CFT A100: INTRODUCTION TO COMPOSITES FABRICATION

Item	Value
Curriculum Committee Approval Date	11/04/2020
Top Code	095600 - Manufacturing and Industrial Technology
Units	3 Total Units
Hours	54 Total Hours (Lecture Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course Description

This is an introduction to composites fabrication utilizing light timber and polymer membrane technology. The course includes mold making, hand layup, vacuum bagging, and some traditional joinery methods. Through fabrication and assembly, the student will get an overall understanding of how a composite structure is built. The intent of the class is for a student to manage their own project, and opportunities to participate in whole-class capstone projects. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Gain a basic understanding of composite fabrication which includes materials, adhesives, mold making, vacuum bagging, and various methods of curing.
2. Create a full scale 1:1 prototype of a semester project made with composite materials.
3. Complete a performance evaluation of the built structure and document the fabrication process.

Course Objectives

- 1. Understand correct personal and shop safety concepts, considering potential hazards associated with operating machinery and equipment.
- 2. Be able to identify common types of organic, ceramic, polymer and metal fibers used in manufacturing.
- 3. Have knowledge of the different types of organic matrices, and how they are processed in prototyping efforts.
- 4. Have knowledge of how polymer matrices along with ceramic and metal matrix materials are processed in industrial applications.
- 5. Understand the working properties and performance characteristics of adhesives and binders used in fabricating with composites.
- 6. Perform basic shop-level chemistry experiments using adhesives and binders.
- 7. Derive mixes of adhesives used in hybrid composites assembly.
- 8. Determine optimum manufacturing process for any selected composite in making a structure.
- 9. Carry out hand and power tool operations commonly utilized in a light industrial manufacturing environment.
- 10. Document the iteration process of product fabrication from design thru final finishing and testing.

Lecture Content

1. Understand composite fabrication industry structure and profile A. Light industrial and commercial applications B. Composites fabrication sustainability. C. Environmental considerations in composites fabrication. 2. Outline a design/build strategy of a structure within preset engineered guidelines A. Optimization calculations including logical workflow sequencing 3. Material selection and customization. A. Membrance and polymer substitution for organic composites B. Use of monolithic material considerations. 4. Raw material quality assurance A. Care and storage of different grades of composite material B. Special use pre-preg and radio frequency sensitive adhesives and binders 5. Basic structure fabrication A. Preparation of engineered drawings and sketches. B. Kinetic analysis of load curve tolerances C. Use basic machine and hand tools to fabricate simple components parts. 6. Perform failure analysis testing of completed prototypes and structures.

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)

Instructional Techniques

Lecture, demonstration, videos, class discussions, experiments, material testing.

Reading Assignments

Students will spend approximately 3 hours a week reading from the textbook and from instructor-generated materials.

Writing Assignments

Students will be required to complete approximately 2 hours a week working on writing assignments. Students will be required to document all of the relevant steps in each of the fabrication processes and then document the results of destructive and non-destructive testing of the completed sub-assemblies.

Out-of-class Assignments

Students will spend approximately 2 hours a week completing field research assignments that require students to identify and apply concepts learned in class to real-life uses of composites. They will also be required to work and complete small fabrication projects.

Demonstration of Critical Thinking

The students will complete field research assignments that require the identification and application of concepts learned in class to real-life uses of composites. They will analyze what they find in the field and critique the application of the materials used to create an assembly.

Required Writing, Problem Solving, Skills Demonstration

Students will participate in a selected building project which will provide a platform for developing and demonstrating the basic design of the use of composites in general fabrication. The foundational skills learned will certainly be incorporated into future design and building efforts undertaken by a designer/maker. Students will document all of the relevant steps in each of the fabrication processes and then document

the results of destructive and non-destructive testing of the completed sub-assemblies.

Eligible Disciplines

Manufacturing technology (quality control, process control): Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required Fochtman, F.. A Comprehensive Guide to Composites: Processes Procedures from the Professionals, 2 ed. Aviation Supplies Academics, Inc, 2015 Rationale: .

Other Resources

1. Instructor produced/selected handouts.