ESG 325 DIFFRACTION TECHNIQUES & STRUCTURE OF SOLIDS (ELECTIVE)

Credit: 3

Course Catalog description:

X-ray diffraction techniques are emphasized. Topics include coherent and incoherent scattering of radiation, structure of crystalline and amorphous solids, stereographic projection, and crystal orientation determination. The concept of reciprocal vector space is introduced early in the course and is used as a means of interpreting diffraction patterns. Laboratory work in X-ray diffraction patterns is also included to illustrate the methods.

PRE- OR COREQUISITE(S): ESG332 Materials Science I: Structure and Properties of Materials

TEXT(S) OR OTHER REQUIRED MATERIAL: Leonid V. Azaroff, Elements of X-Ray Crystallography, 1990, CBLS Pub., ISBN: 1878907115

COURSE LEARNING OUTCOMES	SOS	ASSESSMENT TOOLS
an ability to apply knowledge of mathematics, science and engineering	a	Homeworks, Examinations
an ability to design and conduct experiments, as well as to analyze and interpret data	b	Laboratory Projects
an ability to function on multi-disciplinary teams	d	Laboratory Projects
an ability to identify, formulate, and solve engineering problems	e	Homeworks, Examinations
an understanding of professional and ethical responsibility	f	Quizzes
an ability to communicate effectively	g	Oral Presentation
the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context	h	Homeworks
an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	k	Laboratory Projects, Homeworks, Examinations

COURSE TOPICS:

Weeks 1 &2. Description of nature and properties of X-rays: Production of X-rays, X-ray sources: Detection of X-rays.
Weeks 3 & 4. Elementary theory of diffraction;- Analysis of directions of diffracted beams - Bragg approach and Von Laue approach.
Weeks 5 & 6. Elementary Crystallography;- Symmetry Elements, Point Groups, Space Groups, Vector Analysis in Non-Orthogonal Systems, Theory of Matrix Transformation Between Lattices.
Weeks 7 & 8. Experimental methods: Powder Technique, Laue method, Use of Diffractometer.
Weeks 9 & 10. Intensities of diffracted beams: Scattering from single electron, atom, unit cell, small crystal - the kinematical theory of x-ray diffraction.
Weeks 11&12. Analysis of assumptions and validity of the kinematical theory - the dynamical theory of x-ray diffraction.
Weeks 13&14. X-ray topography.

CLASS/ LABORATORY SCHEDULE:

ESM	325	Diffr Tech & Structr of Solids	LEC	1	TUTH	9:50 AM	11:10 AM

CURRICULUM

This course contributes 3 credit hours toward meeting the required 48 hours of engineering topics.

STUDENT OUTCOMES (SCALE 1-3):

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

3 – Strongly supported **2 – Supported** **1- Minimally supported**

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

M. Dudley 7.13.2010