

Syllabus

MECH 5351: Introduction to 3D Engineering and Additive Manufacturing (CRN 27611)

Fall 2023

Time: Monday and Wednesday, 12:00 PM - 1:20 PM

Room: Old Main 211 (ADA Accessible)

INSTRUCTOR(S): Francisco Medina (e-mail: frmedina@utep.edu)
Kurtis Watanabe (e-mail: kiwatanabe@utep.edu)

OFFICE HRS: by appointment

COURSE DESCRIPTION AND GOALS:

MECH 5351 is the first class of the Graduate Certificate in 3D Engineering and Additive Manufacturing (AM). The instruction is targeted towards engineering graduate students, practicing engineers or soon to graduate engineering students seeking exposure to the various Additive Manufacturing technologies for a career in this growing field. This introductory course is intended as an overview of the various aspects of AM, but it also draws comparisons with traditional subtractive, formative, and joining manufacturing processes. Current emphasis is the use of AM techniques for fabrication of functional components. This course will teach the basics of each AM technology including design considerations and strengths and limitations for the processes.

UPON COMPLETION OF THIS COURSE, EACH STUDENT SHOULD BE ABLE TO:

- Provide a comprehensive overview of AM technologies including descriptions of related technologies, design for AM, AM-specific software, and post-processing/part finishing approaches.
- Discuss a wide variety of new and emerging applications.
- Explain the capabilities, limitations, and basic principles of the various AM technologies.
- Evaluate and select appropriate AM technologies for specific applications.
- By the completion of various hands-on activities and projects throughout the semester, students will apply AM techniques (including CAD) in the design and prototyping of components using AM technologies.

TEXTS:

Additive Manufacturing Technologies : Rapid Prototyping to Direct Digital Manufacturing 2nd Ed. by Ian Gibson, David W. Rosen, Brent Stucker, Springer, 2015, ISBN: 978-1-4419-1119-3. **Available online through UTEP's library.**
3D Printing and Additive Manufacturing: Principles and Applications by Chee Kai Chua, Kah Fai Leong, World Scientific Publishing Co., 2015, ISBN: 978-9814571401 (**optional**) (**TS155.6 .C498 2010**)

SOME ADDITIONAL REFERENCES:

1. *Additive Manufacturing* (<https://www.journals.elsevier.com/additive-manufacturing>, an Elsevier journal that covers numerous contemporary research topics in additive manufacturing).
2. *Proceedings of the Solid Freeform Fabrication Symposium*, The University of Texas at Austin, Austin, Texas. (1990 – present), see <http://utwired.engr.utexas.edu/lff/symposium/> for searchable papers from 1990.
3. Wohlers, T., "Wohlers Report 2021: State of the Industry," Wohlers Associates, Annual Worldwide Progress Report, 2022.
4. Liou, F., 2008, *Rapid Prototyping and Engineering Applications: A Toolbox for Prototype Development*, CRC Press, Boca Raton, FL.
5. Hopkinson, N., R. Hague and P. Dickens, Eds., 2006, *Rapid Manufacturing: An Industrial Revolution for the Digital Age*, John Wiley, New York. (**TS171.4 .R34 2006**)
6. Kamrani, A. K. and E. A. Nasr, 2006, *Rapid Prototyping: Theory and Practice*, Springer, New York, NY. (**TS171.4 .R357 2006**)
7. Noorani, R.I., *Rapid Prototyping: Principles and Applications*, John Wiley & Sons, 2005. (**TS155.6 .N66 2006**)

8. Gibson, I., Ed., 2005, *Advanced Manufacturing Technology for Medical Applications: Reverse Engineering, Software Conversion and Rapid Prototyping*, John Wiley & Sons, Chichester, UK.

In addition to the above references, students are encouraged to search current literature on the topic of additive manufacturing since it provides the most current advances and developments in AM. Also, discussion activities will be performed based on assigned readings for journal articles from these sources.

ASSIGNMENT DEADLINES:

All assignments must be submitted on time at the beginning of class the day the assignment is due. **No late assignments will be accepted and a grade of zero (0) will be assigned for any work not delivered on time.**

METHOD OF EVALUATION

Your **grade for this course will be assessed based on your performance in attendance that will count 5%, weekly quizzes, homework, and in-class activities at 15%, projects at 30%, two exams at 30% (each at 15%), and a final exam at 25%**. Attendance in this course is taken at the beginning of each class. To be counted as attending class, you must be present when your name is called – no exceptions. There will be no make-up quizzes, make-up assignments, or make-up work of any kind. Two exams will be given during the semester and a final comprehensive exam. There will be no make-up exams (unless with prior instructor approval because of an extreme circumstance). There will be two to three projects throughout the semester, and no late project work will be accepted.

GRADING

Attendance	5%
Weekly quizzes, homework, in-class activities	10%
Projects	30%
Exams	30%
Final Exam	25%
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Total	100%

Your final grade will be calculated based on the points you have accumulated as follows:

A	≥90
B	≥80 but <90
C	≥70 but <80
D	≥60 but <70
F	<60

The instructor reserves the right to revise this grading plan. However, students will be informed of any changes during the semester.

*** For further class policies, please refer to the MECH 5351-Class Addendum**

COVID-19 PRECAUTIONS

Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you have tested positive for COVID-19, prior to, after, and/or during your time enrolled in your course(s), you are highly encouraged to report your results to covidaction@utep.edu as well as ppp@utep.edu.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that we can take care of ourselves and others is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.