COURSE DESCRIPTION – ACADEMIC YEAR 2020/2021

Course title	Systems Design and Implementation
Course code	76059
Scientific sector	ING-INF/04
Degree	Master in Software Engineering for Information Systems (LM-18)
Semester	2
Year	1
Credits	12
Modular	Yes
University	UniBZ

Total lecturing hours	80
Total exercise hours	40
Attendance	Recommended
Prerequisites	Lectures and exercises of Mathematical Analysis I and II, Geometry, Physics I, Mechanics of Machinery
Course page	https://ole.unibz.it/

Specific educational objectives	The course belongs to the type caratterizzanti – discipline informatiche and is part of the Specialization Topics.
	Module 1: Embedded Systems Design and Implementation
	The course belongs to the scientific area of Hardware and Software design, with a specific focus on the development, deployment, validation and testing of embedded devices, particularly as regards programmable logic controllers (PLCs), internet-of-things (IoT) devices, and controllers for mechatronics. The course gives a general overview of the principles of hardware and software co-design in an embedded context, with a strong practical slant. The students are led on a journey through small, bare-metal microcontrollers, embedded Linux devices, industry leading PLCs, controllers based on programmable logic and more recently emerging approaches based on artificial intelligence and neural networks. The theoretical and pratical aspects are addressed throughout, as they become relevant to each platform and use case under consideration.
	Module 2: Design and Development of Business Software
	The course belongs to the scientific area of Management Engineering and is focused on Business Intelligence and Enterprise Resource Planning Systems. It represents one of the related topics (affine/verwandt) for the study programme on Software Engineering for Information Systems. The course gives a general overview of the scientific basics of business and its objectives as well as the role software can play in it. During the course, the industrial application of the presented theoretical topics will be integrated by means of targeted application-oriented exercises and cases concerning the business environment, especially the manufacturing sector.

The learning objectives are to introduce informatic students in the fundamentals of business and business software. Based on this, decision making and operational tools such as Business Intelligence and Enterprise Resource Planning Systems are discussed in detail alongside presentations of their real-world application in business. Starting from this knowledge, the students will outline an exemplary design of a business software to apply their knowledge and combine it to the other contents of the study program. In the end, the students should acquire the competence to understand and evaluate business problems and outline an appropriate design for a business software to address the problem in terms of decision support or operational improvements in the manufacturing sector.

Module 1	Embedded Systems Design and Implementation
Module code	76059A
Module scientific sector	ING-INF/04
Lecturer	Minati Ludovico
Contact LA	Faculty of Computer Science, Domenikanerplatz 3 - Piazza Domenicani Ludovico.Minati@unibz.it
Scientific sector of lecturer	ING-INF/04
Teaching language	English
Office hours	During the lecture time span, arranged beforehand by email.
Lecturing Assistant	--
Contact LA	--
Office hours LA	--
Credits	6
Lecturing hours	40
Exercise hours	20
List of topics	- Microcontrollers - Embedded Linux - Programmable logic controllers - Hardware and software co-design - Internet of things - Real-time applications and issues
Teaching format	The lessons are divided into theoretical classroom lessons, and exercises using blackboard and slides as well as exercises.

Module 2	Design and Development of Business Software
Module code	76059B
Module scientific sector	ING-INF/05
Lecturer	Sauer Philipp Christopher
Contact LA	Office Building L - 5th Floor, philippchristopher.sauer@unibz.it, tel +390471017764
Scientific sector of lecturer	ING-IND/35
Teaching language	English
Office hours	During the lecture time span, Wednesday 12:00 - 14:00, arranged beforehand by email.

Lecturing Assistant	--
Contact LA	--
Office hours LA	--
Credits	6
Lecturing hours	40
Exercise hours	20
List of topics	• Introduction to Business Software • Designing business processes • Systems for small/medium business • Enterprise systems • Business intelligence dashboards and online analytic processing
Teaching format	Frontal lectures, exercises, project

Learning outcomes	**Knowledge and understanding:** D1.2 To be able to analyze and solve even complex problems in the area of Software Engineering for Information Systems with particular emphasis on the use of studies, methods, techniques and technologies of empirical evaluation; D1.4 To know in depth the principles, structures and use of computer systems for the automation of information systems; D1.8 To be able to read and understand specialist scientific documentation, such as conference proceedings, articles in scientific journals, technical manuals. **Applying knowledge and understanding:** D2.3 To know how to apply the principles of software engineering to domains of different complexity, both IT and non-IT, in which software technology is of great importance, such as, for example, in the transport sector or in the medical field; **Making judgments:** D3.1 To be able to autonomously select documentation from a variety of sources, including technical books, digital libraries, technical scientific journals, web portals or open source software and hardware tools; **Communication skills:** D4.6 To be able to interact and collaborate during the implementation of a project or research with peers and experts; **Learning skills:** D5.3 In the context of a problem solving activity, to be able to extend knowledge, even if incomplete, taking into account the final objective of the project;

Assessment	**Module 1: Embedded Systems Design and Implementation** The assessment is based on two components: 1) A written exam consisting of exercises and open questions;

	2) A project work (done in groups) in which students should outline the design of a embedded computing tool for addressing a practical problem and present it.
	Module 2: Design and Development of Business Software
	The assessment is based on two components: 3) A written exam consisting of exercises and open questions; 4) A project work (done in groups) in which students should outline the design of a business intelligence tool for addressing a business problem and present it.
Assessment language	English
Assessment typology	Collegial commission
Evaluation criteria and criteria for awarding marks	**Module 1: Embedded Systems Design and Implementation** The written exam consists of two parts: A first part with a series of questions with to-be-freely formulated answers, as well as a second part consisting of several conceptual and design problems to be solved, which are distributed among the various topics covered. Judged will be: • the correctness, originality and inventiveness of the approach and the steps of the solution; • the correctness of the provided answers and arguments presented and the terminology used. **Module 2: Design and Development of Business Software** The final mark is the sum of the scores of the different parts of the summative assessment (presentation and exam) The assessment is based on 1) Laboratory exercise and presentation (40%) - Ability of the outlined tool to solve the business problem - Quality of the drafted scorecard - Quality of the drafted business process - Quality of the presentation 2) Exam (60%) - Ability to solve simple exercises about the topics of the course, - Clarity of answers, - Mastery of language (also with respect to teaching language), - Ability to summarize and establish relationships between topics.

Required readings	Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it
	Module 1: Embedded Systems Design and Implementation • Lecture slides and notes • Lab exercise slides and notes
	Module 2: Design and Development of Business Software • Lecture slides and notes

	• Lab exercise slides and notes

Supplementary readings	**Module 1: Embedded Systems Design and Implementation** • To be announced during the course **Module 2: Design and Development of Business Software** • Laudon, J. P, Laudon, K. C., (2018): Management Information Systems: managing the digital firm, 15th ed., Pearson Education, Upper Saddle River. • Magal, R. S., Word, J. (2009): Essentials of business processes and information systems, Wiley, New York. • Rainer, R. K., Watson, H., (2016): Management information systems: moving business forward, 4th ed., Wiley, Chichester. • Sauter, V. L., (2011): Decision support systems for business intelligence, 2nd ed., Wiley, Hoboken
Software used	TBD