In the name of God

Course Outline

Semnan University
Faculty of Materials and Metallurgical Engineering

2nd semester 2018/2019

updated on 01/23/2019

Course: Modern Analytical Methods		No. of units: 2	Level: Undergraduate
Lecturer: Dr. Habibollahzadeh		Pre-request:	
Internal Phone No: 3383			
Email: ahabibolahzadeh@semnan.ac.ir		Website: http://ahabibolahzadeh.profile.semnan.ac.ir	
Hours per week: 2		Class No:	
Scope: Introduction to instrumental analytical methods; SEM, XRD, XRF, XPS, ICP-AES			
Assessment	Class activities	Quiz	Final exam
Percent	5% +unlimited extra credit for additional activities	15%	80%
References: Electron Microscopy and Analysis, Goodhew and Humphreys Elements in x ray diffraction, Cullity			

Schedule

Educational week	Topics	Notes
1	Introduction: instrumental analysis *vs* wet chemical analysis, comparison between optical and electron microscopes	
2	Scanning electron microscope (SEM); configuration of SEM , electron gun types and functioning, various lenses and their functioning	
3	SEM; interaction between electron and material, elastic and inelastic interactions	
4	SEM; interaction between electron and material, various inelastic interactions	
5	SEM; imaging by back scattered and secondary electrons	Quiz
6	SEM; characteristic and bremsstrahlung x-ray, EDS and WDS detectors	
7	SEM; dot analysis, line scan, and mapping, Auger electron, cathodoluminescences effect	
8	Introduction to XRD; generation of x-ray, various analytical methods using x-ray source	
9	Linear and mass adsorption of x-ray, filtering of x-ray, x-ray diffraction (XRD), Bragg law, monochromator	Quiz
10	XRD; configuration of XRD instrument, sample preparation, XRD graph	
11	XRD; interpretation of XRD graphs, indexing of the peaks	
12	XRD; parameters affecting intensity and location of the peaks, quantitative analysis	
13	XRD; extracting various data from XRD graph, selection of proper anode in x-ray tube	Quiz
14	X ray fluorescence (XRF); set up and functioning of the instrument, data from XRF	
15	Xray photoelectron (XPS); set up and functioning of the instrument, data from XPS	
16	Inductively coupled plasma (ICP)-atomic emission spectroscopy (AES), Quantometer	