**Applied Microscopy in Research; CHM 483/583 BSC 482/582** 4.0 credit hours  Spring 2008

This course consists of 2 parts; 1- an introduction to the theory of operation of light, electron and scanning probe microscopes  2-application of imaging systems/instrumentation to a student research project.  This course is intended to give students a hands-on research experience and a general familiarity with research microscopy.  Enrollment in this course requires instructor permission (based on evaluation of student preparation and viability of student project).

**Faculty:**
Dr. Mike Norton (S-478), 696-6627, norton@marshall.edu, meeting by arrangement
Non-faculty lecture/lab:
David Neff (BTSC-107), 696-3569, dneff@marshall.edu, office hours MWF 8:30-9:30 and by arrangement

**Texts:**

Course lectures will be posted on line.  [http://www.science.marshall.edu/dneff/](http://www.science.marshall.edu/dneff/)
Supplemental for fluorescence microscopy (not tested, for student benefit)

**Lecture:**  MWF 10:00-10:50 BBSC room 107.  Lecture attendance is required during entire semester and will be considered in grading as described below.

**Lab:**  The first 6-7 weekly lab meetings will be arranged by us and by consensus at first class meeting.  Following these group meetings, lab time will be arranged by students, please schedule at least 2 hours collection and processing of image data (for your project) per week on appropriate instrumentation.
Lab reports for weeks 1-6 should include sections titled; **introduction/goals**, **instrumentation/methods**, **results/discussion**.  These lab reports should include a micrograph with a descriptive figure legend and scale information.  Good lab reports also usually include a diagram or drawing (sometimes, a picture is worth a thousand words).  Lab reports are due the Monday following the lab session.

**Grading:**  undergraduate and graduate credit:
Project 60%  (Literature review, project idea presentation, and intro. 10%, scheduled weekly instrument usage 10%, scheduled progress reports 10%, SigmaXi research day report layout 10%, report content 20%)  Non-project 40%  (10% midterm exam, 5% final exam, 10% quizzes and attendance, 15% lab reports)

**Masters Projects:**  The masters students will be expected to perform comparative, quantitative image analysis of their sample.  This will include use of analysis software and possibly instrumental calibration.  For full credit, the masters students must prepare a brief but formal operating procedure so their analytical techniques can be carried out by others doing similar work.

**Schedule:**

week of 1/14/2008  lab: intro. to computer station software/hardware and digital image information.
read: Goldstein1 & 2 (selected parts), Murphy 1
1/14-18 lecture: introduction to course, introduction to instrumentation and basic terminology, lab schedule setup, introduction to microscopic techniques and instrumentation at Marshall U, brief history.
1/21 MLK day, no classes Monday
week of 1/21  lab: SEM basic imaging skills / SEM beam parameters.
read: project database searches, literature review
1/21-1/25 lecture: student project discussion, student presentation of project ideas (10 min. max/student with discussion, have at least one reference with hard copy for instructor)

week of 1/28  lab: SEM beam parameters / SEM image quality and contrast.
read: Goldstein 3-4 (selected), Murphy 2,3,4 (selected)
1/28-2/1 lecture: specimen labels & contrast, probe / specimen interactions in light micr., EM, fluorescence CSLM, and AFM

week of 2/4  lab: EDS (x-ray spectroscopy with SEM)
read: Goldstein 6&7 (selected)
2/4-2/8 lecture: microscope probe formation and control SEM & CSLM, and AFM

week of 2/11 lab: light microscopy and CSLM, basic confocal technique
read: Murphy 5&6 (selected) Murphy 11&12
2/11-2/15 lecture: image formation AFM, SEM, CSLM, and the eye, resolution (in space, time and energy)

week of 2/18 lab: CSLM optimize and process images
2/18-2/22 lecture: top down overview of SEM, CSLM, and AFM

week of 2/25 lab: atomic force microscopy on PacificNanotecnology NanoR
2/25-2/29 lecture: Review & 2 day Midterm exam (exam will be on Wednesday & Friday, it covers reading, lecture and labs)

week of 3/3 lab: begin student projects, instrument scheduling by students
3/3-3/7 lecture: Student projects; introduction, materials and methods

week of 3/10 lab: student projects, instrument scheduling by students
3/10-3/14 lecture: Student projects; progress, problems and preliminary results, Student presentations; introduction, materials and methods (powerpoint style presentation recommended, 10 min. max/student)

week of 3/17 lab: student projects, instrument scheduling by students
3/17-3/21 lecture: Student projects; progress, problems and results & Dr. Wang, intro. to TEM
1st draft abstracts due

Week of 3/24: spring break 2008

week of 3/31 lab: student projects, instrument scheduling by students
3/31-4/4 lecture: Student projects

week of 4/7 lab: student projects, instrument scheduling by students
4/7-4/11 lecture: web page preparation (by Al Goble Marshall University web administrator)
Student projects; results and discussion, final draft abstract due

week of 4/14 lab: student projects-final week for data collection and analysis
4/14 -4/18 lecture Student projects; results and discussion

week of 4/21 lab: class projects, posters must be ready to print
4/21- 4/25 lecture: Student presentations, practice poster presentations

week of 4/28 Sigma Xi research day week (troubleshoot and hang posters, web page preparation)
4/28-4/30 lecture’ final preparation and practice, web page preparation
5/2 Sigma Xi research day, all must be present with posters during event (this date is tentative)

week of 5/5: web page due, final exam week

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See below for MU links.
Disabled services: http://www.marshall.edu/disabled/
Academic dishonesty: http://www.marshall.edu/icob/fold/Policy/Academic_Dishonesty_Policy.pdf
Computing use policy: http://www.marshall.edu/ucs/CS/acceptuse.asp
Other MU policy: http://musom.marshall.edu/students/policies/