Degree Course in Physioterapy

INTEGRATED COURSE: **PHYSICS, STATISTICS AND INFORMATION TECHNOLOGY**
CFU: 8
SSD: FIS/07, INF/01, MED/01, ING-INF/05
COORDINATOR: PROF.SSA ALESSANDRA FILABOZZI
E-MAIL: alessandra.filabozzi@unicamillus.org

MODULE: APPLIED PHYSICS
CFU: 2
SSD: FIS/07
PROFESSOR: Prof.ssa Alessandra Filabozzi   e-mail: alessandra.filabozzi@unicamillus.org

MODULE: INFORMATION TECHNOLOGY
CFU: 2
SSD: INF/01
PROFESSOR: Prof. Franco Arcieri   e-mail: franco.arcieri@unicamillus.org

MODULE: DATA PROCESSING SYSTEMS
CFU: 2
SSD: ING-INF/05
PROFESSOR: Prof. Franco Arcieri   e-mail: franco.arcieri@unicamillus.org

MODULE: MEDICAL STATISTICS
CFU: 2
SSD: MED/01
PROFESSOR: Prof. Daniele Di Giovanni   e-mail: daniele.digiovanni@unicamillus.org

PREREQUISITES

PHYSICS:
Knowledge and competence in Basic Mathematichs, Physics and Statistics at High School level.

INFORMATION TECHNOLOGY:
No prerequisite.

MEDICAL STATISTICS
A prior knowledge of basic mathematics and a confidence in basic IT tools is required.

DATA PROCESSING SYSTEMS:
In order to get a full comprehension of the covered topics it is essential to have the knowledge obtained in the Information Technology module.

LEARNING OBJECTIVES

INFORMATION TECHNOLOGY:
The course intends to provide students with the basic knowledge to understand the essential role of Information Technology (IT) in our society, and specifically in the context of health-related technical professions.

DATA PROCESSING SYSTEMS:
The course intends to provide students with the basic knowledge to understand the role of Information Systems and their lifecycle, specifically focusing on database management systems.

MEDICAL STATISTICS
The course aims to provide the student with the necessary statistical bases to set up a research and collect and analyze data. The student must acquire a correct statistical terminology and be able to understand and interpret a scientific study.

PHYSICS:
Aim of the course of Medical Physics within the integrated course of Physics, statistics and information technology is to provide students with knowledge on the fundamentals of applied physics necessary to the performance of their future activity. In particular, the comprehension of physical principles at the base of medical physics and of functioning of medical instrumentation will be addressed.
At the end of the course, the students will know the fundamental concepts of application of the Scientific Method to the study of biomedical phenomena (choice and measure of parameters, evaluation of errors), they will be able to describe physical phenomena of complex systems using suitable mathematical tools, they will know the scientific basis of medical procedures and principles of functioning of the equipment commonly used for diagnostics and therapeutics.

LEARNING OUTCOMES

INFORMATION TECHNOLOGY:
At the end of the course the student will master the IT terminology and will get a basic knowledge of the characteristics of both modern IT systems and their main applications. Specifically, students get the elements that contribute to define the architecture of an IT system in terms of the relevant hardware and software components (applying knowledge and understanding). The topics covered in the course are applied to different case studies, so to stimulate the student decision making abilities (making judgements), as well as the communication skills and learning skills.

DATA PROCESSING SYSTEMS:
At the end of the course the student will master the Information Systems terminology and will get a basic knowledge of the characteristics of modern Information Systems and Database Management Systems. Specifically, students get the elements that contribute to define the architecture of an Information System in terms of the relevant components (applying knowledge and understanding), with specific application to Database Management Systems. The topics covered in the course are applied to different case studies, so to stimulate the student decision making abilities (making judgements), as well as the communication skills and learning skills.

MEDICAL STATISTICS
The specific learning outcomes of the program are coherent with the general provisions of the Bologna Process and the specific provisions of EC Directive 2005/36/EC. They lie within the European Qualifications Framework (Dublin Descriptors) as follows:

1. Knowledge and Understanding:
Knowledge of basic statistical tools and ability to understand statistical studies and analysis.

2. Applying Knowledge and Understanding
Students should possess the knowledge and skills to use basic statistical tools necessary to describe and analyze data sets.

3. Communication Skills
The student should be able to argue the knowledge acquired

4. Making Judgements
The student is subjected to an end-of-course test to have an objective assessment of his or her ability to apply the knowledge acquired.

PHYSICS:
The specific learning outcomes of the program are coherent with the general provisions of the Bologna Process and the specific provisions of EC Directive 2005/36/EC. They lie within the European Qualifications Framework (Dublin Descriptors) as follows:

1. Knowledge and Understanding:
- *Understand the experimental method and learn the use and transformation of measure units.*
- *Know and understand the proper terminology of physics.*
- *Know and understand the main physical principles and laws concerning kinetics, dynamics, electricity and magnetism, vibration and waves, radiation, balance regulating principles and fluids.*
- *Apply these concepts to biological and physiological phenomena in living organisms.*
- *Identify and recognize the physical principles which govern the function of the specific human organs.*

2. Applying Knowledge and Understanding
- *Apply the principles of physics to selected problems and to a variable range of situations.*
- *Use the tools, methodologies, language and conventions of physics to test and communicate ideas and explanations.*

3. Communication Skills
- *Present the topics orally in an organized and consistent manner.*
- *Utilize a proper scientific language coherent with the topic of discussion.*

4. Making Judgements
- *Recognize the importance of an in-depth knowledge of the topics consistent with a proper medical education.*
- *Identify the fundamental role of a proper theoretical knowledge of the topic in the clinical practice.*

COURSE SYLLABUS

Syllabus INFORMATION TECHNOLOGY:
- *Introduction to IT systems*
- *Notes on the hardware part of IT systems (CPU, memory, input/output). File system management.*
- *The system software: operating systems and associate utility programs*
- *Application software: basic tools for medical practice*

Syllabus DATA PROCESSING SYSTEMS:
- *Introduction to Information Systems*
- *Standards and languages (xml, hl7, etc.)*
- *The lifecycle of Information Systems*
- *Database and Database Management System (DBMS)*

Syllabus STATISTICA MEDICA/ MEDICAL STATISTICS
- *Introduction to statistics: randomness and causality*
- *Observation of reality*
- *Descriptive statistics and inferential statistics*
- *Quantitative and qualitative variables*
- *Absolute, relative and percentage frequency*
- *Tables, diagrams and graphs*
- *Statistical indices: measures of central tendency and dispersion*
- *Central limit theorem*
- *The normal (Gaussian) curve and its properties*
- *Statistical inference: null and alternative hypotheses, p-value, statistical association*
- *Association and causality*

- *Hypothesis testing and introduction to statistical significance tests*
- *Correlation*
- *Univariate and multivariate linear regression*
- *Differences between proportions: observed and expected values*

Syllabus PHYSICS
- *Introduction, measurement, estimating*
- *Describing motion: kinematics in one dimension*
- *Two-dimensional kinematics; Vectors*
- *Dynamics: Newton's laws of motion*
- *Circular motion; Gravitation*
- *Work and Energy*
- *Linear momentum*
- *Static equilibrium; elasticity and fracture*
- *Fluids*
- *Oscillations and waves*
- *Sound*
- *Heat*
- *Electric charge and electric field*
- *Electric potential*
- *Electric currents*
- *DC circuits*
- *Electromagnetic waves*
- *The wave nature of light*
- *Optical instruments*

COURSE STRUCTURE
The teaching is structured in 80 hours of frontal teaching on both theoretical and applicative topics, divided into lessons based on the academic calendar. Attendance is compulsory for at least 75% of the hours, added to all the courses of the integrated course.

COURSE GRADE DETERMINATION
StUdents' learning will be evaluated through a written test in which all the contents covered in the Integrated Course are subject to evaluation.
The verification method includes a questionnaire consisting of 10 multiple choice questions for each of the 4 modules, aimed at assessing both the theoretical knowledge and the student's ability to solve problems.
Each correct answer will be awarded 3 points, with no penalty for wrong answers.
The test is passed with a vote from 18 to 30, in each module. The final mark will be determined by the average of the marks obtained in each module.
If the sufficiency is not obtained in all the modules, the test is not considered passed.

If the sufficiency is not reached in just one module but at the same time the average on the 4 modules is higher than 18/30, it is possible to take an oral test on the insufficient module. If the oral test gives a positive outcome and the sufficiency is reached, the test is passed, and the average is determined with the new vote.

OPTIONAL ACTIVITIES

MEDICAL STATISTICS
If necessary, the students can have an appointment for solving doubts or deepen topics on the teaching program.

READING MATERIALS

INFORMATION TECHNOLOGY:
Deborah Morley and Charles S. Parker, *Understanding Computers: Today and Tomorrow (16th edition)* - Cengage Learning

DATA PROCESSING SYSTEMS:
Deborah Morley and Charles S. Parker, *Understanding Computers: Today and Tomorrow (16th edition)* - Cengage Learning

MEDICAL STATISTICS
MATERIALI AUTENTICI DEL DOCENTE (diapositive)
Harvey Motulsky *Biostatistica essenziale – Una guida non matematica*
Casa editrice Piccin Nuova Libraria, Padova
Geoffrey R. Norman, David L. Streiner *Biostatistica. Quello che avreste volute sapere…*
Casa Editrice Ambrosiana, Rozzano (MI)

PHYSICS
R.A. Serway & J.W. Jewett, Principi di Fisica, EdiSESD. C. Giancoli, Fisica (principi e applicazioni), Casa Editrice Ambrosiana

D. Halliday, R. Resnik, J. Walker, Fondamenti di Fisica, Casa Editrice Ambrosiana
D. Scannicchio, E. Giroletti - Elementi di Fisica Biomedica - EdiSES
https://www.edisesuniversita.it/default/scannicchio-elementi-di-fisica-biomedica.html