MECH 6343 (CRN 27981): Advanced Manufacturing (3D Printing)
Spring 2017 - TTh, 3:00-4:20 PM
LART Room 305

INSTRUCTOR: Dr. César A. Terrazas (e-mail: caterrazas2@utep.edu)
OFFICE HRS: MW 4:30 PM-5:30 PM or by appointment

Course Description and Goals:
The course, Advanced Manufacturing (3D printing), deals with various aspects of additive, subtractive, and joining processes to form three-dimensional parts with applications ranging from prototyping to production. 3D Printing (3DP) or Additive manufacturing (AM) technologies fabricate three-dimensional (3D) parts using layer-based manufacturing processes directly from computer-aided-design (CAD) models. A major current emphasis of AM is on using these technologies in direct manufacturing of end-use parts. In this course, you will learn about a variety of AM and other manufacturing technologies, their advantages and disadvantages for producing both prototypes and functional production quality parts, and some of the important research challenges associated with using these technologies.

Upon completion of this course, each student should be able to:
- Provide a comprehensive overview of 3D Printing technologies including descriptions of related technologies including design and 3DP-specific software and post-processing/part finishing approaches.
- Discuss the wide variety of new and emerging applications like micro-scale 3D, medical applications, direct printing of electronics and directly manufacturing end-use components.
- Explain the capabilities, limitations, and basic principles of alternative 3DP technologies.
- Evaluate and select appropriate 3DP technologies for specific applications.
- By the completion of at least 3 assigned projects through the semester, students will apply 3DP techniques (including CAD) in the design and prototyping of components using AM technologies.
- Identify, explain, and prioritize some of the important research challenges in 3DP.

TEXTS:


SOME ADDITIONAL REFERENCES:
In addition to the listed references, students are encouraged to search literature on the topic of additive manufacturing since they provide the most current advances and developments in AM and these could be helpful for a broader understanding of the subject. Two particular repositories recommended, which are accessible through the UTEP’s network, are:

1. www.sciencedirect.com
2. www.springerlink.com

ATTENDANCE AND CLASS PARTICIPATION:
Attendance in class is mandatory because the required information will be delivered during regular class time and there will be frequent in-class quizzes and group activities. No make-up classes will be offered so it is important that you attend class. The instructor reserves the right to automatically **drop students having more than three unexcused absences**. Attendance can be checked by the instructor through quizzes, exams, roll calling, randomly picked names to participate in class, or other mechanisms.

Participation in this class will also consist of a minimum of two (2) student presentations. Each graduate/doctrinal student should present on his/her research topic and how the subject of 3D printing might be applicable to that research, or on a current research topic within 3D printing, on two different dates. Presentations will run for 15 minutes with 5 minutes available for questions. Points will be deducted for deviations from this timing. Also, students will participate by asking questions to their peers on the subject delivered in each presentation. A minimum of 3 questions shall be asked per student throughout the semester. The subject of these presentations will also be considered material for exams. Students will be informed they are to present one week in advance and they are to provide the title of their presentation to the instructor at the latest on the previous class.

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.**

ACADEMIC DISHONESTY:
Scholastic dishonesty is the attempt of any student to present the work of another as his or her own work, any work which he or she has not honestly performed, or attempting to pass any examination by improper means. Scholastic dishonesty is a serious offense and will not be tolerated. **Appropriate University policies and procedures will be followed for suspected scholastic dishonesty.** You are encouraged to discuss any aspect of the course with classmates and project team members, but do not plagiarize the work of others by copying from the web, other students, articles, or other sources without properly referencing your sources.

GRADING
Your grade for this course will be assessed based on your performance in quizzes (20 %), exams (40%) and three projects (40%). A minimum of five quizzes will be given throughout the semester. The content of a quiz could be the materials covered in previous sessions or to be covered that day. There will be no make-up quizzes. Three exams will be given during the semester. Make-up exams will be given only for extremely credible reasons. There will be three (3) projects through the semester. No late work will be accepted for project’s work and deliverables.

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

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<tr>
<th>Grade</th>
<th>Points</th>
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<tr>
<td>A</td>
<td>&gt;90</td>
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<td>B</td>
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<td>F</td>
<td>&lt;60</td>
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The instructor reserves the right to revise this grading plan. However, students will be informed of any changes during the semester.

TENTATIVE WEEKLY TOPICS

1. Introduction/historical perspective of Adv. Manufacturing - 3D Printing or Additive Manufacturing (AM)
2. Standards for Additive Manufacturing, Generalized AM Process Chain
3. Software for AM, Data Sources, File Formats, Model Repair
4. AM Technology – Material Extrusion, Desktop systems, Direct Write
5. AM Technology – Vat Photopolymerization, Principles of Photopolymerization
6. AM Technology – Binder Jetting, Inkjet Technology (EXAM 1)
7. AM Technology – Material Jetting, Inkjet Technology
8. AM Technology – Sheet Lamination, Ultrasonic Consolidation
9. AM Technology – Directed Energy Deposition, Sintering, Powder Production Techniques
10. AM Technology – Powder Bed Fusion Technologies
11. Design for Additive Manufacturing, Direct Digital Manufacturing, Distributed Manufacturing, (EXAM 2)
12. 3D Scanning, Reverse Engineering, Metrology
13. Traditional Material Processing Techniques, Casting, Injection Molding, Forging, PM
15. Advanced Research in AM, Topology Optimization, Cellular Structures
16. Inspection Techniques, Non-Destructive Testing for AM (EXAM 3)

*Schedule is tentative and it is subject to change