

**Cedar Crest College**  
**Master of Science Program in Forensic Science**

**Instructors:** Jacqueline Speir, M.S.  
Brian Gestring, M.S.  
Lawrence Quarino, Ph.D

**Course Title:** Advanced Microscopy, FSC 513

**Prerequisites:** CHE 347 or equivalent

**Course Description:** An advanced study in the theory and practical application of microscopy methods. The course will focus on polarized light, fluorescence and scanning electron microscopy. Emphasis will be placed on spectroscopic methods that can be interfaced with microscopy such as micro-FTIR, microspectrophotometry and x-ray microanalysis. Additionally, digital imaging and photomicrography will be discussed.

**Course Objectives:**

1. To ensure that students understand the fundamentals of microscopic methods typically used in forensic science.
2. To ensure that the students understand the fundamentals of spectroscopic methods of microanalysis.
3. To ensure that students understand the fundamentals of photomicrography and digital imaging.
4. To ensure that students understand the utility of microscopy in the analysis of all types of trace evidence.

**Course Outcomes:**

1. Students will understand the fundamentals of microscopic methods typically used in forensic science.
2. Students will understand the fundamentals of spectroscopic methods of microanalysis.
3. Students will understand the fundamentals of photomicrography and digital imaging.
4. Students will recognize the utility of microscopy as a primary method of analysis for a variety of trace evidence.

**Course Content Outline**

<i>Topic</i>	<i>Instructor</i>	<i>Date</i>
<b>I. Review of Polarized Light Microscopy</b>	<b>Speir</b>	<b>1/12/08</b>
A. Refractive Index		
B. Reason for Anisotropy		
C. Uniaxial Unknown Lab Exercise		
D. Birefringence Lecture		
E. Lab Exercise on Birefringence		
F. Sign of Elongation (SOE)		
G. Lab Exercise on SOE		
H. TATP & Conoscopy		
<b>II. Digital Photomicrography</b>	<b>Gestring</b>	<b>1/13/08</b>
<b>III. Stereomicroscopy</b>	<b>Quarino</b>	<b>1/19-20/08</b>
<b>III. Microspectrophotometry</b>	<b>Quarino</b>	<b>1/19-20/08</b>
<b>IV. Fluorescence Microscopy</b>	<b>Quarino</b>	<b>1/19-20/08</b>
<b>V. SEM/EDX</b>	<b>Quarino</b>	<b>1/19-20/08</b>

**Course Assessment**

Students will be given an unknown composed of many different types of materials. Using the techniques discussed in the class, students will determine the contents of the unknown.

Students will submit a paper to Dr. Quarino outlining the techniques used and summarizing results and conclusions. The paper will be in the format of manuscripts published in the Journal of Forensic Sciences. Documentation using digital photography where appropriate is expected.

Grades will be on the bases of correct identifications, false identification and the quality of the manuscript. Half the grade will be based on the quality of the manuscript and the other half on the analytical results. From this, a letter grade will be determined.

**Bibliography:**

Adolp, F.P., Dunke, J., “Microspectrophotometry /Colour Measurement” in *Forensic Examination of Fibers*, J. Robertson, editor, CRC Press, 1999.

Beveridge, A., Fung, T., MacDougall, D., “Use of Infrared Spectroscopy for the Analysis of Paint Fragments” in *Forensic Examination of Glass and Paint*, B.Caddy, editor, Taylor and Francis, 2001.

Goldstein, J., Newbury, D.E., Joy, D.C., et al., *Scanning Electron Microscopy and x-ray Microanalysis*, Third Edition, Springer, 2003.

Herman, B., Tanke, H.J., *Fluorescence Microscopy*, Second Edition, Garland/BIOS Scientific Publishers, 1998.

McCrone<sup>1</sup>, W.C., *The Particle Atlas Electronic Edition*, McCrone Institute, 1993.

McCrone<sup>2</sup>, W.C., McCrone, L.B., Delly, J.G., *Polarized Light Microscopy*, McCrone Institute, 1999.

Rost, F., Oldfield, R., *Photography with a Microscope*, Cambridge University Press, 2000.