



COURSE DESCRIPTION BASIC INFORMATICS

SSD: INFORMATICA (INF/01)

DEGREE PROGRAMME: ARCHITETTURA (N14)
ACADEMIC YEAR 2022/2023

COURSE DESCRIPTION

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GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE: NOT APPLICABLE
MODULE: NOT APPLICABLE
SSD OF THE MODULE: NOT APPLICABLE
CHANNEL: 01 Cognome A - Z
YEAR OF THE DEGREE PROGRAMME: II
PERIOD IN WHICH THE COURSE IS DELIVERED: SEMESTER II
CFU: 3

REQUIRED PRELIMINARY COURSES

No preparatory teaching

PREREQUISITES

No prerequisites

LEARNING GOALS

The aim of the course is to provide knowledge of the basic methods and tools for designing and analyzing data and managing and analyzing large geographic data. Particular emphasis is given to the processes of management, of acquisition from inhomogeneous institutional sources, reconciliation and normalization of data in a relational database, of data query through the use of queries created in the Standard Query Language, of acquisition and conversion in a single system of coordinates of vector and raster spatial data, of the use of thematic classification methods for the realization of thematic maps and of the use of geoprocessing operators in spatial analysis processes. At the end of the course, students will have acquired the fundamental knowledge and

skills necessary for the management and analysis of data organized in relational databases and the processes necessary for the design of GIS and the development of spatial analysis processes, acquiring the aptitude for problem solving with the advanced aid of GIS as decision support tools.

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Knowledge and understanding

The student will have to acquire the basic knowledge regarding the main structuring elements of ICT, the main tools for setting up GIS and for decision support.

Applying knowledge and understanding

The student must be able to use GIS applications in the construction of projects and policies.

COURSE CONTENT/SYLLABUS

The course teachings refer to relational databases for data analysis and the use of GIS as a decision support tool. Below is the program of the course which shows the topic of each lesson and its description.

Topic: Databases: needs and characteristics. Relational databases Description: the needs for using relational databases are highlighted with typical examples; in particular, the problems arising from the improper use and management of data such as inconsistencies and duplications are analyzed. Topic: Databases: needs and characteristics. Relational databases Description: the basic concepts of relational data theory are introduced starting from the set concept of relation.

Topic: The relational data model and the operators of relational algebra. Description: the concept of table as a set relationship and the concept of primary key necessary to uniquely determine the instances is introduced. Topic: The relational data model and the operators of relational algebra. Description: the concept of foreign key is introduced and one-to-one and one-to-many associations (relationships) are discussed Topic: The relational data model and the operators of relational algebra. Description: many-to-many relationships are dealt with in their breakdown into two one-to-many relationships. Creating a database in MS Access is simulated. Topic: Creating a database in MS Access. Creating tables and relationships between tables. Referential integrity constraints. Description: using the RDMS Access tool, the tables and the relationships between them are created and the referential integrity constraints are applied. Topic: Designing a Relational Database in MS ACCESS. Creation of the ISTAT census data database of the municipality of Naples. Description: the reconciliation activities of data starting from inhomogeneous sources and their acquisition in relational database tables are explored. An experiment is carried out starting from the ISTAT census data of the population and building of the municipality of Naples. Topic: Designing a Relational Database in MS ACCESS. Creation of the ISTAT census data database of the municipality of Naples. Description: the creation of the database of the ISTAT census areas is carried out in MS Access with the composition of the relationships between the tables and the acquisition as instances of the reconciled data. Topic: Querying and Analyzing Data in a Relational Database The Standard Query Language and Query Query Creation. Description: The Standard Query Language is introduced. The main data query commands are analyzed. Topic: Querying and Analyzing Data in a Relational Database The

Standard Query Language and Query Query Creation. Description: By using the MS Access Query Builder different query query types are constructed. Topic: Querying and Analyzing Data in a Relational Database Creation of query queries and analysis of ISTAT census data of the municipality of Naples. Description: the different types of query queries are prepared for the ISTAT census analysis Topic: Spatial data - vector and raster data - geographic coordinates.

Description: The concept of spatial data and geo-reference is introduced. Atomic vector spatial data types (point, polyline and polygon), raster data types (satellite images, digital orthophotos, data modeled on surfaces by spatial interpolation processes) are specified, and how they are implemented is analyzed. Topic: Spatial data - vector and raster data - geographic coordinates.

Description: The main geographic coordinate systems are covered: UTM WGS84 - ETR 89, Gauss Boaga, UTM ED50, Cassini-Soldner. In addition, the methods of conversion between coordinate systems and georeferencing of non-georeferenced vector and raster data are explored.

Topic: Data management and spatial selections in GIS. Description: The implementations of vector and raster spatial data types in GIS and their acquisition mode in legend and map display are analyzed. Topic: Data management and spatial selections in GIS. Description: It deals with the use of tables and the creation of fields connected to the features of vectorial themes. The methods of selection of features are analyzed through the use of queries on the fields. Topic:

Data management and spatial selections in GIS. Description: It deals with the use of tables and the creation of fields connected to the features of vectorial themes. The methods for selecting features are analyzed by creating queries on fields (selection by means of attributes). Topic: Data

management and spatial selections in GIS. Description: It deals with the use of tables and the creation of fields connected to the features of vectorial themes. The methods of selecting features are analyzed by creating queries on the fields. The creation and use of joins and relates between tables to associate external tables with features of a vector thematism are discussed. Furthermore, the Summarize function is analyzed and tested, which allows to obtain statistical data of synthesis of fields grouped by unique values of a field. Topic: Data management and spatial selections in GIS. Description: The types of spatial selection are discussed by applying the use of spatial operators (Intersect, completely contain, within, etc.). Numerous examples of spatial selection in GIS are analyzed. Topic: Data management and spatial selections in GIS.

Description: The concept of thematic classification is introduced and its use for the creation of thematic maps. Thematic classification methods for unique values of fields are analyzed. Topic: Thematic classification methods. Description: Thematic classification methods of manual, equal interval and quantile type are analyzed, highlighting for which needs and problems their use is necessary and appropriate. Topic: Thematic classification methods. Description: The thematic classification methods natural reaks and standard deviation are analyzed, highlighting the importance of their use for the study of the spatial distribution of characteristics and phenomena related to the classified themes Topic: The Geoprocessing Operators. Description: The main geoprocessing operators Dissolve, merge, union, clip and intersect are introduced and examples of the use of geoprocessing operators in the solution of spatial analysis problems are discussed. Bibliographical references: Topic: The Geoprocessing Operators. Description: The geoprocessing buffer operator is discussed and the different types of buffer analysis are analyzed with examples for the determination of risk or constraint areas and the analysis of entities subject to the presence

of such risks or constraints. Topic: Creation of a GIS of the municipality of Naples and creation of thematic maps. Description: The creation of a GIS of the municipality of Naples including basic topographical data, districts and census areas is experimented and thematic maps are created linked to census information on the population, families, foreigners, buildings and on accommodation. Topic: Creation of a GIS of the municipality of Naples: experimentation of spatial analysis processes for urban analysis. Description: Spatial analysis processes applied to the GIS of the municipality of Naples are tested for the analysis of specific urban analysis problems.

READINGS/BIBLIOGRAPHY

· Slides provided in class related to relational databases · F. Di Martino, M. Giordano, S. Sessa, *RDBMS Relational Database and Architectures*, Aracne Editrice, pages 152, 2006, ISBN: 88-548-0583-1 · P. Atzeni, *Databases. Models and query languages*, Milan, McGraw Hill Companies, pages 766, 2009, ISBN: 88-386-9445-1 · Slides provided to the students related to GIS systems · F. Di Martino, M. Giordano, *Geographic Information Systems - Theory and Methods*, Aracne Editrice, pages 440, 2005, ISBN: 88-548-0172-0 · Seravalli, *GIS. Theories and applications*, Milan, La Mandragora Editrice, pages 224, 2011, ISBN: 8875863261

TEACHING METHODS OF THE COURSE (OR MODULE)

The teacher will use: a) Frontal lessons for about 50% of the total hours; b) Exercises to practically deepen theoretical aspects for 50% of the total hours. Instrumentation used: recorded lessons, multimedia supports, specialist software, online material.

EXAMINATION/EVALUATION CRITERIA

a) Exam type

- Written
- Oral
- Project discussion
- Other

In case of a written exam, questions refer to

- Multiple choice answers
- Open answers
- Numerical exercises

b) Evaluation pattern

There are no elapsed tests during the course