



UNIVERSITÀ
degli STUDI
di CATANIA

DEPARTMENT OF BIOMEDICAL AND BIOTECHNOLOGICAL
SCIENCES

Bachelor's Degree in Orthoptic and ophthalmologic
assistance

Academic Year 2019/2020 - 1° Year

FISICA STATISTICA ED INFORMATICA

10 CFU - 1° Semester

Teaching Staff

MARIO MASSIMILIANO SALFI - Module Computer science - INF/01 - 4 CFU

Email: salfi@dmi.unict.it

Office: Dipartimento di Matematica ed Informatica - viale Andrea Doria, 6 - 95125 CATANIA - studio:
Blocco III, MII-20

Phone: +39 095 738 3096

Office Hours: Per appuntamento (inviare una email)

MARTINA BARCHITTA - Module Medical statistics - MED/01 - 2 CFU

Email: martina.barchitta@unict.it

Office: Comparto 10, edificio C/ via S.Sofia 87

Phone: 0953782183

Office Hours: Tutti i lunedì e i mercoledì dalle 11.30 alle 12.30. Si consiglia di chiedere conferma sulla presenza del docente per e-mail

PAOLA LA ROCCA - Module Applied Physics - FIS/07 - 4 CFU

Email: paola.larocca@ct.infn.it

Office: Dipartimento di Fisica e Astronomia, Via S.Sofia 64 - 95123 Catania

Phone: +390953785214

Office Hours: Lunedì e mercoledì dalle 09:00 alle 11:00. Si consiglia comunque di contattare il docente in anticipo per verificare che impegni istituzionali o personali non lo costringano a spostare il ricevimento di un giorno specifico.

LEARNING OBJECTIVES

▪ Computer science

At the end of the course, the student will learn the fundamental concepts of computer science, the encoding of information, the architecture of a computer, the operating systems and software applications. It will also possess a global knowledge on the internet and computer networks, on the theory of databases, on applications of informatics in ophthalmological contest, as well as practical knowledge on the use of an operative system and of the suite "Microsoft Office" (Word, Excel).

▪ Medical statistics

To develop statistical and methodological abilities applied to the analysis of biological/biomedical events. To develop abilities to apply the principal tools of statistical data collection, measurement and analysis.

▪ Applied Physics

The module "Applied Physics" aims at providing the students with the basilar physics notions that are fundamental for other courses of the Degree Course in Orthoptic and Ophthalmologic Assistance. During the course the students will also learn about the most important technologies frequently used in biomedical field.

The Learning Objectives, within the Dublin Descriptors scheme, are:

1. Knowledge and understanding: knowledge of the basic principles of Physics and their main applications to the biomedical field, focusing on topics like geometric and physical optics;
2. Applying knowledge and understanding: ability to describe and develop models of simple physical phenomena through the scientific method, to identify and solve science problems in phenomena of interest to orthoptists;
3. Making judgements: ability to make numerical estimations of physical quantities;
4. Communication skills: ability to discuss (in an oral conversation or in writing) a scientific topic using an appropriate scientific language;
5. Learning skills: ability to study individually and to keep up-to-date with the new scientific discoveries in this field.

COURSE STRUCTURE

▪ **Computer science**

Lessons ed exercitation in classroom, assignment and correction of homeworks.

▪ **Medical statistics**

The course includes lectures in which continuous interaction with students and exercises in the multimedia classroom is encouraged, using specific statistical software, with examples to apply the knowledge acquired during the course.

▪ **Applied Physics**

Classroom-taught lessons by the use of interactive power point presentations (with images, videos and animations).

Exercises in groups or supervised by the teacher.

DETAILED COURSE CONTENT

▪ **Computer science**

Introduction to computer science

Encoding and representation of information

Architecture of computer

The operating system and application software

Computer networks and the internet

Hypertext and HTML code

Network security and malware

Introduction to databases

Elements of medical informatics

Technology at the service of ocular diagnostics

Retinal prostheses

Word processors: Microsoft Word

Spreadsheets: Microsoft Excel

Databases: Microsoft Access

Presentation programs: Microsoft PowerPoint.

- **Medical statistics**

The biological variables. Monovariate data synthesis measures. Bivariate analysis. Probability and statistical inference.

- **Applied Physics**

- 1) Oscillations and waves**

Waves, simple harmonic motion, damped and forced oscillations, classification of waves, the linear wave equation, ray representation and wave fronts, Huygens' principle, waves superposition, reflection and transmission, light dispersion, waves in interference, beats, diffraction, polarized light.

- 2) Light and Optics**

Electromagnetic waves, the spectrum of electromagnetic waves, the nature of light, the ray optics, wave under reflection, waves under refraction, total internal refraction, optical fibers and their applications (endoscopy), laser light and its application in medicine, prism and its applications in optometry, images formed by refraction, thin lenses, lens aberrations, images formed by mirrors.

- 3) Optical applications in biology and medicine**

Simple and compound microscope, the eye, eye reference axes and point, distance evaluation, visual acuity, visual defects, color vision.

- 4) Sound waves**

Propagation of sound waves, intensity of sound waves, ultrasound, Doppler flowmetry, ultrasound images and ultrasound modality to record images.

- 5) Radiations in biology and medicine**

The atomic nucleus, radioactive isotopes, the nuclear decay, ionizing radiation and interaction of radiation with matter, optical coherence tomography (OCT), radiation biological effects, radiation protection and dosimetry, hadron therapy.

TEXTBOOK INFORMATION

- **Computer science**

- Luca Mari, Giacomo Buonanno, Donatella Sciuto - Informatica e cultura dell'informazione (seconda edizione), McGraw-Hill.

- Teacher's slides (see on <http://www.dmi.unict.it/~salfi/informaticaortottica.htm>)

- **Medical statistics**

- Biostatistica - M.Pagano, K.Gauvreau - II edizione italiana, Idelson-Gnocchi

▪ **Applied Physics**

1) Scannicchio D. : Fisica Biomedica, Ed. Edises - Napoli

2) Giancoli D.C.: Fisica. Principi e applicazioni, Casa Editrice Ambrosiana - Milano

3) Serwey R.A. and Jewett J.W.: Principi di Fisica, Ed. Edises - Napoli

4) Contessa G.M. and Marzo G.A.: Fisica applicate alle scienze mediche, CEA - Milano
