

MSE 110 – Solid State Chemistry

Credits and contact hours:	4 credits and 60 contact hours.
Indicate: math, basic science, engineering topic or other	Basic Science
Instructor's or course coordinator's name:	Pierre Lucas, Andrew Wessman and Douglas Loy
Textbook, title, author and year:	W. Callister. <i>Materials Science Engineering, an Introduction</i> , John Wiley & Sons, 2018.
Other Supplemental materials:	<i>Departmental MSE 110 Textbook available on CD.</i>
2020-2021 catalog description:	Fundamental principles of the chemistry of condensed states of mater including metals, polymers, molecular solids and ceramics.
Prerequisites:	CHEM 151 or CHEM 105A/106A.
Co-requisites:	None
Required, Elective, or Selected Elective:	Required
Instruction Outcomes:	Upon successful completion of MSE 110, the student will be able to: <ul style="list-style-type: none">• To gain an understanding of how the chemical structure of materials determine their properties, including electrical, optical and mechanical properties.• Provide a broad basis of solid state chemistry concept to prepare for later more detailed treatments in upper division

classes.

- To practice teamwork and report writing skills. The grade is partially determined by individual laboratory reports.

Student Outcomes – Listed in Criterion 3 or any other outcomes are addressed by the course:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- an ability to communicate effectively with a range of audiences.
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.

Topics covered:

- Quantization and Atomic Structure (8)
 - Wave particle duality; Bohr's Atom; The periodic table
- Bonding and properties (12)
 - Ionic, Covalent, Metallic and VderW bonding; Band structure, conductivity; Intrinsic and extrinsic Semiconductors
- Crystalline Structures (14)
 - Crystalline sites; Crystal types; Crystal lattices; XRD; Miller indices
- Optical properties (9)
 - Absorption, optical window and impurities; Reflection; Refraction; Optical fibers and lasers
- Electrochemistry (11)
 - Redox reactions; Standard redox potential; Corrosion
- Electrochemical cells