MET-1270: ADDITIVE MANUFACTURING PROCESSES

Cuyahoga Community College

Viewing: MET-1270 : Additive Manufacturing Processes

Board of Trustees:
January 2020

Academic Term:
Fall 2020

Subject Code
MET - Mech Eng/Manuf Ind Eng Tech

Course Number:
1270

Title:
Additive Manufacturing Processes

Catalog Description:
Fundamental principles and workflow for additive manufacturing production and how it applies to additive manufacturing processes. Product life cycle from cradle to grave, value assessment, materials selection, current market trends, and emerging markets as applied to additive manufacturing.

Credit Hour(s):
3

Lecture Hour(s):
2

Lab Hour(s):
2

Requisites

Prerequisite and Corequisite
MET-1250 Introduction to Additive Manufacturing; and MATH-0955 Beginning Algebra, or appropriate Math placement score.

Outcomes

Course Outcome(s):
Identify in detail the seven additive manufacturing categories: VAT Photopolymerization, Powder Bed Fusion (PBF), Binder Jetting, Material Jetting, Sheet Lamination, Material Extrusion, and Directed Energy Deposition.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):
1. Describe the seven additive manufacturing categories in detail.
2. Determine which additive manufacturing method is the best solution for 3D printing a part.

Course Outcome(s):
Analyze the characteristics of additive manufacturing materials, printing process and post processes of AM parts.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Identify typical materials used in the seven additive manufacturing materials.
2. Identify the best use of materials based on design and intended use of a product.
3. Explain proper handling of AM materials.
4. Describe how to mix 3D printing materials.

Course Outcome(s):

Explain the fundamental principles and workflow for 3D printing while acquiring the skills to identify where additive manufacturing can create value in the lifecycle of a product.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Discuss the fundamental principles and workflow for AM production and how it applies to AM processes.
2. Examine current AM market and uses of AM in multiple industries and emerging trends.
3. Recognize and identify how AM can be used for a product lifecycle, from concept to end-of-life.

Course Outcome(s):

Utilize engineering economic principles to develop plans and analytics for product develop and manufacture.

Objective(s):

1. Create a cost analysis spreadsheet.
2. Assess the value of a part that has been 3D printed.

Course Outcome(s):

Communicate attributes of additive manufacturing technologies and its use for product development and industry solutions for product manufacturing.

Objective(s):

1. Write technical documents and provide data analysis including spreadsheets and charts that effectively communicate solutions to design problems.
2. Research case studies of AM processes used in product development and manufacturing presented in a technical paper, 3D printing, post processes and finishes of parts.

Methods of Evaluation:

1. Problems and assignments
2. Technical reports and documents
3. Final project, including visual presentation
4. Quizzes and/or midterm
5. Final examination
6. Oral presentation

Course Content Outline:

1. Product design, development and 3D printing laws
   a. Intellectual property for additive manufacturing
   b. 3D printing copyright regulations
2. Create project budget
   a. Cost analysis plan
   b. Cost analysis spreadsheet
3. Identifying stakeholders
   a. Recruitment of stakeholders
   b. Potential impact of product design and development for stakeholders using additive manufacturing
4. 3D printing parts that are predesigned

a. Additive manufacturing processes uses for a successful print and longevity of product life
b. Identification of best material to use for 3D printing parts
c. Mix 3D printing materials for printing
d. Post processes of 3D printed parts

5. Communication with industry professionals
   a. Presenting ideas for additive manufacturing processes
   b. 3D printed models
   c. Physical prototypes
   d. Clear verbiage
6. Technical documentation and data analysis
   a. Documentation of additive manufacturing production processes of a product.
   b. Use data to make informative decisions and conclusions

Resources

Chee Kai ChuaKah, Fai Leong. *3D Printing and Additive Manufacturing: Principles and Applications (with Companion Media Pack)* . Fifth Edition. 2017.

Gebhardt, A. . *Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing*. 2nd ed. Cincinnati, OH: Hanser Publications, 2019.

Redwood, B. Scho#ffer, F. and Garret, B. "The 3D printing Hanbook: Technologies, design and applications" Amsterdam, The NEtherlands: 3D Hubs B.V., 2018.

Resources Other

Handouts and materials specified by instructor.

Top of page

Key: 4588