Syllabus for MATSE 567: Additive Manufacturing of Metallic Materials
Spring 2018

Meeting time: TR 9:05 AM – 10:20 AM
Credits: 4
Location: Online
Course web page: On Canvas

Information on Instructors

Professor: Allison Beese
Office location: 327 Steidle
E-mail: amb961@psu.edu
Office Hours: Tuesdays 10:30-11:30AM

Course Description

This course will expose students to the state of the art in understanding processing, structure, property relationships in materials fabricated using additive manufacturing. The course will focus on metallic alloys, while also showing how the content is applicable to polymers, ceramics, and advanced materials in AM.

Course Goal

To give students a fundamental understanding of and appreciation for the relationships among the complex processing in additive manufacturing, the microstructure of the materials produced, and the properties of these materials.

Course Topics

- Overview of AM
- Feedstock materials
- Energy sources, beam-material interactions
- Molten pool characteristics
- Solidification, defects, solid state phase transformation
- Post-processing, heat treatments
- Mechanics of materials, residual stress, and distortion
- Metals in AM
- Polymers in AM
- Ceramics in AM
- Advanced materials in AM

Course Objectives

The objectives of the course are to enable the students to:

1. Understand the processing techniques used in additive manufacturing of metals, ceramics, and polymeric materials.
2. Identify key processing parameters that influence structure in AM of metallic materials.
3. Explain the effects of processing parameters on the solidification structures seen in AM of metallic materials.
4. Recognize the influence of residual stress in AM of metals.
5. Appreciate the relationship between the structure and the mechanical behavior of materials made by additive manufacturing.

Textbooks

Throughout the course, readings will be assigned and posted on Canvas

The reference textbook for the course is:

"Additive Manufacturing Technologies-Rapid Prototyping to Direct Digital Manufacturing"
Authors: Ian Gibson, David Rosen, and Brent Stucker
Publisher: Springer, 2010
http://link.springer.com/book/10.1007%2F978-1-4419-1120-9

Assessment Tools and Grading Policy

Performance will be assessed using written reviews, presentations, and class participation through discussion boards with the following weighting:

Paper reviews (~5)	25%
Presentations (2)	30%
Written reports (2)	30%
Peer reviews (2)	10%
Class participation	5%

For all assignments, students must contact the instructor *prior* to the due date of the assignment if they are unable to complete the work.

Paper reviews: Papers will be assigned for reading, and students will write critical reviews of the papers.

Presentations: There will be two individual presentations: one that will discuss processing-structure relationships in a selected material system, and one that will discuss structure-property relationships in a selected material system. Details on the format of these presentations will be provided later.

Written reports: To accompany each of the oral presentations, each student will write a report detailing their review of the topic and proposed research. Details on the format of these reports will be provided later.

Peer reviews: You will be assigned one of your peer's written reports to read and provide constructive feedback on for each of the two report assignments. Details on the format of these reviews will be provided later.

Class participation through discussion boards: Your participation in class discussions will be evaluated through the use of (approximately) weekly discussion boards.

Grading scale:

A	93-100%	A-	90-92%	B+	87-89%	B	83-86%
B-	80-82%	C+	77-79%	C	70-76%	D	60-69%
F	below 60%						