



COURSE MODULE – COLOUR IMAGE ACQUISITION & REPRODUCTION

COURSE CODE	COSI IAR
COURSE LEVEL	Master
ECTS CREDITS	5
COURSE INSTRUCTOR/S	Javier Romero (University of Granada); Luis Gómez (university of Granada), with the assistance of guest lecturer(s)
EDUCATION PERIOD	SEMESTER 2
EXPECTED PRIOR-KNOWLEDGE	Applied Optics and Photonics, desirable also Radiometry, Sources and detectors.
LANGUAGE OF INSTRUCTION	English

AIM This course will aim to provide the student with accurate knowledge about working principles and internal processing mechanisms of colour image capture devices (mainly RGB cameras and RGB scanners) and also colour reproduction devices, from a more technical perspective than offered in previous courses of the master, and dealing with more complete theoretical and practical issues.

TEACHING ACTIVITIES This course is based on flip-teaching, exchanges and discussions between students and instructor, lectures, exercises and practical sessions activities, as well as homework.

COURSE OUTLINE

- (topic 1)* Introduction and review of basic concepts
- (topic 2)* Optical image formation
- (topic 3)* Quality of imaging systems
- (topic 4)* RGB cameras and scanners
- (topic 5)* Display technologies
- (topic 6)* Printing technologies
- (topic 7)* Color management

PRACTICAL ACTIVITIES

- Basic characterization of a RPi webcam: measurements of dark current signal and linearity testing. Computing the Camera Response Function.
- Analysis of the optimal camera settings for a vegetation detection application using conventional digital cameras.
- Scanning and photographing the Macbeth colour checker. Evaluation of the colour fidelity (assessed by displaying the two images in the same LCD-based calibrated display, measuring the colour signals of the 24 patches with a spectroradiometer and computing the colour differences between them; comparing both with the reference of the checker placed side by side). Analysis of the image quality provided by the two colour acquisition devices using the standard metrics. Discussion of results.
- Printing the Macbeth colour checker. Using two different impact printing technologies with standard settings. Comparative with the previous results using colour image capturing devices coupled to a display.

LEARNING OUTCOMES¹

- Knowledge and Comprehension of the fundamentals, principles, applications, limits, relationships, of all concepts and topics covered by this course;
- Application, Analysis, Synthesis and Evaluation skills of the main concepts and topics covered by this course;
- Ability to apply/implement concepts and principles introduced in the lectures on practical tasks and on industrial study cases;
- Ability to self-learn, to understand some problems and to suggest/find solutions to solve these problems.

FORM/S OF ASSESSMENT 30% continuous evaluation of theoretical contents; 70% practical work (20% lab work including reports + 50% homework including proposed exercises and a seminar about a recently developed technology for colour image acquisition or reproduction devices).

¹ The meaning of *keywords* in italic used to define Learning Outcomes are detailed in Annex.



ASSESSMENT CRITERION Written exam lab sessions and Homework/seminar presentations

Excellent - outstanding performance	A
Very Good - above the average standard but with some errors	B
Good - generally sound work with a number of notable errors	C
Satisfactory - fair but with significant shortcomings	D
Sufficient - performance meets the minimum criteria	E
Fail - some more work required before the credit can be awarded	FX
Fail - considerable further work is required	F

Detail of criteria used to assess acquired skills :

- Activities and questionnaires giving evidence of knowing (5%)
- Activities and questionnaires giving evidence of comprehension/understanding (5%)
- Activities and questionnaires giving evidence of analysis (5%)
- Activities and questionnaires giving evidence of synthesis (5%)
- Activities and questionnaires giving evidence of evaluation (5%)

The evaluation of informal learning outcomes will be based on questionnaires and laboratory notebook (self-evaluation, learning diary).

LITERATURE AND STUDY MATERIALS

Color Imaging. E. Reinhard et al. AK Peters, 2008.
Introduction to color imaging science. Hsien-Che Lee. Cambridge, 2005.
Tutorials, lectures and notes provided by the course instructor
Additional books:
The Science of Imaging. An introduction. G. Saxby. IoP, 2002.
The reproduction of color. R.W.G. Hunt. Wiley, 2005.

CONTACT DETAILS

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