

# COURSE CONTENT

## Course

Course code: MEC 411

Course title & the credit unit: Computer-aided Design and Computer-aided Manufacturing  
(2 UNITS)

Course status - compulsory

## Course Duration

*Two hours per week for 15 weeks (30 hours)*

## Lecturer Data

**Name of the lecturer:** Ikpotokin, I.

**Qualifications obtained:** M. Sc. Mechanical Engineering

**Department:** Mechanical Engineering

**Faculty:** College of Science and Engineering

**E-mail:** ikpotokin.igbinosa@lmu.edu.ng

**Office Location:** No 129, Wing C, New College Building, Landmark University.

**Consultation Hours:** Wednesdays and Fridays and 2- 3 pm.

## Course Content:

Computer-aided design hardware, Computer-aided design software, expert system for computer aided design/computer-aided manufacturing, computer-aided design/computer-aided manufacturing interface, computer numerical control of machine tool, computer-aided quality control, computer integrated manufacturing systems.

## Course Description:

*Computer-aided design/computer-aided manufacturing is concerned with the use of computer to integrate design and manufacturing process for fabricating products that meet customer demand by optimizing all elements involved in the life cycle of the product. The aim of CAD/CAM is to minimize product design and changes and the time and cost required in taking the product from design concept to production and introduction of the product into the market.*

*CAD/CAM encompasses several technologies like automation, numerical control, adaptive control, material handling and movement, sensor technology, flexible fixturing, artificial intelligence, computer-aided manufacturing, just-in-time manufacturing, cellular manufacturing, and so on. The development and production of mechanical members such as shaft, gear, etc, and aerospace, automotive, and machine tools has been achieved with the help of CAD/CAM..*

*CAD/CAM has tools for prototyping a design and setting up virtual factory for manufacturing without retooling to facilitate fast delivery of process orders placed for different products. Therefore, CAD/CAM provides for just-in-time manufacturing.*

*The areas to cover include an overview of the course, CAD hardware and software, expert system for CAD/CAM, CAD/CAM interface, machine tool control, computer-aided quality control, and computer integrated manufacturing systems.*

### **Course Justification:**

*The emergence of CAD/CAM had a very significant impact on manufacturing by standardizing product development and reducing design effort, tryout, and prototype work, thus resulting in significantly reduced costs and improves productivity. The two-engine Boeing 777 passenger airplane for example, was designed completely using computer, with 2000 workstations linked to eight computers. The airplane was constructed directly from CAD/CAM systems and no prototypes were built as in previous models. Had the people involved use conventional paper design, they might have experienced much interference among hardware systems, requiring costly design changes and revised drawings. This is a major cost factor in designing a complex system. The advantage of being able to see what everyone else was doing, through an integrated solid model and digital data system, saved changes in orders and rework expected for a design of this magnitude.*

*The Boeing 777 has more than 130,000 unique engineered parts, and when rivets and other fasteners are counted, there are more than 3 million individual parts. The ability of the CAD system to identify interferences eliminated the need to build a physical model (mockup) of the airplane.*

**Course objectives**

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

- (i) *To understand the meaning and engineering field of application of CAD/CAM.*
- (ii) *To know the benefits of CAD/CAM.*
- (iii) *To know how to integrate CAD into manufacturing processes.*
- (iv) *To understand the quality control aspect of manufacturing using computer.*
- (v) *To acquire skills for writing some basic machine tool control programs.*

**Course Requirement:**

*To be well grounded in this course, the students must be familiar with machine design, workshop practice and manufacturing processes. This is because CAD/CAM system requires the application of computer in the aforementioned courses.*

*Since the course involves the use of computer it is expected that student familiarized themselves with computer components. Student attendance in class is mandatory as nonchalant attitude towards class attendance may lead to failure.*

*The lecture is expected prepare his lecture note and release it to the student after the lecture. During lecture delivering, illustrate examples in modern world would be used.*

**Method of Grading**

<b>S/N</b>	<b>Grading</b>	<b>Score (%)</b>
1.	Test I	10
2.	Test II	20
4.	Final Examination	70
	<b>Total</b>	<b>100</b>

**Course Delivery Strategies:**

- *Provision of detailed explanation in class on the topic.*
- *Provision of adequate illustration on the board with the aid of a projector.*
- *Making lecturing periods interactive and complimentary it with practical work.*
- *Giving the students class work during the lecture period.*
- *Giving take-home assignments at the end of each lecture.*

# LECTURE CONTENT

**Week 1:** Introduction to CAD/CAM systems, reasons for implementing CAD/CAM and its benefits.

**Week 2:** CAD system hardware: Computer fundamentals, central processing unit, input unit and output unit.

**Week 3:** CAD system software: Introduction, types of software, engineering base and non-engineering-specific software.

**Week 4:** Expert system for CAD/CAM: Artificial intelligence, application of artificial intelligence in design and role of artificial intelligence in manufacturing.

**Week 5:** Expert system and its benefits, expert system technique for design, characteristics and examples of an expert system, fuzzy logic.

**Week 6:** CAD/CAM interface: introduction, rationale for CAD/CAM, CAD/CAM system, CAM

**Week 7:** Computer numerical control of machine tools: Machine tool control, computer numerical control, Numerical control of machine tool, elements of NC systems,

**Week 8:** Coordinate system and programming for numerical control.

**Week 9:** Computer-aided quality control: Definition of quality and its terminology, computer-aided testing, benefits of computer-aided control.

**Week 10:** Computer-aided control inspection: methods of inspection.

**Week 11:** Computer integrated manufacturing: Introduction, integration and rationalization, CIM sequence functions.

**Week 12:** Elements of CIM and CIM database management system.

**Week 13:** CIM hardware and software and benefits of CIM.

**Week 14:** Revision.

**Week 15:** Examination

## **Study Question**

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

**Reading List:**

Sadhu, S., Computer Aided Design & Manufacturing, Romesh Chander Khanna, India, 2007.

*Singh, H., Systems Approach to Computer-Integrated Design and Manufacturing, John Wiley & Sons, Inc., 1996.*

*Mikell P. Groover and Emory W. Zimmers, CAD/CAM, Jr., Prentice Hall of India Private Limited.*

*Zeid, I., CAD/CAM Theory and practice, McGraw-Hill, Inc., New York, 1991.*