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## FISICA STATISTICA E INFORMATICA - channel 2

6 CFU - 1° Semester

### Teaching Staff

**CATIA MARIA ANNUNZIATA PETTA** - Module medical physics - FIS/07 - 2 CFU

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**Office Hours:** Lunedì e Mercoledì 15.30-18. Il docente garantisce la sua presenza per tutto il tempo necessario ai colloqui con gli studenti che si presenteranno entro le 15.45. Se non si sarà presentato alcuno studente, alle 15.45 il ricevimento sarà chiuso.

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### LEARNING OBJECTIVES

#### ▪ **medical physics**

At the end of the course, the student will learn the general principles underlying the understanding of physical phenomena and the laws that regulate them, with particular regard to the physical mechanisms that in human physiology affect the production and transport of electrical signals, blood circulation, energy production and transport.

#### ▪ **medical statistics**

The course objectives are:

- 1) Understand the basic concepts and methods of Medical Statistics for students to analyze data observed in the field of health phenomena. The study deals with the theoretical aspect and the practical application of these methods.
- 2) Train the student's ability to collect, process, interpret, and evaluate quantitative and qualitative data.
- 3) Develop the student's ability to communicate with others, with technical language skills, information and ratings related to data distribution related to health phenomena.

4) To increase the student's ability to independently study medical statistics.

#### ▪ **Computer Technology**

The objectives of this module are focused on learning and the conception of the logic that regulates basic computing, elaboration data, structure, classification and typology of networks.

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## **DETAILED COURSE CONTENT**

#### ▪ **medical physics**

##### **Physical quantities and their measurement**

Scalar and vector quantities, International System and CGS System

##### **Elements of Mechanics**

Kinematics: trajectory, speed and acceleration. Straight and uniformly accelerated rectilinear motion. Uniform circular motion.

Dynamics: The forces. The principles of dynamics. Mass and weight. Gravitational force. The centripetal force. Work and energy. Mechanical power. Kinetic energy and potential energy. Conservation of mechanical energy.

##### **Fluid mechanics**

Pressure. Pascal's principle. Hydrostatic pressure. Stevino's law. Measurement of atmospheric pressure. Principle of Archimedes.

Dynamics of the ideal fluids: flow rate, continuity principle, Bernoulli's theorem.

Dynamics of viscous fluids: laminar motion and hydrodynamic resistance of a duct. Viscosity of the blood. Turbulent motion and critical speed. Measurement of arterial pressure.

Plasma composition. Diffusion, filtration and osmosis through membranes. Osmotic equilibrium in the blood: isotonic solutions, flows through the capillaries.

Gas mixtures: partial pressures. Solubility of a gas in a liquid: Henry's law. Gaseous exchanges in the alveoli and in the capillaries.

##### **Electromagnetism**

Electric charge. Strength of Coulomb. Electric field. Electrostatic potential. Electrostatic energy.

Capacitors. Electric current. Laws of Ohm. Magnetic field. Electromagnetic and mechanical waves. Wavelength and frequency. Electromagnetic spectrum. X and gamma radiation.

##### **Overview of thermodynamics**

Temperature and heat. Temperature measurement. Internal energy. Specific heat. Changes in state and latent heat. Metabolism.

#### ▪ **medical statistics**

Background: variables, constants, measurement scales, summations, products, percentages, ratios, combinatorial analysis. Collecting and organizing data. Indices of central tendency. Indices of dispersion. Graphical representation of data. Probability and probability distributions. Sampling and statistical inference. Comparison of samples and analysis of the dependence. Rates and proportions. Epidemiological statistics.

#### ▪ **Computer Technology**

- Information processing systems;
- Hardware, software and their stratification;
- Operating Systems: fundamental functions and their evolutions;
- Bits, Bytes and numbers connected to them;

- Database;
  - Classification, Type and Network Levels;
  - E-mail & Protocol;
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## **TEXTBOOK INFORMATION**

- **medical physics**

1. D. Scannicchio, E. Giroletti, Elementi di Fisica Biomedica, EdiSES
2. F. Borsa, A. Lascialfari, Principi di Fisica per indirizzo biomedico e farmaceutico, EdiSES

- **medical statistics**

P. B. Lantieri, D. Risso, G. Ravera - Elementi di Statistica Medica - McGraw-Hill, 2007

- **Computer Technology**

Teaching Handouts

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