Title: Color Measurement Lab II
Date: April 4, 2003
Credit Hours: 3
Prerequisite(s): 1050-721 Color Measurement Lab I
1050-701 Vision & Psychophysics
Corequisite(s): 1050-702 Applied Colorimetry
Course proposed by: Ethan D. Montag

Course information:

<table>
<thead>
<tr>
<th>Classroom</th>
<th>Lab</th>
<th>Studio</th>
</tr>
</thead>
</table>
| Contact hours | Maximum students/section | (specify _______)
| 1 | 20 | |
| 3 | 20 | |

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

Goals of the course (including rationale for the course, when appropriate):
This course is the second 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 precision and accuracy of commercial spectrophotometers, the construction and evaluation of an imaging colorimeter using a monochrome CCD camera, and the optimization of color difference equations based on psychophysical data.

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

This course is the second 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 precision and accuracy analysis of color measuring instrumentation, color tolerance psychophysics, and building an imaging colorimeter.

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

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 Precision and Accuracy of Spectrophotometers
   6.1.1 Basic principles
      6.1.1.1 Measurement geometry
      6.1.1.2 Evaluating precision
      6.1.1.3 Modeling accuracy
      6.1.1.4 Use of standards
   6.1.2 Programming skills
      6.1.2.1 Regression
      6.1.2.2 Data management

6.2 Building an Imaging Colorimeter
   6.2.1 Basic principle
      6.2.1.1 Colorimetry
      6.2.1.1 Flat-fielding, dark-fielding
      6.2.1.2 Modeling camera response
      6.2.1.3 Goodness-of-fit metrics
   6.2.2 Programming skills
6.2.2.1 Nonlinear Optimization

6.3 Optimizing color-difference equations
   6.3.1 Basic principles
      6.3.1.1 Modeling psychophysical data
      6.3.1.2 Color difference equations
      6.3.1.3 Industrial color tolerance
   6.3.2 Programming skills
      6.3.2.1 Statistical analysis
      6.3.2.2 Regression

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:

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data management and experimental skills</td>
<td>Graded laboratory notebook</td>
</tr>
<tr>
<td>Scientific communication skills</td>
<td>Technical reports</td>
</tr>
<tr>
<td>Programming skills</td>
<td>Computing assignments</td>
</tr>
</tbody>
</table>

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