UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Propaedeutic Sciences

2627-1-I0305D003

Aims

Knowledge and Understanding
Upon completion of the Integrated Course in “Scienze Propedeutiche”, students will acquire fundamental knowledge of Mathematics, Medical Statistics, Physics, and Signal Theory necessary to understand biological phenomena, diagnostic processes, and the technologies employed in professional healthcare applications.

Applying Knowledge and Understanding
Upon completion of the Integrated Course in “Scienze Propedeutiche”, students should be able to use basic mathematical and statistical tools for the analysis of biomedical data arising from healthcare professional activities; apply the fundamental principles of general physics, radiation physics, and signal theory to understand the methods of signal and image acquisition and processing.

Contents

The general aims of the course are to provide students with basic knowledge of Medical Statistics (Descriptive statistics and theory of probability), Mathematics, Applied Physics and Basics of Signal Processing

Detailed program

MEDICAL STATISTICS: Types of variables. Tables and graphs. Indices of position and dispersion. Measurement errors: precision and accuracy. Probability: conditional probability independence, probability of the union and intersection of events. Random variables and probability distributions: Binomial and Gaussian. Correlation and regression.

MATHEMATICS FOR PHYSICS: Basic algebra. Power, exponential and logarithmic functions. Exponential and logarithmic functions. Complex numbers. Combinatory calculus.

APPLIED PHYSICS: Unit of measurement and changes of the unit of measurement. Vector and scalar quantities. Operations with vectors and vector properties. Concept of force, moment of a force. Equilibrium of a rigid body, examples of the equilibrium of the human body. The levers and their application. Elements of geometrical optics. Electromagnetic waves and electromagnetic radiation spectrum. Elements of Physical optics: absorption and scattering of light. Beer-Lambert law. The atomic nucleus structure. Radioactivity. Law of radioactive decay. Radiation-matter interaction.

BASIS OF SIGNAL PROCESSING: 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.

Prerequisites

Basic knowledge of mathematics

Teaching form

Lectures

Textbook and teaching resource

Fowler J., Jarvis P., Chevannes M., Statistica per le professioni sanitarie, 2006 Edises
Bland M, Statistiuca Medica, Apogeo Education, Maggioli Editore, 2019

D. Scannicchio, Fisica Biomedica, EDISES, D. Scannicchio, Esercizi e problemi di Fisica, Edizioni Unicopli, U.Amaldi, Fisica delle radiazioni, Boringhieri

Teachers will provide other educational material

Semester

First Semester

Assessment method

Written exam plus possible oral exam upon request of the teachers or the student. The written test will consist of:
? numerical exercises and multiple choice questions on Medical Statistics
? numerical exercises and multiple choice questions on Mathematical Methods for Physics
? numerical exercises and multiple choice questions in Applied Physics
? multiple choice questions on Basics of Signal Processing

Office hours

By appointment required by mail

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING