INFORMATION SYSTEMS AND SOFTWARE DESIGN

A.Y. 2021-2022

1. INTRODUCTION AND OVERVIEW

1.1. **Presentation, objectives and learning objectives of the course.** *Datum, informatio*. Importance of the analysis and design activities: skills' acquisition. Concepts: software engineering and information systems. Concepts: organizational analysis, methodology, quality. Presentation of the topics and of the course program. Methodology of the course, teaching method. Examination arrangements.

2. SOFTWARE ENGINEERING

2.1. Software evolution. Life cycle. Direct and indirect costs. Maintenance. Logical design of information systems: Reality and Model

2.2. **Methodologies.** Models for software development. Waterfall Model. Applicability of the model. Prototyping cycle. Exploration model. Agile methodologies. Incremental model. Iterative Model. Agile methodologies vs classical methods. Analysis process: adaptive vs. predictive. eXtreme Programming guidelines and phases.

2.3. **Requirements and Specifications**

2.4. ***Lab Toolbox: Requirements***

2.5. **Design**

2.6. **Coding, Testing and Validation**

2.7. ***Lab Case: version control.*** *Management through the repository*.

2.8. **Software Project Management.** Company structure. Organization: teams and roles. Planning a project. Table of tasks

2.9. ***Lab Toolbox: production table of tasks, production graph of addictions.*** *Scheduling tasks. PERT. GANTT. Costs estimation*

2.10. **Gantt Planning**

2.11. ***Lab Toolbox: planning of a project.*** *Use of Microsoft Project.*

3. METHODS AND TOOLS

3.1. **Evaluation of the activity and cost estimates**

3.2. **Function point analysis.** Counting method. Identification of the elements. Calculation of UFP. Determination of the adjustment factor. Calculation of Adjusted Function Point (AFP). Example of UFP count.

3.3. ***Lab Toolbox: Funcion Point Analysis.*** *Metodo di valutazione, con analisi e disegno della base dati*.

3.4. **Unified modeling language (UML).** Definition of a visual approach to design. The advantages of the diagrams in the design phase. Unified Software Development Process, characteristics and phases. UML structure. The views. The diagrams. Use cases. Actor. Relationship between actor and use case. Other types of relationship and association. How to make use cases. Meaning and description of diagrams. Diagrams: classes, objects, collaboration, sequence, activity, state, physical, components, deployment.

3.5. ***Lab Case: UML***

3.6. ***Lab Toolbox: UML***

4. INFORMATION SYSTEMS

4.1. **Concepts, evolution.** Information system and system of informations. Components. Concept of information system. Quantity of information and uncertainty of the task. Information system and computer system. Characteristics, finality, modality and process information.

5. INTERNET INFORMATION SYSTEMS

5.1. **The phases of analysis, design, implementation and work tools.**

5.2. ***Lab Toolbox: Website***

5.3. (Lab) Toolbox analisi 2QCV2Q

5.4. **Portals**

6. INFORMATION SYSTEMS FOR ANALYSIS AND DECISIONS

6.1. **Information systems for analysis and decisions.** Uses and users. Architecture. Multidimensional database.

6.2. **Data Cube**. Operations: Drill-down, roll-up, Pivoting. Slice and dice. Ranking. Loading Access, Analysis and Reporting. DSS, EIS, Data Mining. Limitations. Time of realization.

6.3. **Data quality**. Standards for metadata. Special database. Costs. Data marts.

6.4. ***Lab Toolbox: Information Systems for Analysis and Decisions***

7. DATA VIRTUALIZATION AND DATA LAKE

7.1. **Data Virtualization.**

7.2. **Big Data & Data Lake.** Data Lake architecture. Data Lake vs Data Warehouse. In-memory.

8. DATA VISUALIZATION

8.1. **Presentation of data.** How to represent data graphically. Approach to the graphical representation of information. Some rules to build effective graphics. Multidimensional analysis with Excel. Analyze data. Produce Pivot tables and charts.

8.2. ***Lab Toolbox: Data Visualization***

9. VALUE OF INFORMATION

9.1. **Information systems from data to Big Data**.

9.2. **Open Innovation.** Open Innovation Models.

9.3. **The paradigm of Industry 4.0.** Enabling technologies.

9.4. **Data Strategy.** Data analytics. Categories of analysis: from predictive to automated.

9.5. **Digital Twin.**

Reference books and readings (Reported for further details, the course is entirely covered by the slide and lecture notes available to students).

M. Fugini, P. Grefen, B. Pernici, P. Plebani, Fondamenti di Sistemi Informativi: per il settore dell'informazione, 2018
P. Atzeni, S.Ceri, P. Fraternali, S. Paraboschi, R. Torlone, Basi di Dati, Connect, 2018
R. Elmasri, S. B. Navathe, Fundamentals of Database Systems, 7th Edition. Pearson, 2016
P. Atzeni, S. Ceri, P. Fraternali, S. Paraboschi, R. Torlone, Basi di Dati, Modelli e linguaggi di interrogazione, McGrawHill, 2013
T. Di Noia, R. De Virgilio, E. Di Sciascio, F. M. Donini, Semantic Web, tra ontologie e Open Data, Apogeo, 2013
A. De Mauro, Big Data per il Business: Guida strategica per manager alle prese con la trasformazione digitale, Apogeo 2020
A. Agrawal, J. Gans, A. Goldfarb, Macchine predittive. Come l'intelligenza artificiale cambierà lavoro e imprese, Franco Angeli, 2019
J. Kaplan, Intelligenza artificiale, guida al prossimo futuro, Luiss, 2017