

INFORMATION SYSTEMS AND SOFTWARE DESIGN

A.Y. 2020-2021

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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 Exercise: Requirements**
- 2.5. **Design**
- 2.6. **Coding, Testing and Validation**
- 2.7. **Lab Case: version control.** *Management through the repository.*
- 2.8. **Project Management.** Company structure. Organization: teams and roles. Planning a project. Table of tasks
- 2.9. **Lab exercise: production table of tasks, production graph of additions.** *Scheduling tasks. PERT. GANTT. Costs estimation*
- 2.10. **Project Management. Gantt Planning**
- 2.11. **Lab exercise: 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 exercise Function 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 Exercise: UML**

4. INFORMATION SYSTEMS

- 4.1. **Concepts, evolution, design criteria.** 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, evaluate**
- 5.2. **Lab Exercise: Website**
- 5.3. **Portals**

6. INFORMATION SYSTEMS FOR ANALYSIS AND DECISIONS

- 6.1. **Information systems for analysis and decisions.** Uses and users. Architecture. Multidimensional database. 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. Data quality. Standards for metadata. Special database. Costs. Data marts.
- 6.2. **Multidimensional analysis.** Dimensions and measures. Pivot tables and charts.
- 6.3. **Data Lake.** Big data concept. Availability of data. Data Virtualization. In-memory processing.

7. PRESENTATION OF DATA – DATA VISUALIZATION

- 7.1. **Data Visualization.** Approach to the graphic representation of information. Some rules to build effective graphics. Examples of online data analysis. Examples of effective graphic representations.
- 7.2. **Lab Exercise: Analytics and information representation**

8. VALUE OF INFORMATION

- 8.1. **Value of information.** *Information systems from data to Big Data. Open Innovation. The paradigm of Industry 4.0. Data Strategy. Digital Twin. Analysis on Open data available online.*

REFERENCE BOOKS (Reported for further details, the course is covered by the slide and lecture notes available to students).

- 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, IV edizione, McGrawHill, 2014
P.Atzeni, S.Ceri, P.Fraternali, S.Paraboschi, R.Torlone, Basi di Dati, Modelli e linguaggi di interrogazione, IV edizione, McGrawHill, 2013.
T.Di Noia, R.De Virgilio, E.Di Sciascio, F.M.Donini, Semantic Web, tra ontologie e Open Data, Apogeo, 2013.
Kenneth C. Laudon, Janesich P. Laudon, Vincenzo Morabito, Ferdinando Pennarola, Management dei sistemi informativi, Fondamenti, Progetto e applicazione, Pearson Italia, 2010.