



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Multimedia Data Processing

2425-1-F9201P211

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#### Aims

The course offers an introduction to multimedia signals: images, video and audio, presenting the main methods of processing, digitizing and encoding. At the beginning the course analyzes the analog to digital conversion in particular by introducing the concepts of sampling and quantization. The main processing algorithms especially for the case of digital images are shown: histogram modification, filtering and white balancing. During the practical activities the student will apply the acquired theory to audio, image and video signals.

#### Contents

The course provides the basis for digitizing and encoding analogic signals: images, audio and videos. It also provides the competences to develop algorithms to process, code and compress digital signals.

#### Detailed program

1. Definition of one-dimensional signals, two-dimensional signals, N-dimensional signals

- Analog signal
- Digital signal

2 Analog to digital conversion

- Sampling theorem
- Filter Anti-Aliasing
- Quantization

### 3 Digital signals: sampling and quantization:

- Images
- Audio
- Video

### 4 Image processing

- Contrast enhancement
- High and low pass filtering
- White balance

### 5 Signal in the transformed domain: Fourier Transform

- Fourier analysis in the frequency domain

### 6 Compression

- Main compression loss-less and lossy algorithms
- Audio Compression
- Image Compression (particularly JPEG)
- Video Compression (in particular MPEG)
- Main image Formats

## **Prerequisites**

No prerequisite

## **Teaching form**

The course consists of lectures (28 hours), and practical activities (24 hours). Several exercises will be carried out during the practical activities to verify the new expertise acquired. The course is taught in English.

The lectures will be delivered as follows:

14 hours of didactics, in remote asynchronous mode.

14 hours of didactics in presence.

24 hours of laboratory in interactive teaching mode.

## **Textbook and teaching resource**

slides published on the web site of the course

codes and exercises of the practical activities

TEXTBOOK

## Semester

second semester

## Assessment method

### Examination:

Oral exam + practical activities (4 mandatory) + final project (optional)

### Evaluation Type:

Final mark out of thirty

### Oral exam

The exam (oral) consists of open questions about digitalization and compression of multimedia signals and signal processing mainly in the case of images. This part verifies the competencies acquired and it is based on what taught during the lessons, available on the slides and on the indicated text books.

### Assignments

The practical activity is a fundamental part of the course. Periodic assignments are proposed during the practical activity. These assignments remain valid for the academic year in which the teaching is delivered. **Four assignments are mandatory** to pass the exam.

### Final Project

A final project in matlab (optional) will provide up to 2 points for the final exam.

## Office hours

Friday from 11.00 to 12.00.

## Sustainable Development Goals

INDUSTRY, INNOVATION AND INFRASTRUCTURE

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