UNIVERSITÀ DI PAVIA

Anno Accademico 2020/2021

DATABASES IN MEDICINE	
Enrollment year	2019/2020
Academic year	2020/2021
Regulations	DM270
Academic discipline	ING-INF/06 (ELECTRONIC AND INFORMATION BIOENGINEERING)
Department	DEPARTMENT OF ELECTRICAL,COMPUTER AND BIOMEDICAL ENGINEERING
Course	BIOENGINEERING
Curriculum	PERCORSO COMUNE
Year of study	2°
Period	1st semester (28/09/2020 - 22/01/2021)
ECTS	6
Lesson hours	58 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	QUAGLINI SILVANA - 6 ECTS
Prerequisites	As far as the theoretical part is concerned, the knowledge provided by the basic courses in computer science is required, and some notions of set theory and basic statistical knowledge are desirable. For the practical part, a good familiarity is required with the use of the PC (Windows).
Learning outcomes	The course deals with some aspects of the work that an engineer has to face if she is operating in a clinical setting, either as part of a bioengineering or clinical engineering service within a healthcare facility, or acting as an external consultant. This professional role, already present since a long time in other countries, is increasingly requested also in Italy and clinical / biomedical engineers are performing various tasks. Among these, we can distinguish two main categories: the first one concerning the biomedical instrumentation and the second one concerning the computer applications. The course is aimed at the latter,

and consider those activities which now involve the clinical routine, in need of databases, in particular the computerized medical record.

The goal is to make the student able to perform, together with the medical counterpart, the analysis of a certain problem, to design and implement, according to this analysis, a database, and finally to use the stored data to make the desired assessments, such as statistics, economic evaluations, data quality checks.

The course is therefore both theoretical (providing the basics of relational data bases) and practical, and in particular provides for a deep learning of the SQL query language, which is the currently most widespread and required standard on the market.

Course contents	1. General structure and functionality of the medical record, advantages of computerization compared to traditional paper support; 2. The relational model for databases. In particular, the concepts of relationship, key, external key, redundancy, dependency (functional, complete functional, mutual, multiple) between attributes, normal forms will be illustrated; 3. Models for data representation: dependency diagram, Entity-Relationship model (E-R), transition from models to normalized relations; 4. Overview of relational algebra 5. SQL language for querying relational databases; 5. Use, in the educational laboratory, of a database that implements a simple clinical chart, with particular regard to the distinction between static data and time-varying data, use of coding, standards (DRG, ICD9-CM, drugs and principles active) 6. Queries, through SQL, on the stored data, for the creation of reports (e.g., the discharge letter) and simple descriptive statistics; 7. The export of data for their future use through statistical analysis packages, for the realization of more complex statistics than those obtainable with SQL
Teaching methods	The course consists of lectures and exercises in classrooms equipped with PC for database use. The exercises take advantage of the help of a tutor because the number of students requires the use of at least two classrooms at the same time. The classrooms are however in audio-video connection so that everyone can hear and contact the teacher. During the laboratory time, a relational Database Management System is used, which models a simple clinical record, some hints are made on the creation of the user interface and on how the inserted data can be processed. In this way the student is enabled to understand and deal with the typical practical implementation problems. Toward the end of the course, if possible, a medical user is invited to show students a practical application of what they learned during the course. If necessary for safety reasons, the course will be entirely delivered from remote.
Reccomended or required readings	The lecture notes downloadable by Kiro report the lessons that are held in the classroom, while for a more in-depth discussion of the topics, the following books are recommended: 1. P. Atzeni, S. Ceri, S. Paraboschi, R. Torlone. Basi di Dati - Modelli e

	linguaggi di interrogazione. McGrow-Hill, 2002 2. Francesco Pinciroli, Marco Masseroli. Elementi di informatica biomedica, Editore Polipress, 2005, Collana: Scienza e tecnologia per la salute, ISBN: 8873980171
Assessment methods	A practical test will be carried out on the SQL language and a practical test on the E-R diagrams. The two tests are held on the same day and are two hours each. It is possible to do them in separate sessions. The oral exam will follow, subject to passing all the practical tests, including those of the "Fundamentals of Medical Informatics" module. At the beginning of the oral test an "entry test" will be performed based on the resolution of some logical expressions and mathematical calculations: it must be passed in order to continue the oral exam itself.
Further information	The database that is used during the exercises can be downloaded from the Kiro platform. This is the same database that will refer to the SQL queries to be performed during the exams. You can also download several exercises (texts only and texts + solutions) on both E-R and SQL charts
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile