importance of time estimation, blanks lay-outs, capacity for power presses, etc.*

➤ **Description**

- First hour: *Introducing the sheet metal shop and types of operations carried out.*
- Second hour: *Sheet metal workshop treatment processes before use. Fabrication workshop will be use for the practical.*

➤ **Study Question: This section entails study question for the week lecture.**

1. *What is 'Blanks layout' in sheet metal shop?*
2. *Explain the procedures you will follow for laying out a rectangular box open at the top as shown below.*
3. *Explain the following terms: Breaking out, Bending, Turning up, Hollowing, Raising, Single and Double seam joints and Rivetted joints.*

➤ **Reading List - Books and materials students can read.**

- *T. R. Banga and S. c. Sharma, 2004, Mechanical Estimating and costing, ISBN.81-7409-100-9*

**Week 6: Topic for the week**

Lathe work

➤ **Objectives (list the objectives)**

*The students at the end of the lectures for the week should be able to:-*

1. *Know the types of Lathe operations.*
2. *Know type of tools required and understanding the measurement processes.*
3. *Know the danger of inaccuracy in component production.*

➤ **Description**

- First hour: *Introduction of major and minor type of lathe operation.*

- Second hour: *Type of lathes and clamps.*
- **Study Question: This section entails study question for the week lecture.**
  1. *Draw and label a lathe machine.*
  2. *Mention three factors on which cutting speed depends and state the meaning of 'Feed and depth of cut'*
  3. *Mention seven types of lathe operations and explain what is meant by labour cost and machining cost.*
- **Reading List - Books and materials students can read.**
  - *T. R. Banga and S. c. Sharma, 2004, Mechanical Estimating and costing, ISBN.81-7409-100-9*
  - *Harold Hall, 2007, Model Engineer's Workshop Projects Special Interest Model Books Ltd. ISBN 978 185486 248 8.*
  - *Alex Weiss, 1999, Workshop Materials, Nexus Special Interests Ltd. ISBN 1 85486 192 1.*
  - *Les Oldridge, 1988, Basic Bench-work, Argus books Ltd. ISBN 0 85242 920 7.*

**Week 7:** Topic for the week

Milling.

- **Objectives (list the objectives)**

*The students at the end of the lectures for the week should be able to:-*

  1. *Know types of milling cutters attachments.*
  2. *Know what is Tooth geometry, speeds and feeds etc.*
  3. *Know milling procedures and care for cutters.*
- **Description**
  - First hour: *Introducing the basic milling working holds.*
  - Second hour: *Characteristics of combined operations and complex milling.*
- **Study Question: This section entails study question for the week lecture.**
  1. *Give a brief outline of milling operation.*
  2. *Mention five types of milling operations.*
  3. *Why must cutter tools be handled with optimum care?*
- **Reading List - Books and materials students can read. Illustration below:**
  1.
    - *Tubal Cain, 1984, Milling Operations in the Lathe, Angus Books Ltd., ISBN 0-85242-840-5.*
    - *T. R. Banga and S. c. Sharma, 2004, Mechanical Estimating and costing, ISBN.81-7409-100-9*

**Week 8:** Topic for the week.

Machine Shop and Metal Work Training.

- **Objectives (list the objectives)**

*The students at the end of the lectures for the week should be able to:-*

  1. *Introducing the student to machine shop and metal work traing.*
  2. *Know causes of shop accidents and how to keep safe..*

3. *Know the basic metal working procedures and machining operation for a particular job.*
4. *Establish the connectivity linkages between machine shop activities and metal work training.*

➤ **Description**

- First hour: *Introduction and definitions of machine shop activities.*
- Second hour: *Type of metal forming activities and their machineries.*

➤ **Study Question: This section entails study question for the week lecture.**

1. *Explain two type activities carried out in grinding operations.*
2. *What types of activities are carried out in shaping planning operations?*
3. *What is metal remover rate?; and explain tool life.*

➤ **Reading List - Books and materials students can read.**

- Tubal Cain, 1984, Milling Operations in the Lathe, Angus Books Ltd., ISBN 0-85242-840-5.
- T. R. Banga and S. c. Sharma, 2004, Mechanical Estimating and costing, ISBN.81-7409-100-9

**Week 9:** Topic for the week.

Plastic Technology Training.

➤ **Objectives:**

*At the end of the lecture for this week:*

- 1 *Introducing the Students to the world of plastic technology.*
- 2 *Students should understand the characteristics of plastic technology.*
- 3 *Students should understand the usage and importance of plastic technology in engineering.*

➤ **Description:**

- First Hour: *Definition of plastic technology and its usage.*
- Second Hour: *What is meant by Thermoplastics and thermosetting plastics.*

➤ **Study Questions:**

1. *What are plastic compounds?*
2. *Mention other elements that constituted plastic compounds.*
3. *Write a short note on Polytetrafluoroethylene.*

➤ **Reading List**

- Harold Hall, 2007, Model Engineer's Workshop Projects Special Interest Model Books Ltd. ISBN 978 185486 248 8.
- Alex Weiss, 1999, Workshop Materials, Nexus Special Interests Ltd. ISBN 1 85486 192 1.
- Les Oldridge, 1988, Basic Bench-work, Argus books Ltd. ISBN 0 85242 920 7. .

**Week 10:** Topic for the week.

Moulding – Injection, rotational and compression moulding.

➤ **Objectives:**

*At the end of the lecture for this week:*

- i. Students should know the components and arrangements of moulds.*
- ii. Students should know the casting principles.*
- iii. Students should know the classification of moulds.*
- iv. Students should understand the design, construction and working operations of moulds.*

➤ **Description:**

- First Hour: *Introducing the students to Components and arrangements of a mould.*
- Second Hour: *Classification of the design, construction and working principle of a mould.*

➤ **Study Questions:**

- 1. Explain the principles of injection in mould operation.*
- 2. Why are certain equipments or components casted?*
- 3. Which types of moulds are suitable for engine parts production?*

➤ **Reading List**

- *Harold Hall, 2007, Model Engineer's Workshop Projects Special Interest Model Books Ltd. ISBN 978 185486 248 8.*
- *Alex Weiss, 1999, Workshop Materials, Nexus Special Interests Ltd. ISBN 1 85486 192 1.*
- *Les Oldridge, 1988, Basic Bench-work, Argus books Ltd. ISBN 0 85242 920 7.*

**Week 11:**

Metal cutting.

➤ **Objectives:**

*At the end of the lecture for this week:*

- i. Students should know the activities surrounding the metal cutting procedure.*
- ii. Students should understand the use of metal design and operation before cutting.*
- iii. Students should understand the uniqueness of the end product.*

➤ **Description:**

- First Hour: *Bringing components to shape by the removal of metal at the bench using hand tools, machine tools.*
- Second Hour: *Distinguishing machine producing components on a machine tool and producing components on the bench.*

➤ **Study Questions:**

- 1. Why is it important to keep hack saw as closely as possible to a scribed line?*
- 2. Make neat sketches showing the cross-section of three different files.*
- 3. Why is it desirable to use a cutting medium when tapping holes?*
- 4. Why is it difficult to produce a flat surface when using a file?*

➤ **Reading List**

- *R. T. Pritchard, 1976, Workshop Processes, Vol.1, ISBN 0 340 04938 3.*
- *Harold Hall, 2007, Model Engineer's Workshop Projects Special Interest Model*



*Books Ltd. ISBN 978 185486 248 8.*

- *Alex Weiss, 1999, Workshop Materials, Nexus Special Interests Ltd. ISBN 1 85486 192 1.*
- *Les Oldridge, 1988, Basic Bench-work, Argus books Ltd. ISBN 0 85242 920 7.*

**Week 12:** Topic for the week.

Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM)

➤ **Objectives:**

*At the end of the lecture for this week:*

- i. *Students should know what CAD and CAM programs are used for.*
- ii. *Students should know the use of these programs in complicated machines.*
- iii. *Students should understand the common methods on how these programs can help a programmer and facilitate production.*

➤ **Description:**

- First Hour: *Introducing the CAD and CAM program.*
- Second Hour: *How the package is used in conjunction with production machineries.*

➤ **Study Questions:**

1. *Write a short note CAD and CAM programs*
2. *Mention two ways in which these programs can ease production process.*

➤ **Reading List**

- *Miltiadis A. Boboulos, 2010, CAD-CAM & Rapid Prototyping Application Evaluation, ISBN 978-87-7681-676-6.*

**Week 13:** Topic for the week.

CNC machining.

➤ **Objectives:**

*At the end of the lecture for this week:*

- i. *Students should know types of CNC machines, models, their advantages and disadvantages.*
- ii. *Students should know the types of similitude and similarity between the NC and CNC.*
- iii. *Students should understand the applications and accuracy of these models.*

➤ **Description:**

- First Hour: *CNC Machine Overview and Computer Numerical Control History.*
- Second Hour: *Types of Machines, Programming and Operation, Advantages and Disadvantages.*

➤ **Study Questions:**

1. *What are the advantages and disadvantages of a CNC machine?*
2. *State three types of motion used in CNC machine operations and explain.*
3. *What is meant by programmable functions in CNC machine? Explain three.*

➤ **Reading List**

- *R. T. Pritchard, 1976, Workshop Processes, Vol.1, ISBN 0 340 04938 3.*
- *Harold Hall, 2007, Model Engineer's Workshop Projects Special Interest Model Books Ltd. ISBN 978 185486 248 8.*

- Alex Weiss, 1999, *Workshop Materials*, Nexus Special Interests Ltd. ISBN 1 85486 192 1.
- Les Oldridge, 1988, *Basic Bench-work*, Argus books Ltd. ISBN 0 85242 920 7.
- Miltiadis A. Boboulos, 2010, *CAD-CAM & Rapid Prototyping Application Evaluation*, ISBN 978-87-7681-676-6.

**Week 14:** Topic for the week.

*Hands-on-experience of students on all workshop equipment.*

Revision

➤ **Objective:**

- i. *To revise all the topics taught*

➤ **Description:**

- First Hour: *Revise topics taught in classroom in this course.*
- Second Hour: *Workshop hands-on – experience.*

➤ **Study Questions:**

1. *Give three advantages obtained when producing a surface on a machine tool as against producing a similar surface at the bench.*
2. *Make a neat sketch showing the method of guiding the saddle along the bed of a centre lathe.*
3. *By means of a simple sketch illustrate how motion may be transmitted at 90°*
4. *What is the purpose of rack and pinion? Sketch a simple engineering application.*

➤ **Reading List**

- R. T. Pritchard, 1976, *Workshop Processes, Vol.1*, ISBN 0 340 04938 3.
- Harold Hall, 2007, *Model Engineer's Workshop Projects Special Interest Model Books Ltd.* ISBN 978 185486 248 8.
- Alex Weiss, 1999, *Workshop Materials*, Nexus Special Interests Ltd. ISBN 1 85486 192 1.
- Les Oldridge, 1988, *Basic Bench-work*, Argus books Ltd. ISBN 0 85242 920 7.
- Miltiadis A. Boboulos, 2010, *CAD-CAM & Rapid Prototyping Application Evaluation*, ISBN 978-87-7681-676-6.

**Week 15:** Topic for the week.

*Revision & Examination*

➤ **Objective:**

- i. *To examine the students on all that has been taught during the semester.*

➤ **Description:**

*Classroom-based examination*

➤ **Reading List**

- *R. T. Pritchard, 1976, Workshop Processes, Vol.1, ISBN 0 340 04938 3.*
- *Harold Hall, 2007, Model Engineer's Workshop Projects Special Interest Model Books Ltd. ISBN 978 185486 248 8.*
- *Alex Weiss, 1999, Workshop Materials, Nexus Special Interests Ltd. ISBN 1 85486 192 1.*
- *Les Oldridge, 1988, Basic Bench-work, Argus books Ltd. ISBN 0 85242 920 7.*
- *Miltiadis A. Boboulos, 2010, CAD-CAM & Rapid Prototyping Application Evaluation, ISBN 978-87-7681-676-6.*

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