Minnesota State College Southeast

BIKE 2010: 3D Prototyping

A. COURSE DESCRIPTION

Credits: 3

Lecture Hours/Week: 2

Lab Hours/Week: 2

OJT Hours/Week: *.*

Prerequisites: None

Corequisites: None

MnTC Goals: None

Learn how prototype parts and assemblies can be generated using CAD design data. Understand available processes to rapidly create functional objects, visual models, and working assemblies. Learn to apply a variety of rapid prototyping methods including: 3D Printing, Desktop Machining, Wood Router, Vacuum Forming, Laser Cutting, manual detailing and finishing (paint, decals, etc.). (Prerequisite: none) (3 credits: 2 lecture/1 lab)

B. COURSE EFFECTIVE DATES: 02/27/2018 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. Explain current and emerging prototyping techniques in manufacturing, including bicycle design & fabrication
2. Explain how rapid prototyping, including 3D printing, can accelerate design and development
3. Describe the advantages and limitations of each prototyping technology
4. Design and 3D print objects containing moving parts without assembly
5. Demonstrate operation of non-3D printer rapid prototyping devices (laser cutting, vacuum forming, tabletop mills, etc.)
6. Prototype print a bicycle component or accessory

D. LEARNING OUTCOMES (General)

1. Understand how the designer¿s role has evolved over time and how it is likely to change as we move toward mass customization and why rapid prototyping is important
2. Use the principles of Design Thinking and document their design process
3. Navigate the CAD software being used for this course
4. Apply the unique advantages of 3D printing to their designs
5. Compare additive manufacturing to traditional prototyping technologies and choose the best technology for a given application
6. Distinguish between various 3D printing technologies and materials and select appropriately for a given application
7. Define essential geometry terms and understand how they relate to a 3D mesh
8. Create smooth and detailed 3D structures
9. Take advantage of model-sharing websites to accelerate learning and improve product designs
10. Use the CAM software to prepare files for 3D printing
11. Manipulate machine movement and material layering
12. Build a selected bicycle component or accessory in CAD and prototype the component using the most appropriate prototyping methods
13. Design systems with 3D printing technology in mind, including shape tolerance and material build thickness
14. Nest and orient 3D models on the build tray to conserve space and materials
15. Explain the prototyping processes used for parts of a case study
16. Identify a project for further study and analysis
17. Explain what 4D printing means and imagine its potential impact on the design process
18. Understand the uses and limitations of vacuum forming and how it can be used to build a prototyping mold for layup parts
19. Understand the uses and limitations of laser cutting as a prototyping method
20. Understand the uses and limitations of desktop machining as a prototyping method
21. Understand the uses and limitations of wood/plastic router as a prototyping method
22. Awareness of other available and emerging prototyping processes such as water jet cutting, powdered metal, injection molding, etc.

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted