

**MECHANICAL ENGINEERING PROGRAM**  
**ABET COURSE SYLLABUS**

**ME 161 Introduction to Composite Materials Manufacturing (2 Units) Elective**

<b>Course Description:</b> <b>(2019-20 Catalog)</b>	Reinforcing fibers and matrix materials both synthetic and natural. Composite material molding and forming processes including hand layup, autoclave, compression molding, filament winding, and vacuum infusion molding. Mold, mandrel or tooling design. Composite component post-processing and machining. 2 laboratories.
<b>Prerequisite Courses:</b>	N/A.
<b>Prerequisites by Topic:</b>	Introduction to composites materials manufacturing methods.
<b>Textbook:</b> <b>(and/or other Optional material)</b>	Laboratory Manual provided by the instructor.
<b>References:</b>	Fundamentals of Composites Manufacturing, Second Edition: Materials, Methods and Application, A Brent Strong, 2008. Composites Manufacturing Materials, Product, and Process Engineering, by Sanjay K. Mazumdar, <b>CRC PRESS</b> , Boca Raton London New York Washington, D.C.

**Course Coordinator/Instructor:** Eltahry Elghandour, Associate Professor of ME

- Course Learning Outcomes:** The student will be able to:
- Operate composite manufacturing equipment and associated machine tools.
  - Manage a composite work area for the organized and cleanliness needs of these unique materials.
  - Prepare and assemble materials and tools required to manufacture composites.
  - Explain concepts and define terminology associated with design and manufacturing processes for composite materials.
  - Describe design and manufacturing methods for various composite materials.
  - Apply basic composites joining and repair techniques.
  - Design, fabricate, and test a composite manufactured part and deliver both a final technical report and presentation that are well organized and convey information clearly and concisely.

- Apply engineering fundamentals in evaluating various manufacturing methods that best fit geometry and performance requirement.

**Relationship of Course to Mechanical Engineering Student Outcomes:**

SO 1: Introduce (I)  
 SO 2: Introduce (I)  
 SO 3: Introduce (I)  
 SO 4:  
 SO 5: Introduce (I)  
 SO 6: Introduce (I)  
 SO 7: Introduce (I)

**Topics Covered:**

See below ... Lab only class

**Laboratory Projects:**

- Introduction to safety rules for lab equipment and composite manufacturing methods. (one meeting Lab)
- Introduction to composites, with application (one meeting lab)
- Matrices (Epoxies) and their properties
- Hand-wet lay-up room temperature cure
- Thermoplastic composites and reinforcements
- Hand-lay-ups (Use Oven) and Aspect ratio, rules of mixture
- Open molding of engineering and advanced composites
- Design and build different mold shapes for composite manufacturing and testing
- Compression molding
- Three point bend for sandwich beam
- Resin Infusion
- Final Project- Design, build, and test a prototype model of composite bridge using various composite materials.

**Class/Lab Schedule:**

Two 170-minute lab per week.

**Contribution of Course to Meeting the Professional Component:**

(a) College-level mathematics and basic sciences:	0 credits
(b) Engineering Topics: Design-Yes:	2 credits
(c) General Education:	0 credits
(d) Other:	0 credits

**Prepared by:**  
 Eltahry Elghandour

**Date:**  
 2/2/2020

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