M.Sc. 2 years full time in Business Innovation and Informatics (Italian Class LM-18: Informatics)

Roberto Tagliaferri, DISA-MIS, University of Salerno
Email: robtag@unisa.it
Objectives

- The M.Sc. degree course in "Business Innovation and Informatics" has been designed to provide graduates from a wide variety of backgrounds with the necessary tools and skills for understanding complex information technology (IT) problems while, at the same time, knowing about the needs and requirements of a modern organization.

- The interdisciplinary knowledge of a graduate in Business Innovation and Informatics aims to combine computer skills with their managerial skills, helping to form new professionals able to act as integrators of different skills and approaches to be used in
  - decision making,
  - data management for operational activities innovative,
  - in the analysis of large amounts of data accumulated over time to produce information to support decisions.

- In modern organizations must effectively develop new types of decision-making, combining the insight and experience the ability to manage the information extracted from the data collected with the analytical methods of Business Intelligence.
Objectives

- This Master offers a balanced combination of courses that cover the necessary background in management as well as the fundamental aspects of current and evolving information technologies. Moreover, the program provides students with a specialized knowledge in topics at the interface between management and informatics such as enterprise resource planning.

- Since English is the unique teaching language, graduates are well-prepared to work in international companies.

- Moreover, the interdisciplinary approach of this Master provides a general skill to work across traditional areas.
Teaching Organization

- The legal duration of the Master's degree course is two years.
- It can also sign up for part-time, according to the rules established by the University.
- This Master combines lectures to cover the theoretical aspects with hands-on labs for conveying the relevant practical elements, through specific project works.
- It also provided a practical application of the content of study to be carried out in the Laboratory under the guidance of the teacher. In particular, the project works will take place either in parallel with lessons, either in an interdisciplinary mode (as a connection between different teachings).
- The project work will be studied even within the business companies partner of the study program and will cover the resolution of the complex real-world problems.
Teaching Organization

- The Master Degree in Business Innovation and Informatics is held entirely in English, so as to allow a formation of the international level.
- For graduation, students must acquire 120 ECTS, due to the following types of educational activities:
  - Core courses
  - Specialization courses
  - Elective courses chosen by the student
  - final test
Teaching Organization: «core courses» in Business and Informatics

- MANAGEMENT AND CONTROL SYSTEMS
  - Systems Management (SECS-P/08, 5 CFU)
  - Cost Control Systems (SECS-P/07, 5 CFU)

- INDUSTRIAL AND QUALITY MANAGEMENT
  - Industrial Management (ING-IND/17, 5 CFU)
  - Quality Systems (SECS-P/13, 5 CFU)

- IT PROJECT MANAGEMENT (INF/01, 10 CFU)

- KNOWLEDGE MANAGEMENT SYSTEMS (INF/01, 10 CFU)
«Core courses» in Business and Informatics

- Management and Control Systems
  - Systems Management (SECS-P/08, 5 CFU)
  - Cost Control Systems (SECS-P/07, 5 CFU)

Aims and contents:
- the course has the goal to provide students needed basic concepts to the government and the management of business, analyzed in the light of the current economic, social and technological;
- illustrate the main business process management models and main technical calculation and analysis of costs.
- Students will be provided the information necessary to understand the determination of costs business management and design and implementation of management control systems.

Course program
- The relationship with the environment. The environment perceived by the firm and the stakeholders.
- Theories of firm decisions. The strategic management. The integrated management, the direction cycle and the information cycle.
- Performance control: tools and methods. Performance controls and effective strategy implementation. The value, networks and relationships.
- Advanced technologies enabling the integration.
«Core courses» in Business and Informatics

- INDUSTRIAL AND QUALITY MANAGEMENT
  - Industrial Management (ING-IND/17, 5 CFU)
  - Quality Systems (SECS-P/13, 5 CFU)

- Aims and contents:
  - The course covers the main principles of operations management, as rational approach to productive resources management.
  - The goal is to provide to the students a reference framework and a set of tools to analyze and make decision related to production systems.
  - Students will be earn a solid theoretical and empirical expertise in the field of quality.

- Course program
  - PRODUCTION SYSTEMS
    - Descriptive Characteristics
      - Classification of Production Processes, Layout analysis, Performance indicators  
      - Quality Management
    - Structural Characteristics
      - Capacity Design, Economic Analysis
    - Operative Characteristics
      - Process Analysis, Inventory Management, Operations Planning and Control
  - DEEPENING
    - Logistics and Transportation
    - Operations Strategy
«Core courses» in Business and Informatics

- IT PROJECT MANAGEMENT (INF/01, 10 CFU)
- Aims and contents:
  - The course aims at providing students with an endowment of knowledge related to project management. The attention will be on software development projects. The course will be also focused on agile approaches like SCRUM.
  - Moreover, the course will allow students to acquire knowledge on project management tools and metrics for measuring team performance. Lastly, during the first weeks of the course, basic notions related to software engineering will be recalled.
  - At the end of the course, the students will be able to successfully apply the acquired knowledge and to face further studies on advanced aspects of project management.
- Course program
  - Course lessons will be divided into three main parts and a final part dedicated to project works.
  - The first one will focus on some important aspects related to software engineering: software engineering processes, requirement engineering, system modeling, architectures, software design and implementation, testing
  - The second one will focus on: risk management, people management and teamwork, software pricing, plan-driven development, project scheduling, agile planning, estimation techniques and COCOMO cost modeling, software quality, software standards, reviews and inspections, quality management, agile development and software measurement, version management, system building, change management and release management
  - The third part will go deep in details on Agile Approaches for project management, such as SCRUM, and on project team performance metrics.
KNOWLEDGE MANAGEMENT SYSTEMS (INF/01, 10 CFU)

Aims and contents:
- The course aims to introduce students to Knowledge Management Systems and to their use in an enterprises and other organizations. Knowledge and understanding will be developed through formal languages for the representation of enterprise architectures and through the modelling of business processes.
- The student will acquire advanced notions about structured database, semi-structured database and document management systems in order to have an overall vision of how Knowledge Management Systems can be used within an enterprise.

Course program
- The course is comprised of two fundamental parts: 1) Introduction to enterprise architectures and 2) Data and Knowledge Management.
- Introduction to enterprise architectures
  - The Archimate Framework. Layering: the business layer, the application layer and the technology layer. Structural, behavioral and informational concepts. Principle of service orientation of enterprise architectures, collaborations. Business processes, BPMN modeling of business processes, the role of ICT for the internal (intranet, workflow, document management) and external coordination (extranet, supply chain, CRM)
- Data and Knowledge Management
Specialization Courses

- CURRICULUM IN COMPUTATIONAL INTELLIGENCE & DATA ANALYTICS
  - COMPUTATIONAL INTELLIGENCE (INF/01, 10 CFU)
  - BIOMEDICAL DATA & SIGNAL PROCESSING (ING-INF/05, 10 CFU)
  - DATA SCIENCE (INF/01, 10 CFU)

- CURRICULUM IN SECURITY AND AWARENESS
  - SECURE PROTOCOLS AND PRIMITIVES FOR COMPUTATION AND COMMUNICATION (INF/01, 10 CFU)
  - SAFE AND AWARENESS SYSTEMS (INF/01, 10 CFU)
  - SECURE PROGRAMMING AND SECURE APPLICATIONS (INF/01, 10 CFU)
Curriculum in Computational Intelligence & Data Analytics

- Computational Intelligence (INF/01, 10 CFU)

Aims and contents:
- The student will acquire the knowledge of models of machine learning, computational and artificial intelligence. The student will acquire the competence in applying advanced models of machine learning, computational and artificial intelligence to real problems with multidimensional data in the area of knowledge discovery.

Course program
- Pattern Recognition and Machine Learning
  - Introduction to Pattern Recognition
  - PDF Distributions and Estimation
  - Mixture Models, Clustering and EM
  - PCA
  - Linear Models for Regression
  - Linear Models for Classification
  - Non Linear Models for Regression
  - Non Linear Models for Classification
  - Feature Analysis
  - Advanced Models of Clustering
  - Deep Learning
- Introduction to Information Theory
Biomedical Data & Signal Processing (ING-INF/05, 10 CFU)

Aims and contents:

- Learning the theories and the techniques commonly employed in biomedical data and signal processing will let the student increase his knowledge about data models and algorithms. Starting from the main concepts essential for the data analysis in time and space, the student will encounter a number of practical solutions for important problems in biomedicine related to data and image processing and management, including the transformation of signals and images from their raw data format to interpretation-oriented representations.

- The student will first of all become familiar with the concepts of multidimensional signal, image time series filtering and convolution, noise reduction and signal enhancement, local and global image transformations, morphological analyses, in the way these concepts are widely used in Biomedicine, with special focus on Neuroimaging. Ultimately, the student will learn how to implement and adapt existing software solutions for biomedical data models, with special application to the analysis of Neuroimaging data and images.

Course program

- Part I: General Aspects of Signal and Image Processing
  - Introduction to signals and images; Transformations, transfer functions, convolution and filtering; Principles of signal and image acquisition; Mathematical operations on signals and images; Time, space and frequency filters; Image registration and segmentation.

- Part II: Biomedical Data and Signal Processing
  - Introduction to biomedical signals and images; Characterization of typical biomedical signals (ExG); Biomedical Image Processing: Application to neuroimaging; Neurosignals and neuroimage time series; Inferential and descriptive statistical analysis of neuroimaging data; Clustering, classification and regression problems in neuroimaging.
Curriculum in Computational Intelligence & Data Analytics

- Data Science (INF/01, 10 CFU)

Aims and contents:
- The course aims at providing students with an endowment of knowledge related to massivedata analysis (big data analysis), in order to allow a scalable management of complex systems and heterogeneous platforms. It also aims at developing analytical capabilities to solve complex problems, whose solutions go toward synergic approaches in terms of data mining algorithms, advanced computational paradigms, distributed system for data management, targeted at data-driven discovery and predictive analysis. The student, at the end of the course, will have acquired theoretical knowledge and practical skills related to data analysis and analytics (for solving problems related to the acquisition and management of bid data) and the ability to use the main techniques and tools for the resolution of specific problems.

Course program
- The course is divided into three parts.
  - The first part deals with the under pinning of methodologies and formal approaches for data analysis. The main algorithms are studied: unsupervised, supervised and predictive models to analyze and manipulate the data.
  - The second part is aimed at presenting the techniques and tools for the big data analysis; this part of the course will introduce the main systems for managing distributed data and databases, as well as paradigms and models for distributed computing.
  - The third section focuses on the study of advanced techniques for the modeling and abstraction of raw data: the information that is derived from the data is processed through "strategies and methods to identify, collect, develop, maintain, and disseminate knowledge" accessible thanks to advanced tools to Information Technology.
Secure Protocols and Primitives for Computation and Communication (INF/01, 10 CFU)

Aims and contents:
- The course aims to provide students with an endowment of knowledge related to the formal methods for designing cryptographic primitives and of their secure composition into secure protocols.
- Different classes of primitives will be discussed and different methodologies for their secure composition will be presented (Random Oracle vs Plain Model, Stand-Alone security vs Universal Composition).
- The student, at the end of the course, will have acquired theoretical knowledge and practical skills related to the design of secure protocols and their implementation in one of the major programming languages (C++ or Java).

Course program
- Primitives
  - block cipher (SP and Feistel), stream cipher, message authentication code, pseudo-random generator, public-key encryption, digital signatures
- Protocols
  - Identification, key exchange, commitment, secret sharing
Curriculum in SECURITY AND AWARENESS

- Safe and Awareness Systems (INF/01, 10 CFU)

Aims and contents:
- Understanding of the specific issues of Situation Awareness systems and of the peculiarities of the software architectures and of the involved functionalities in several application domains.
- To design software Situation Awareness system in scenarios where it is fundamental the management of what happens around the user/operator interacting with the system and what and how the user understand of this interaction depending on the data perceived in a temporal window.

Course program
- Basic as well as advanced knowledge for the design software architectures endowed with of Situation Awareness;
- main phases and methodologies that guide the design of a Situation Awareness System;
- methodologies and the technologies have been successfully used for most of Critical Mission Systems over an international scenario.
Curriculum in SECURITY AND AWARENESS

- Secure Programming and Secure Applications (INF/01, 10 CFU)

Aims and contents:
- The course aims to provide students with an endowment of knowledge related to the most widely used security library and how to use them to build secure applications. In addition the course will discuss the elements of language-based security used to construct safe software. The student, at the end of the course, will have acquired practical skills related to the design of secure applications and their implementation in major programming languages (C++ or Java). The course will also thoroughly discuss the Public-Key Infrastructure model that is at the base of the TLS protocol.

Course program
- The course is divided into two parts: primitives and protocols and for each part it will discuss the main industrial standards and how they are implemented in the most widely-used libraries
  - Primitives
    - block cipher (AES and its modes of operations)
    - hash functions (SHA3 and SHA256)
    - message authentication code
    - pseudo-random generator
    - public-key encryption (RSA, RSA-OAEP)
    - digital signatures (DSA)
  - Protocols
    - identification (The TLS handshake and X509 certificates)
    - key exchange (Diffie-Hellman).
Other elective courses in Management

- 2 ELECTIVE COURSES (10 ECTS) CHOSEN FROM AMONG THE FOLLOWING
  
  - COMPLEXITY MANAGEMENT (SECS-P/08, 5 CFU)
  
  - IT BANKING (SECS-P/11, 5 CFU)
  
  - FINANCIAL ANALYSIS (SECS-P/09, 5 CFU)
  
  - ADVANCED PROJECT MANAGEMENT (ING-IND/17, 5 CFU)
Other elective courses

- 2 ELECTIVE COURSES (10 ECTS) CHOSEN FROM AMONG THE FOLLOWING

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimization</td>
<td>ING-INF/04</td>
</tr>
<tr>
<td>Inferential Statistics For Big Data</td>
<td>Secs-S/01</td>
</tr>
<tr>
<td>Frontiers Of Technology For Brain Imaging And Therapeutics</td>
<td>MED/50</td>
</tr>
<tr>
<td>Advanced Techniques for Computational Control &amp; Management in industrial Informatics</td>
<td>ING-IND/33</td>
</tr>
<tr>
<td>Web Programming</td>
<td>INF/01</td>
</tr>
<tr>
<td>Human-Computer Interaction</td>
<td>INF/01</td>
</tr>
<tr>
<td>Cross Cultural Management</td>
<td>Secs-P/08</td>
</tr>
<tr>
<td>Leadership, Teamwork E Management</td>
<td>Secs-P/10</td>
</tr>
<tr>
<td>Numerical Algorithms In Big Data Science</td>
<td>MAT/08</td>
</tr>
<tr>
<td>Complex Systems</td>
<td>INF/01</td>
</tr>
<tr>
<td>Business Process</td>
<td>Secs-P/08</td>
</tr>
</tbody>
</table>

- 2 ELECTIVE COURSES (10 ECTS) CHOSEN FROM ALL THE PREVIOUS ONES OR FROM ANY OTHER M.SC. OF THE UNIVERSITY OF SALERNO, ALSO TAUGHT IN ITALIAN
FINAL EXAM

- Having passed all the tests of the training activities included in the curriculum of the chosen curriculum and acquiring the related receivables, the student, regardless of the number of years of enrollment, is admitted to the final test, to which they are assigned 19 ects.
- The final exam consists of preparation, drafting and discussion in open session before a special commission, of a degree thesis written in by the student under the guidance of a supervisor.
- The final examination of the course in business innovation and informatics must be fully supported in English and in English the dissertation must be written.
- The thesis must cover a topic agreed with the rapporteur and must be developed autonomously by the student and with the help of significant original contributions that can be theoretical, methodological, design or implementative.
- The thesis may include the development of a project in companies or external bodies, in a manner determined by the board of studies course.
- The final test is intended to verify the quality of the work, the original and innovative nature with regard to the scientific context and application reference, the degree of autonomy of the candidate and his ability to communicate complex scientific contents in English.
Thank You