

ESG 332 MATERIALS SCIENCE I: STRUCTURE & PROPERTIES OF MATERIALS (REQUIRED)

Credit: 4

COURSE CATALOG DESCRIPTION:

A study of the relationship between the structure and properties of engineering materials and the principles by which materials' properties are controlled. The structure and the structural imperfections in simple crystalline materials and the role that these factors play in defining electrical conductivity, chemical reactivity, and mechanical strength/ductility are considered. The molecular structure of polymers is discussed and related to the behavior of plastics, rubber, and synthetic fibers. The principles of phase equilibria and phase transformations in multi-component systems are developed. These principles are applied to the control of the properties of semi-conductors, commercial plastics, and engineering alloys by thermochemical or thermomechanical treatment. Corrosion, oxidation, and other deterioration processes are interpreted through the interaction of materials with their environment.

PRE- OR CO-REQUISITE(S): ESG 198 or CHE 131 or 141 and ESG 302

TEXT(S) OR OTHER REQUIRED MATERIAL William D. Callister, Materials Science and Engineering: An Introduction, 9th Edition, 2015, Wiley, ISBN# 978-1118319222 (Other versions, ISBN# 978-1119062431, ISBN# 978-1118324578, & ISBN# 978-1118477700 are also fine.)

COURSE LEARNING OUTCOMES	SOs	ASSESSMENT TOOLS
Knowledge of underlying atomic and crystal structures of materials	a,e,h,j,k	Written examinations
Knowledge of influence of atomic and crystal structures upon materials properties	a,e,h,j,k	Written examinations
Understanding of how materials are designed to meet performance criteria	a,c,e,h,i,j,k,f	Written examinations

COURSE TOPICS:

Week 1. Why study MSE?/ Atomic Structure and Interatomic Bonding

Week 2. Fundamentals of Crystallography/ Structure of Crystalline Solids

Week 3. Structure of Crystalline Solids (Cont'd)

Week 4. Imperfections in Solids/ Diffusion

Week 5. Mechanical Properties of Metals

Week 6. Dislocation and Strengthening Mechanisms/ Failure

Week 7. Phase Diagrams

Week 8. Phase Transformations

Week 9. Properties, Applications, and Processing of Metals

Week 10. Properties, Applications, and Processing of Ceramics

Week 11. Structures, Characteristics and Applications, Processing of Polymers

Week 12. Composite Materials

Week 13. Electrical Properties including Materials for IC Package

Week 14. Corrosion and Degradation of Materials/ Economic, Environmental, & Societal Issues in MSE

CLASS/ LABORATORY SCHEDULE:

ESG	332	Materials Sci I: Struct & Prop	LEC	1	TUTH	10:30 AM	11:50 AM
			REC	R01	RETU	12:30 PM	01:23 PM
		Mid-term	Exam	1	Oct. 17	10:30 AM	12:00 NN
		Final	Exam	1	Dec. 17	09:30 AM	11:30 AM

CURRICULUM

This course contributes 4 credit hours toward meeting the required 48 hours of engineering subjects.

STUDENT OUTCOMES (SCALE 1-3):

A	B	C	D	E	F	G	H	I	J	K
3		2		3	2		3	2	3	3

3 – Strongly supported

2 – Supported

1- Minimally supported

LEAD COORDINATOR(S) WHO PREPARED THIS DESCRIPTION AND DATE OF PREPARATION:

Clive Clayton 05/17/10

GRADING POLICY (ASSESSMENT RUBRICS)

Mid-term Exam 30% (10:30-11:30 Thursday, Oct. 17, 2019)

Final Exam 40% (10:00-11:20 Tuesday, Dec. 17, 2019)

Quizzes 10% (for twice, 5% each)

Assignments (Homework) 10%

Attendance 10%

CALCULATOR POLICY (following NCEES POLICY)

The only calculator models acceptable for use during the 2018 exams are as follows.

Casio: All fx-115 and fx-991 models (Any Casio calculator must have “fx-115” or “fx-991” in its model name.)

Hewlett Packard: The HP 33s and HP 35s models, but no others.

Texas Instruments: All TI-30X and TI-36X models (Any Texas Instrument calculator must have “TI-30X” or “TI-36X” in its model name.)

OFFICE HOURS

Tuesday, 1:30 - 2:30 PM

Revised 08/16/19 at SUNY Korea by Ohyang Kwon, Instructor