

## Course introduction

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### **Methods for Image Processing**

academic year 2015–2016

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Office hours: Tuesday h. 16:00

## Timetable

<b>Day</b>	<b>Time</b>	<b>Room</b>
Monday	14:00–16:00	3Nord
Tuesday	14:00–16:00	3Nord

## Course structure

- ▶ frontal lessons
- ▶ laboratory exercise
  - ▶ experimentation with techniques seen at lesson
  - ▶ Matlab

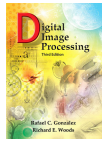
## Course assessment

- ▶ Written exam (10–20/30) + oral exam (5–12/30)
- ▶ Project (0–3/30)
  - ▶ application of a technique seen at lesson to a real problem
  - ▶ in-depth study of some topics
  - ▶ introductory work for the thesis
- ▶ exams calendar asap

## Some little problems...

- ▶ The course worths 6 CFU
- ▶ it covers a 5 CFU course
  - ▶ part of the lessons will deepen some topics and will be optional for students who attend the 5 CFU course
- ▶ it is offered to both bachelor and master degree students
  - ▶ oral exams and project will be differentiated
- ▶ for who already attended the course in previous years:
  - ▶ flexibility for the assessment topics
    - ▶ exams on the old syllabus
    - ▶ check it with the teacher

## Course materials



- ▶ R.C. Gonzalez and R.E. Woods, *Digital Image Processing*, Prentice Hall, 2008, 3rd edition.



- ▶ R.C. Gonzalez e R.E. Woods, *Elaborazione delle immagini digitali*, Pearson Education Italia, 2008, terza edizione.

- ▶ Errata sheet: [http://www.imageprocessingplace.com/downloads\\_V3/dip3e\\_downloads/dip3e\\_errata\\_sheet/DIP3E\\_Errata\\_Sheet.zip](http://www.imageprocessingplace.com/downloads_V3/dip3e_downloads/dip3e_errata_sheet/DIP3E_Errata_Sheet.zip)

The course syllabus follows the topics covered in the textbook. Only few notes are not present in the book:

- ▶ lecture notes on the course website.

For the exams, the assessed syllabus concerns the topics covered by the adopted textbook.

## Course goals

- ▶ Learning the basic concepts of the automatic processing of *digital* images:
  - ▶ acquisition and representation;
  - ▶ enhancement;
  - ▶ information extraction from an image.
- ▶ Implementing some simple image processing techniques by using a numerical computing program.

## Syllabus

**Introduction** image basic concepts, image processing applications.

**Digital images fundamentals** light, vision and perception;  
acquisition and digitalization of images.

**Representation** formats for the representation of digital images,  
pixel relations, basic mathematical operations.

**Intensity transforms and spatial filtering** intensity transforms,  
histograms, equalization, spatial domain filtering,  
equalization, image improvement in spatial domain.

**Filtering in the frequency domain** Discrete Fourier Transform,  
extension to 2D functions, filtering and improvement  
of images in the frequency domain.

**Morphological processing** dilation, erosion, opening, closing,  
extraction of connected components, convex hull,  
thinning, thickening, contour extraction.

**Segmentation** edge detection and linking, region based processing.

**Compression** redundancy, image encoding.

## Extended syllabus

Almost impossible in 48 hours, but maybe:

**Image restoration** noise models, motion blur, deconvolution.

**Image restoration** image inpainting.

**GPU programming** parallel architecture for image processing.

## Timing and calendar

- ▶ How use the “academic quarter”?
- ▶ Any calendar change proposal?