MTSE 5800
Special Studies in Materials Science (Credit)
Additive Manufacturing: Processes and Materials Science Fundamentals
Fall Semester 2018 – 3 credit hours

Instructor: Dr. Raj Banerjee / Co-Instructor: Dr. Narendra Dahotre
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Office Hours: Walk-in or e-mail to make appointment
Lecture: Tuesdays, 2:30 p.m. – 5:20 p.m. (can be scheduled differently as necessary)
Location: UNT Discovery Park, Room D207A
Lecture Notes will be provided (uploaded on UNT Blackboard)

COURSE INFORMATION

Goals / Learning Objectives: Additive manufacturing is the formalized term for what used to be called rapid prototyping and what is now popularly called 3D Printing. For the present class, the fundamentals of additive manufacturing processes will be discussed within the context of the traditional manufacturing life cycle. The broad range of additive manufacturing processes, devices, capabilities and materials that are available will be discussed in this course, and the various tradeoffs that must be made in selecting additive manufacturing processes, devices and materials to suit particular product requirements will also be addressed. The course will also cover some basics of heat and mass transfer associated with AM processes, fundamentals of casting and its relationship to AM, and the broad physical metallurgy of AM processed metals and alloys.

Prerequisites: MTSE 3000 (Introduction to Materials Science and Engineering) or equivalent

Examinations, Projects, and Grading (tentative): There will tentatively be two in-class written exams and one final project. Tentatively, the overall grading will be as follows.

Exam I: 25%
Exam II: 25%
Final project: 50%

Makeup Exam Policy: If a student cannot take the exam on the scheduled date due to some unavoidable circumstances, such as out of town business trip, sickness, etc., then he/she must notify the instructor in writing before the scheduled exam time to schedule a makeup exam.

Class Attendance is Mandatory. Please notify me if you have to miss a class or will be late.
**Academic Integrity** – Plagiarism and cheating will NOT be tolerated. Please see UNT academic manual for the definition of plagiarism. Any student caught cheating will be given an overall F grade (Fail). When in doubt please ask me.

**Topics to be covered**

- Introduction and Basic Principles of Additive Manufacturing (AM): History, Terms, Classification, Merits/Demerits, Current Status
- AM Processes based on Materials (Polymers, Metals, Ceramics)
- Categories of AM Processes (Powder bed fusion, Directed energy deposition using powders and wire based feed)
- Aspects of Materials Science relevant to Additive Manufacturing
  - Fundamentals of metals solidification
  - Solid-solid transformation
  - Defects - Texture, porosity, residual stresses
- Applications, Economics, and Future Direction