UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Basis of Signal Processing

2324-1-I0303D040-I0303D086M

Aims

Students will learn the basics of signal processing required for their profession.

Contents

The course provides students with an overview of the basic principles for analyzing and manipulating signals of various types. Essential concepts such as time and frequency domain representation, signal transforms, sampling and quantization, filtering, and practical applications are explored. This course provides both theoretical and practical foundations in signal processing, enabling students to acquire transferable skills in various fields such as communications, acoustics, imaging, and more.

Detailed program

This course provides a solid foundation for understanding the fundamental principles of electronics, signal processing, and medical technologies, preparing students to tackle complex challenges in the fields of engineering and medicine. The course will consist of 6 modules.

Module 1: Signal Fundamentals
This module introduces the fundamental concepts of signals, including signal types, transducers, periodic and aperiodic signals, analog and digital signals, as well as advanced concepts such as pulsation and phase of sinusoidal signals.

Module 2: Electrical Circuits and Systems Theory
In this module, concepts of current, voltage, resistance, power, and electrical circuits will be examined. Systems

theory will be explored, including impulse response, transfer function, and signal convolution.

Module 3: Filtering and Noise
The third module focuses on signal filtering and noise management in electronic systems. Passive and active filtering techniques will be explored, as well as the effect of noise on diagnostic images.

Module 4: Medical Imaging
This module examines the use of medical imaging technologies, such as radiography, magnetic resonance imaging, and ultrasound, in diagnosis and therapy. Principles of image acquisition and clinical applications will be discussed.

Module 5: Analog-to-Digital Conversion
In the fifth module, principles of analog-to-digital conversion will be explored, including sampling, quantization, and the sampling theorem. Concepts of encoding and bitrate in medical imaging will also be analyzed.

Module 6: Telecommunication Networks and Artificial Intelligence
Finally, the sixth module will cover telecommunication networks, communication protocols, and the role of Artificial Intelligence in the medical field. Advantages and challenges in implementing advanced technologies in medicine will also be discussed.

Prerequisites

Good mathematical knowledge.

Teaching form

Frontal lessons.

Textbook and teaching resource

Slides and teaching materials provided by the instructor.

Semester

First semester.

Assessment method

Office hours

By appointment requested via e-mail.

Sustainable Development Goals

QUALITY EDUCATION