Boston University College of Engineering
Department of Mechanical Engineering
www.bu.edu/me

ME 557: ADDITIVE MANUFACTURING SPRING 2025

Instructor: Prof. Keith A. Brown
Office: 8 St. Mary's Street (Photonics), Rm 920
Email: brownka@bu.edu
Phone: 617-353-4841
Office Hours: By appointment

Lecture: MW 12:20-2:05 PM in EPC 204

Lab: Lab is available 24/7 in EPC B05 (code 4242)
Lab office hours will be scheduled by survey in the first week of class

Teaching Assistant: Claire Finkel (cvf3uq@bu.edu)

Course Materials and Resources:

Optional Textbook: "Theory and Practice of Additive Manufacturing" by Tuhin Mukherjee and Tarasankar DebRoy. Wiley Press
Companion to material presented in class

Blackboard: http://learn.bu.edu
Assignments, announcements, lecture slides, and your grades

Gradescope: https://www.gradescope.com/
Submission of assignments

Piazza: https://piazza.com/bu/spring2025/me557
Forum for open discussion between students and instructors

Prerequisites: 3D modeling skills

Description:
This course will teach the fundamentals of Additive Manufacturing (AM), how it is being used in industry to accelerate product development, and its implications on traditional low-volume and high-volume manufacturing processes. Topics will include:

1. Extensive use of fused filament fabrication (FFF) and stereolithography (SLA)
2. Survey of the existing methods of additive manufacturing
3. Methods for designing for additive manufacturing (DFAM)
4. Implications of additive manufacturing in the complete product lifecycle

Course learning objectives:

i. Understand the fundamental principles of AM
ii. Be able to use AM processes including FFF and SLA
iii. Understand and be able to apply principles of DFAM
iv. Understand AM-adjacent methods including reverse engineering and post processing
v. Understand the additive eco-system, its implications, and how it is changing
vi. Create additive designs and evaluate the design and print quality

Grading:

Projects (80%):	Four equally weighted projects throughout the semester
In-class exercises (15%):	Exercises to be completed and submitted during class
Participation (5%):	Based upon overall participation in class

Once grades have been posted for two weeks, regrades will no longer be accepted.

In-class exercises:
Some lectures will feature in-class exercises in which students will be given time to work through exercises or design challenges. The goals of these exercises are to make the lectures more immersive and familiarize students with software tools and techniques. These will be submitted during gradescope by the end of the lecture period. *Note that students may need laptops to complete these exercises*.

Projects:
At four times during the term, students will be asked to complete projects. These will involve additively manufacturing something. Note that the FFF and SLA systems are available 24/7 but will only be staffed during the schedule lab office hours. Completed projects must be physically handed in to Prof. Brown for evaluation by the due date for full marks. Additive manufacturing can be fraught with unexpected delays, so start early. *Note that students will need a USB microSD card reader to operate the printers*.

Policy on collaboration: Collaboration is encouraged on exercises and projects, however students should turn in their own work in their own words.

Classroom Courtesy:
To preserve an open and distraction-free learning environment for all students, students disrupting class or distracting their classmates will be asked to leave the classroom.

Boston University Academic Conduct Code:
Honesty is a core value of Boston University. Any violations of the BU academic honesty and integrity standards ***will be pursued*** through appropriate University channels. This includes, but is not limited to: cheating, plagiarism and misrepresentation. If you have any questions as to what constitutes an honor code violation, please ask. ***Ignorance is not an excuse for cheating***. You may access the BU Academic Conduct Code at:
http://www.bu.edu/academics/policies/academic-conduct-code/

Course Schedule:
The following is a tentative schedule for the course

	Date	Topic	Notes
1	W 1/22	Introduction to Additive Manufacturing	
2	M 1/27	The Digital Workflow	
3	W 1/29	Design for Additive Manufacturing (DFAM)	
4	M 2/3	Fused Filament Fabrication (FFF) part 1	Start project 1: FFF Intro
5	W 2/5	Fused Filament Fabrication (FFF) part 2	
6	M 2/10	Vat Polymerization part 1	
7	W 2/12	Vat Polymerization part 2	
8	T 2/18	Direct Ink Writing	Start project 2: SLA Intro
9	W 2/19	Other Polymer Additive Processes	
10	M 2/24	Metal Additive Processes part 1	
11	W 2/26	Metal Additive Processes part 2	
12	M 3/3	Sensing, Control, and Qualification	
13	W 3/5	Defects in Additively Manufactured Parts	Projects 1 and 2 due
14	M 3/17	Topology Optimization (TO)	Start project 3: Aesthetic
15	W 3/19	Lattices	
16	M 3/24	No Lecture	
17	W 3/26	Digital Twins	
18	M 3/31	Reverse Engineering	
19	W 4/2	Computational Fabrication w/ Emily Whiting	Start project 4: Functional
20	M 4/7	Microstructure and its Control	
21	W 4/9	Post Processing and Properties of AM Parts	
22	M 4/14	Industry Lecture I (Azul3D) – Virtual	
23	W 4/16	Industry Lecture II (Zen Marlin)	
24	W 4/23	Safety, Sustainability, and Economic Issues	
25	M 4/28	Applications – Dentistry	
26	W 4/30	Process Summary	Projects 3 and 4 due