COURSE DESCRIPTION CARD - SYLLABUS

Course name
Data engineering for sustainable and mobile application [S2TIIZM1E>IDnPZiMA]

Course

Field of study
Information Technology for Smart and Sustainable Mobility

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
24

Laboratory classes
0

Other
0

Tutorials
24

Projects/seminars
0

Number of credit points

4,00

Coordinators

Lecturers

Prerequisites

Basic programming skills (e.g., Python, JavaScript, or other relevant languages) Basic understanding of Data Structures (e.g., Lists, trees, graphs, hash maps) Basic knowledge of sustainability concepts is recommended but not required

Course objective

Introduction to data management, from centralized databases to distributed semantic web of data. Description of different data modelling approaches

Course-related learning outcomes

Knowledge:
The student knows methods, techniques, and tools used for data storage, information and data modeling, and data acquisition.
The student has advanced detailed knowledge of selected topics in the application of data engineering in mobile application development, including taxonomy and ontology, as well as good and bad practices in data modeling for mobile applications.

Skills:

The student is able to obtain information from literature, databases, and other sources, integrate it, interpret and critically evaluate it, draw conclusions, and formulate well-justified opinions
The student is able to use information and communication techniques employed in the design and development of mobile applications.
The student is able-when creating sustainable and efficient mobile solutions-identify the best methods for data acquisition and storage.
The student is able to assess the usefulness and applicability of new achievements (methods and tools) as well as new IT products

Social competences:
The student understands the importance of using the latest knowledge in IT tools in solving research and practical problems

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam
Practical exam

Programme content

Data Modeling, Semantic Web, Graph Databases, Ontology Engineering, Big Data Processing, Smart City Interoperability

Course topics

1. Data storage:
o Relational databases (SQL)
o Non-Relational databases (NoSQL)
o Graph based, document based, etc.
2. Introduction to distributed semantic web of data
3. Information and data modeling
o Visual representation
o Languages (RDF, OWL, JSON-LD, etc.): namespaces, relationships, entities, properties.
o Data storage: Triplestore, Graph Databases, etc.
o Query languages and engines: SPARQL
4. Taxonomy and Ontology
o Inference, Equivalence, Transitivity
o Examples: generic, IoT, SAREF, Smartcity, etc.
o Data models: Data vs Metadata (data quality, enrichment, and linking) and Attribute definition
5. Data acquisition, sources and introduction to processing
o 5V's of BigData (velocity, volume, value, variety and veracity)
o Datasets vs Data Streams (timeseries, etc.)
o Mapreduce
6. Good and bad modeling practices
7. Initiatives on smartcity interoperability
o FIWARE, Smart Data Models, NGSI-LD ETSI standard, oneM2M
o Infrastructure federation

Teaching methods

The course is conducted remotely (online) in a synchronous format. Classes may also be held in person.
Interactive lectures with multimedia presentations
Case studies and practical examples

Bibliography

Basic:
Gonzalez-Feliu J., Semet F., Routhier J. (eds.) (2014) Sustainable urban logistics: concepts, methods and information systems. Springer Science+Business Media. Springer-Verlag.

Additional:
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Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	48	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	52	1,00