

**MSE 480 – Advanced Characterization Methods in MSE**

**Credits and contact hours:** 3 credits and 45 contact hours.

**Indicate: math, basic science, engineering topic or other** Engineering topics

**Instructor's or course coordinator's name:** Dr. Pierre Lucas

**Textbook, title, author and year:** ASM Metals Handbook, 9<sup>th</sup> edition, vol. 10, "Materials Characterization."

**Other Supplemental materials:** none

**2016-2022 catalog description:** An introduction, through a combination of lectures and equipment demonstrations, to both established and new techniques for microstructural characterization of materials.

**Prerequisites:** None

**Co-requisites:** None

**Required, Elective, or Selected Elective:** Required

**Instruction Outcomes:**

1. Understand principles of various materials characterization techniques
2. Compare advantages and disadvantages of each technique to the relevant ones
3. Identify the most suitable technique to provide the information you need for your samples
4. Recognize practical consideration and limitations of each technique
5. Improve your technical communication skills (MSE580)

**Student Outcomes –**

**Listed in Criterion 3 or any other outcomes are addressed by the course:**

To produce graduates who can:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- an ability to communicate effectively with a range of audiences.
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.

**Topics covered:**

1. Materials Properties and Microstructures (2)
2. Probing Mechanisms for Materials Analysis (3)
3. Light-Matter Interactions (3)
4. Optical Spectroscopy (2)
5. Characterization of Optical Properties of Materials (2)
6. Vibrational Spectroscopy and Raman (3)
7. FTIR/Raman Lab Visit (1)
8. AFM and related techniques + Demo (3)
9. XRD principles and instrumentation (3)
10. XRD Lab Visit (1)
11. TEM/FIB principles and instrumentation (3)
12. TEM/FIB Lab Visit (1)
13. SEM principles and instrumentation (2)
14. SEM/EDS Lab Visit (1)
15. EDS/EMP principles and instrumentation (4)
16. EMP Lab Visit
17. LEAP principles and instrumentation (2)
18. Graduate Presentations (3)