Washtenaw Community College Comprehensive Report

MEC 120 3D-Printing: Machine, Process and Innovation
Effective Term: Fall 2016

Course Cover

Division: Advanced Technologies and Public Service Careers
Department: Industrial Technology
Discipline: Mechatronics
Course Number: 120
Org Number: 14400
Full Course Title: 3D-Printing: Machine, Process and Innovation
Transcript Title: 3D-Printing: Machine, Process
Is Consultation with other department(s) required: No
Publish in the Following:
Reason for Submission: New Course
Change Information:
Rationale: This class is being created for an advanced certificate in the advanced manufacturing program. This course is needed to get students skills to operate new equipment being purchased for our program.
Proposed Start Semester: Fall 2016
Course Description: In this course, students will look at three aspects to Fusion Deposit Modeling (FDM), one of the most popular forms of 3D printing. First covered is assembly and alignment of a 3D printing machine. Second, students explore programming and process parameters, using open source STL files. Finally, students will learn an entry level CAD software.

Course Credit Hours

Variable hours: No
Credits: 4
Lecture Hours: Instructor: 45 **Student:** 45
Lab: Instructor: 45 **Student:** 45
Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 90 **Student:** 90
Repeatable for Credit: NO
Grading Methods: Letter Grades
Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

No Level Required

Requisites

General Education

Request Course Transfer

Proposed For:

Student Learning Outcomes

1. Apply skills necessary to build and assemble the mechanical and electronic aspects of a 3D printer.
   Assessment 1
   Assessment Tool: Capstone project art to print
   Assessment Date: Fall 2019
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All
   Number students to be assessed: Random sample of all students with a maximum of one full section.
   How the assessment will be scored: departmentally-developed rubric
   Standard of success to be used for this assessment: 75% of the students will score 75% or greater.
   Who will score and analyze the data: Department Faculty

2. Use open source 3D printing software for programming and parameter controls.
   Assessment 1
   Assessment Tool: Capstone project art to print
   Assessment Date: Fall 2019
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All
   Number students to be assessed: Random sample of all students with a maximum of one full section.
   How the assessment will be scored: departmentally-developed rubric
   Standard of success to be used for this assessment: 75% of the students will score 75% or greater.
   Who will score and analyze the data: Department Faculty

3. Use computer-aided design (CAD) software to create and 3D print a solid model of a part.
   Assessment 1
   Assessment Tool: Capstone project art to print
   Assessment Date: Fall 2019
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All
   Number students to be assessed: Random sample of all students with a maximum of one full section.
   How the assessment will be scored: departmentally-developed rubric
   Standard of success to be used for this assessment: 75% of the students will score 75% or greater.
   Who will score and analyze the data: Department Faculty

Course Objectives

1. Identify tools and process for assembly of 3D printer.
2. Identify safety requirement for assembly.
3. Assemble components for the 3D printer including: Extruder, print head, cooling fan(s), Y-plate, heat-bed, Y-axis assembly, control box, X-carriage, X end idlers, X-end motor, Frame, Graphical LCD controller.
4. Assemble the components into a final assembly.
5. Explore alignment methods to attain perpendicularity between the X-Y-Z axes.
6. Align 3 axes.
7. Download firmware.
8. Identify safety requirements for operation.
9. Run software to align heat plate to axes.
10. Build heat enclosure.
11. Recognize basic G-Code used in moving 3D printer axes and feeders.
12. Learn tools within open source 3D printing software such as Cura.

13. Understand the importance of process parameters including platform heat, head temperature, wire feed, speed and more.
14. Download existing files into open source software for fabrication of parts on their machines.
15. 3D Print sample parts.
16. Explore Inventor CAD software and gain skills at file management, View Control, Geometry Control, creations of solid model, editing.

New Resources for Course

Kit 3d printers for the lab to be purchased with CC step grant monies

Course Textbooks/Resources

Textbooks
Manuals
Periodicals
Software

Equipment/Facilities

Level III classroom
Computer workstations/lab

Reviewer	Action	Date
Faculty Preparer:		
Thomas Penird	*Faculty Preparer*	*Aug 30, 2015*
Department Chair/Area Director:		
Thomas Penird	*Recommend Approval*	*Aug 30, 2015*
Dean:		
Brandon Tucker	*Recommend Approval*	*Oct 06, 2015*
Curriculum Committee Chair:		
Kelley Gottschang	*Recommend Approval*	*Nov 30, 2015*
Assessment Committee Chair:		
Michelle Garey	*Recommend Approval*	*Dec 01, 2015*
Vice President for Instruction:		
Michael Nealon	*Approve*	*Dec 14, 2015*