Introduction to Additive Manufacturing

Proposed minimester course (1-0-1)

Prerequisites

MATH 2552 (ODEs), MSE 2001

Description

The course surveys additive manufacturing (AM) processes, materials used in the processes, and their applications. The physical principles underlying the processes are investigated through analytical models and compared with experiments. Students will learn about the 7 classes of AM processes, their physical principles, their capabilities, and some characteristics of commercially available AM machines.

Textbook

Gibson, I, Rosen, D.W., Stucker, B., *Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing,* Second Edition, Springer, 2015.

Topics

- Classes of additive manufacturing processes
- Characteristics of AM processes
- Materials used in each process
- Physical principles underlying each AM process
- Analytical models for selected processes
- Tour of Invention Studio
- Part fabrication experiments

Course outcomes:

Outcome 1: To teach students the basic principles underlying additive manufacturing processes.

1.1 Students will demonstrate a basic technical understanding of the physical principles, materials, and operation of the types of AM processes.

1.2 Students will demonstrate the ability to identify characteristics of parts that are fabricated by AM processes.

Outcome 2: To educate students on how to model and simulate some AM processes to predict the results of material processing operations.

2.1. Students will understand models of material processing phenomena and apply them to simulate AM process operations.

2.2. Students will learn about the relationships between AM process phenomena and part accuracy and surface finish.

Correlation between Course Outcomes and Student Outcomes:

ME 3XXX							
	Mechanical Engineering Student Outcome						
Course Outcomes	1	2	3	4	5	6	7
Course Outcome 1.1	X						X
Course Outcome 1.2	X		X		X		X
Course Outcome 2.1	X						X
Course Outcome 2.2	X		X		X		X

GWW School of Mechanical Engineering Student Outcomes:

(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
(3) an ability to communicate effectively with a range of audiences
(4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Prepared by: David Rosen, 2/25/2019