Purdue University
School of Materials Engineering

MSE 235 Materials Properties Laboratory Fall 2015

Instructors: Prof. Kendra Erk and Prof. Aisling Coughlan

Text: - Callister and Rethwisch, "Materials Science and Engineering, an Introduction"
- Montgomery, Runger, and Hubele, **"**Engineering Statistics"
- Van Aken and Hosford, "Reporting Results"

Goals: The goal of this course is to introduce students to the relationship between structure and properties in materials and provide basic tools that will be employed and built upon in future courses in materials engineering. At the completion of this course the students will have completed course and laboratory work providing the following skills and tools:

1. Ability to recognize and concisely describe molecular, network and crystal structures, crystallographic terminology and symmetry in different crystalline and non-crystalline materials.
2. Have experience in direct and indirect approaches for assessing microstructural features and related properties in various materials.
3. Introduction to elasticity and its relationship to crystal structure and microstructure in materials.
4. Ability to relate specific microstructural features to macroscopic properties.
5. Develop some sense of measurement, process, and performance variability. Be able to identify statistical significance.
6. Learn how to obtain technical information and use it correctly in technical reports.
7. Develop skills to represent engineering data in graphs and tables and write technical reports.

WEEK	THEME	TECHNIQUES/SKILLS	REQUIRED READING
1	Material Properties	Archimedes method for density, histogram and basic statistics, graphical displays in OriginPro	3.1-3.5 Engr Stats 74-84 Reporting Results 82-91
2, 3, 4, 5	Identification and Structures of Crystalline and Amorphous Materials	x-ray diffraction, infrared spectroscopy, crystal plane visualization, optical microscopy	3.7-3.12 (metals) 3.13-3.16 (+XRD) 12.1-12.3 (ceramics) 14.1-14.12 (polymers)
6, 7	Mechanical, Electrical, and Thermal Properties of Metals	Nanohub computer simulation, tensile testing, hardness testing, electrical resistivity, furnace operation, temperature measurement, thermal couple construction	6.1-6.8, 6.11 18.1-18.13
9, 10, 11, 12	Mechanical Properties of Polymers Phase Diagrams and Microstructure Strengthening Mechanisms of Metals	tensile testing, hardness testing, metallographic sample preparation, optical microscopy	15.1-15.6 9.1-9.12 7.1-7.13
13	Failure Properties of Materials	Charpy impact test, 3- and 4-point bend measurement, Weibull distributions	8.1-8.6, Report Results (Weibull)