Rochester Institute of Technology
Rochester, New York

COLLEGE of Science
Chester F. Carlson Center for Imaging Science

Color Measurement Laboratory I: 1050-721

1.0 **Title**: Color Measurement Lab I **Date**: April 4, 2003
Credit Hours: __3__
Prerequisite(s): None
Corequisite(s): 1050-701 Vision & Psychophysics

Course proposed by: Ethan D. Montag

2.0 **Course information:**

	Contact hours	**Maximum students/section**
Classroom	1	20
Lab	3	20
Studio		
Other (specify _____)		

Quarter(s) offered (check)
___√__ **Fall** _____ **Winter** _____ **Spring** _____ **Summer**

Students required to take this course: (by program and year, as appropriate)
First year color science MS students and Imaging Science Ph.D. students specializing in color science.

Students who might elect to take the course:
Graduate students in other programs within the Center for Imaging Science

3.0 **Goals of the course** (including rationale for the course, when appropriate):
This course is the first part of a two course lab sequence designed to develop laboratory skills in color measurement, instrumentation, programming, experimental practice, and technical writing. In this sequence the students will learn basic experimental skills necessary for performing color science research for their theses and their careers in industry and academia. These skills include collecting and organizing large sets of data, designing and performing physical and psychophysical experiments, keeping a laboratory notebook, writing research reports in a technical format suitable for

publication and programming data analysis routines and mathematical constructs common to the field.

Specifically, this course will have laboratories covering the measurement of spectral sensitivity, constructing a spectrophotometer, the measurement of daylight spectral power distributions with analysis based on principle components, and the performance and analysis of a psychophysical experiment.

4.0 Course description (as it will appear in the RIT Catalog, including pre- and co-requisites, quarters offered)

This course is the first part of a two-course sequence in which students develop the background and skills required for successful laboratory practice for color science research including data management and analysis, technical writing, and basic programming. Topics include the instrumentation and standardization required for high quality optical radiation measurements, analysis techniques for determining the accuracy and precision of those measurements, the optical properties of objects and radiation, optical and electronic design of spectroradiometric and spectrophotometric instrumentation, the use of standard reference materials for calibration, and evaluation of instrumentation and psychophysical experimentation.

5.0 Possible resources (texts, references, computer packages, etc.)

5.1 Berns, R.S., *Billmeyer and Saltzman's Principles of Color Technology, 3rd Ed.*; Wiley-Interscience: New York, (2000).
5.2 Wyszecki, G. & Stiles, W.S. *Color Science, 2nd Ed.*, J Wiley-Interscience: New York, (2000).
5.3 Hunt, R.W.G. *Measuring Colour,* Fountain Pr Ltd; (2001).
5.4 MATLAB
5.5 Assigned journal and proceedings papers.

6.0 Topics (outline):

6.1 Measuring Spectral Sensitivity
- 6.1.1 Basic principles
  - 6.1.1.1 Wavelength accuracy
  - 6.1.1.2 Slit width
  - 6.1.1.3 Light sources
  - 6.1.1.4 Camera linearization
- 6.1.2 Programming skills
  - 6.1.2.1 File I/O
  - 6.1.2.2 Plotting
  - 6.1.2.3 Math operations
  - 6.1.2.4 Functions and scripts

6.2 Building a spectrophotometer
- 6.2.1 Basic principles
  - 6.2.1.1 Measurement principles
  - 6.2.1.2 Light sources
  - 6.2.1.3 Measurement geometry
- 6.2.2 Programming skills

6.3 Daylight measurements and PCA
- 6.3.1 Basic principles
  - 6.3.1.1 CIE daylight
  - 6.3.1.2 CCT
  - 6.3.1.3 Principle component analysis
- 6.3.2 Programming skills
  - 6.3.2.1 Matrix algebra

6.4 Psychophysical paired-comparison experiment
- 6.4.1 Basic principles
  - 6.4.1.1 Collecting psychophysical data
  - 6.4.1.2 Analysis and interpretation
- 6.4.2 Programming skills
  - 6.4.2.1 User interface
  - 6.4.2.2 Statistical analysis

7.0 Intended learning outcomes and associated assessment methods of those outcomes

The specific course content will be assessed in the context of the following skills:

Learning Outcome	Assessment Method
Data management and experimental skills	Graded laboratory notebook
Scientific communication skills	Technical reports
Programming skills	Computing assignments

8.0 Program or general education goals supported by this course

8.1 Fundamentals of color measurement and instrumentation
8.2 Experimental data collection and analysis
8.3 Basic programming skills
8.4 Technical writing

9.0 Other relevant information (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

9.1 The instrumentation and facilities of the RIT Munsell Color Science Laboratory

10.0 Supplemental information

NONE