

MECH 5390/6390

**Special Topic: Ceramic and Polymer Materials Modeling and Manufacturing**  
Course Syllabus

**Instructors:** Yirong Lin, Ph.D.  
**Locations:** LART 305  
**Time:** TRs 1:30 – 2:50 pm  
**Offices:** Engineering A 111, or MS Team  
**Office Hours:** TRs 3:30 pm to 4:30 pm, Team  
**Email:** ylin3@utep.edu

**Textbook:** Optional

- Leo, Donald J. *Engineering analysis of smart material systems*. John Wiley & Sons, 2007
- Kohlgrüber, Klemens, ed. *Co-Rotating Twin-Screw Extruders: Fundamentals*. Carl Hanser Verlag GmbH Co KG, 2019

**Course Objective:**

This course focuses on several smart ceramic materials including piezoelectric, pyroelectric, thermoelectric, and their application in engineering systems such as sensing and actuation. In addition, polymer processing and rheology and their application in polymer processing will be discussed. The course content includes lectures, technical presentation, literature search, and presentation to enrich the learning outcome.

**Course Contents:**

- Course Introduction and overview
- Piezoelectrics, fundamental, modeling, and engineering applications
- Pyroelectric and thermoelectric materials
- Polymer rheology
- Polymer processing

**Project:**

Hands-on projects related to smart materials such as piezoelectric and/or pyroelectric will be covered. In addition, a literature search presentation project on the current state of the art of ceramic and polymer materials will be carried out at the end of the semester. Both projects are individual-based.

**Grading:**

- **Quiz:** 2 quizzes (20%),
- **Exam:** 2 Exams (50%),
- **Project report:** 1 report (20%),
- **Presentation:** 10-minute presentation/person (10%).
  - For 6390, an additional mini-review is needed as 10% of credits, in addition to all of the above.