IE 416/MFG 516: Additive Manufacturing
Spring 2023

Class Time and Location: Tuesdays 13:40-16:30, FASS G052
Zoom Meeting: https://sabanciuniv.zoom.us/j/99634075212

Lab: Mondays, 17:40-19:30, FENS L029

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Disclaimer: We may have to revise the course plan according to the countrywide reassessment to be made regarding higher education. This is expected to happen at the beginning of April. The content to be delivered is certain but the method of course delivery, the number and dates of exams, and some other details are subject to change.

Pre-requisite: ENS 209 or Computer Aided Design (CAD) knowledge or permission of instructor

Objective of the course: Learn the fundamentals of Additive Manufacturing processes, their materials, design, path planning and applications of various Additive Manufacturing processes.

Outcomes: At the conclusion of this course, you will be able to:
- Learn various Additive Manufacturing (AM) processes
- Understand the fundamental physical fundamentals of AM processes
- Analyze and optimize Computer-Aided Design (CAD) for AM
- Develop and implement algorithms to generate path plans for AM
- Decide on materials for AM
- Identify capabilities, constrains and limitations of AM processes to decide on best process for a given application

Description:
This course will introduce advanced design and fabrication methodologies in Additive Manufacturing. The Additive Manufacturing is defined as the process of adding materials layer-by-layer to manufacture parts from three-dimensional (3D) computer models. Additive Manufacturing also called Layered Manufacturing, 3D Printing or Solid Freeform Fabrication is considered one of the next-manufacturing revolutions. The topics covered include various additive manufacturing processes and their process principles, the materials used, computer-aided design and path planning for additive manufacturing

processes, process-related limitations and constraints and applications of Additive Manufacturing. The course also includes several related hands-on projects.

Grade Distribution for the course is as follows:

	IE 416	**MFG 516**
Assignments…….....	20%	10%
Projects…….....	40%	35%
Review Paper…….....	N/A	15%
Final Exam	40%	40%
Total…….....	100 %	100%

References:

- Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing by Ian Gibson, David W. Rosen, Brent Stucker
- Fabricated: The New World of 3D Printing by Hod Lipson, Melba Kurman
- Computer Aided Manufacturing, by T.C. Chang, R.A. Wysk, and H.P. Wang 3rd Edition, Prentice Hall, 2006.
- Product Design: Techniques in Reverse Engineering and New Product Development by K. Otto and K. Wood, Prentice Hall, 2001.
- Principles of CAD/CAM/CAE, by K. Lee, Addison-Wesley, 1999.

Topics:

1. Introduction Additive Manufacturing
2. Computer-aided design for AM
3. Reverse engineering
4. Path Planning and optimization AM
5. Different AM processes and physical fundamentals
6. Photopolymerization
7. Powder Processes
8. Extrusion
9. Hybrid
10. Materials for AM processes
11. Applications of AM
12. Tooling
13. Advanced AM Processes