Course Syllabus Winter 2012

MATE 510
Materials Analysis

Section 510-01: Mon/Fri 2:10 – 4:00 PM Bldg 5, Rm 225

Instructor
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Office Hours: Tues/Thur 2-5 PM

Course Objective:

In today's world there are many fields of technology that rely on the properties of a material's surface in order for engineering designs to meet their functional requirements. Examples include biotechnology, nanotechnologies, energy systems, structural systems, photonics, electronics and aircraft. In many cases it is the surface composition and morphology of materials that impacts their most important properties. We will explore the basic principles behind a wide range of analytical techniques for characterizing surface as well as bulk properties and interpreting the complex data generated by these analysis techniques.

Instructional Materials:

Textbook: John Vickerman, Surface Analysis – The Principle Techniques, John Wiley & Sons
2nd Edition, 2009; ISBN: 978-0-470-01763-0

Resources: Ray Egerton, Physical Principles of Electron Microscopy, Springer, 2005
ISBN: 978-0387-25800-0

Skoog, Holler & Crouch, Principles of Instrumental Analysis, 6th Edition, Brooks/Cole, 2007
ISBN: 978-0-495-01201-6

Proposed Schedule: (*Subject to change by Instructor*)

Week	Topics	Text
1	Introduction	Chapter 1
2	Vacuum Systems	Appendix 1
3	Electron Microscopy: TEM & SEM	Egerton
4	ESCA-XPS	Chapter 3
5	AES	Chapter 2
6	SIMS & Molecular Mass Spectrometry	Chapters 4 & 5 Skoog, Holler & Crouch
7	SPM & LCFM	Chapter 9
8	XRF & ICP-AES	Skoog, Holler & Crouch
9	Raman & FTIR	Chapter 7 Skoog, Holler & Crouch
10	Analysis Decision Matrix	
	Comprehensive Final	

Deliverables

Each week there will be activities in class that enable us to practice applying the concepts presented in the lectures. One of the main objectives of the course will be to develop a decision matrix or flow chart that will enable us to determine which technique to select when attempting to solve a material analysis problem. There will be two tests and a final to help assess your mastery of the principles behind these analysis techniques. In addition, we will conduct a virtual lab analysis project involving SIMS with UCSB's Materials Research Lab.

Grading

Activities*	= 50 points
Tests (2 x 50 pts)	= 100 points
Decision Matrix	= 25 points
Virtual SIMS Report	= 25 points
Final	= 100 points
Total = 300 pts	

* All assignments must be turned in on time to receive full credit, 10% penalty per day if late.

Classroom Civility

- ✓ **Attendance to all class sessions is mandatory & please be on time**
- ✓ **Please no disruptions in class like socializing (talking)**
- ✓ **No food or drink (water is OK) in classroom**
- ✓ ***Please Silence all cell phones, iPhones, Blackberry, etc.***
- ✓ ***No texting or use of notebook PCs during class***