Teaching guide

IDENTIFICATION DETAILS

Academic year:	2023-2024
Degree:	Computer Engineering
Field of Knowledge:	Engineering and Architecture
Faculty/School:	Senior Polytechnic School
Course:	FUNDAMENTALS OF COMPUTER ENGINEERING
Type:	Basic Training
ECTS credits:	6
Year:	1
Code:	5614
Teaching period:	First semester
Area:	IT
Module:	Basic training
Teaching type:	Classroom-based
Language:	English
Total number of student study hours:	150

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SUBJECT DESCRIPTION

"Fundamentals of Computer Engineering" aims to provide a global vision of Computer Engineering in both

academic and professional points of view. The course gives the students a grasp of the fundamentals on which this engineering is based (mathematics, physics, anthropology and ethics), the future professional careers and the role of a computer engineer in today's society.

The course is divided in two parts. the first part addresses the theoretical foundations, while the second helps develop practical skills.

The first part covers three fundamental blocks of content.
1) Computer Engineering in Society: Background and historical perspective: past, present and future of Computer Engineering. Computer Engineering as an academic discipline or profession. The human factor: anthropological and ethical foundations.
2) Information and Data: Information representation. Organization of information.
3) Information Processing, Management and Transmission: Fundamentals, current paradigms and trends in computer systems and applications.

The second part of the course is devoted to the development of practical skills where an introduction to web development is addressed, through the realization of a project for the creation of a web page on contents related to the course.

Besides providing the basics of a computer engineer technical skills, this course contributes to the development basic soft-skills for an engineer, such as teamwork, ethical commitment and communication skills, both oral and written, of technical information, favouring the comprehensive training of the engineer as stated in the educational project of the University.

The course "Foundations of Computer Engineering" is meticulously crafted to offer a holistic perspective of Computer Engineering, encompassing its academic and professional dimensions. The main objective of this course is to acquaint students with the fundamental principles that underpin the discipline, including mathematical, physical, anthropological, and ethical foundations. Moreover, it aims to familiarize them with the diverse career opportunities available and the pivotal role assumed by computer engineers in contemporary society.

This course is structured into two distinct modules. The initial module delves into theoretical foundations and encompasses three pivotal content blocks:

- The first block critically examines the intersection of Computer Engineering and Society, exploring its historical antecedents, contextualizing its present state, and contemplating its future trajectory. Moreover, it elucidates Computer Engineering as an academic discipline and profession, and delves into the profound human aspects such as anthropological and ethical foundations.
- The second block focuses on the fundamental principles of Computer Engineering, aiming to comprehend the inner workings of computers and identify their key components.
- Finally, the last block revolves around Data management, processing, and communication. It not only elucidates the fundamental concepts but also explores current paradigms and emerging trends in systems and applications.

The second module of the course is dedicated to fostering practical skills. Herein, workshops play a pivotal role, fostering teamwork, the production of well-crafted printed documentation, and the delivery of impactful oral presentations to diverse audiences. Significantly, the laboratories provide an invaluable opportunity for students to gain hands-on experience in web development by embarking on a project centered around the creation of a web page exploring topics relevant to the subject.

In addition to the cultivation of technical competencies, this course espouses the development of essential skills requisite for future engineers. It emphasizes the significance of teamwork, ethical commitment, and effective communication skills, both oral and written, particularly in the technical domain. By embracing these overarching goals, this course aims to nurture well-rounded engineers who embody the comprehensive educational vision outlined in the university's educational project.

GOAL

The specific objectives that this subject aims to achieve are:

- To understand the purpose of Computer Engineering, its ultimate goal, and the societal benefits it provides, while reflecting on the role each individual wishes to play as an engineer in the future society.
- To gain knowledge about the pillars on which technological progress must be based, including a historical perspective on technological development.
- To recognize the importance of the human factor in professional practice and foster a sense of service and contribution to the common good.
- To have a global vision of the field of study, its various areas of knowledge, and to distinguish career paths and professional profiles in order to question one's own vocation.
- To provide knowledge about current paradigms, trends in computing, data management, and an introduction to web development.

PRIOR KNOWLEDGE

Admission requirements for the Degree program.

COURSE SYLLABUS

MODULE I: THEORETICAL FOUNDATIONS

BLOCK 1. Computer Engineering in Society.

- Historical background and perspectives.
- Definitions and basic concepts.
- Past, present, and future of ICT (Information and Communication Technology).
- Computer Engineering as an academic discipline and profession: (1) competencies and knowledge required for a computer engineer; (2) career prospects; (3) the role of ethics in the education of computer engineers; and (4) code of ethics.

BLOCK 2. Current paradigms and trends in systems and applications.

- Software development: more than just programming.
- Structure of computer systems: hardware, software, Operative systems and networks.
- New paradigms and trends: Cloud computing, Quantum computing, Artificial Intelligence, Blockchain, Smart cities, IoT (Internet of Things).

BLOCK 3. Information and Data.

- Information and Data: number systems, representation of numeric and alphanumeric information (codes).
- Data Foundations: Big Data, Data models, Data protection, Laws and ethics.

MODULE II: PRACTICAL SKILLS - INTRODUCTION TO WEB DEVELOPMENT

BLOCK 1. Introduction to and management of software repositories.

- Basic concepts.

- Repositories: Git & Github.

BLOCK 2. Creation of HTML5 web pages.

- Basic concepts.
- The Document Object Model.
- Forms and containers.

BLOCK 3. Design and layout with CSS3.

- Basic concepts.
- CSS elements.
- Box and float models.
- Element positioning.

EDUCATION ACTIVITIES

This subject will offer a combination of different activities and methodologies, both in-person (taking place in classrooms and other spaces with the presence of the professor) and non-in-person, have been incorporated.

In-person activities have a strong practical component to enhance students' learning. They include:

- Theorical classes: The professor will present the fundamental concepts of the subject, encouraging interaction with the students, promoting questions, and facilitating debate on the different topics covered.
- Practical classes and laboratory sessions: These sessions will involve the application of concepts learned in class by students to solve exercises and problems. Both individual and group practices will be carried out, and a web projects will be developed.
- Work presentations: Students will have the opportunity to present some of the assignments they have completed in the subject.
- Workshops: Different workshops will be conducted to develop cross-cutting competencies applied to real cases and projects within the subject area.
- Tutorials: Individual or group sessions aimed at clarifying doubts and providing guidance to students.

The required autonomous work will involve both individual and group. This will include the preparation of assignments, reading documentation, studying, and exam preparation. Consistency in autonomous work and keeping up with assignments is highly important.

Working groups will be established from the beginning of the subject to encourage collaborative work inside and outside the classroom. Group work will be carried out throughout the semester, with different planned deliverables to provide formative assessment throughout the course.

An online learning platform called the Virtual Classroom will be used to facilitate access to materials, work planning, as well as communication with the professor and other students. This platform offers different electronic resources to complement students learning.

DISTRIBUTION OF WORK TIME

CLASSROOM-BASED ACTIVITY	INDEPENDENT STUDY/OUT-OF-CLASSROOM ACTIVITY
68 hours	82 hours

• Theorical lessons 16h • Practical lessons 16h • Laboratory 16h • Tutorials 5h • Evaluation 3h • Workshops 6h • Oral presentation of assignments 6h	• Individual Study and Work 34h • Teamwork 48h

SKILLS

Basic Skills

Students must have demonstrated knowledge and understanding in an area of study that is founded on general secondary education. Moreover, the area of study is typically at a level that includes certain aspects implying knowledge at the forefront of its field of study, albeit supported by advanced textbooks

Students must be able to apply their knowledge to their work or vocation in a professional manner and possess skills that can typically be demonstrated by coming up with and sustaining arguments and solving problems within their field of study

Students must have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflections on pertinent social, scientific or ethical issues

Students must be able to convey information, ideas, problems and solutions to both an expert and non-expert audience

Students must have developed the learning skills needed to undertake further study with a high degree of independence

General Skills

Capacity for conceiving, developing and maintaining computer systems, services and applications using engineering methods in software as an instrument of quality control, in accordance with the knowledge acquired according to section 5 of this report.

Knowledge of basic materials and technologies, which provide skills for the learning and development of new methods and technologies, as well as those which provide strong versatility for being adapted to new situations.

Specific skills

Basic knowledge about the use and programming of computers, operative systems, databases and computer programmes applied to engineering.

Knowledge of the structure, organisation, function and interconnectivity of computer systems, programming basics,

and their application for solving problems in engineering.

LEARNING RESULTS

To recognize and employ, in an explanation or discourse, the terminology, both hardware and software, involved in the design, management, and operation of a computer system, relating to any field of knowledge within computer engineering.

To narrate and establish connections between key historical facts and events in the emergence and evolution of computers and computer science, as well as to present and analyze future trends.

To explain the foundations and apply different mechanisms for the representation and organization of both numerical and non-numerical information within a computer system.

To explain the basic aspects of the fundamental areas of Computer Engineering: hardware, software, and networks.

To develop a web application for the purpose of disseminating information.

To conduct research, create, and effectively present a research project, utilizing both oral and written communication skills.

LEARNING APPRAISAL SYSTEM

ORDINARY CALL

Evaluation:
The evaluation of student performance will take into account the following aspects:

1. Theoretical-practical exams: 40% of the final grade. Different tests or written assessments on the subject content will be conducted.
2. Research assignment: 20% of the final grade. A group assignment about a research topic will be conducted during Part I.
3. Written assignment: 30% of the final grade. A web project related to the topics covered in the second part.
4. Progress and participation: 10%. The following aspects will be mainly assessed: punctuality, respect, attitude that fosters a learning environment in class, collaboration with classmates, and active participation. To receive points in this category, attendance is compulsory for at least 80% of the total class hours.

Grade calculation:

To pass the course, a minimum grade of 5 is required for all [1], [2] and [3], with a weighted average (including [4]) >= 5. In this case, the final grade for the assessment is calculated as:

Grade = [1] * 0.40 + [2] * 0.20 + [3] * 0.30 + [4] * 0.10

If the minimum or overall values are not met, the student will fail the assessment, and the grade will be:

Grade = 3

EXTRAORDINARY CALL

The student must take a final exam covering all the theoretical content of the subject and submit any pending practical assignments for evaluation in which they have not achieved the minimum required grade.

Class participation is non-recoverable

ACADEMIC EXEMPTIONS

If a student is exempt from attending class, either due to a second enrollment in the subject or subsequent enrollments, or by explicit authorization from the Degree Director, they will be evaluated through the same type of assessments. However, the group assignment must be completed individually, and the 10% class participation will be added to the evaluation of theoretical-practical exams, resulting in a total weight of 50% of the grade.

To pass the course, the student must achieve a final grade of at least 5 and meet the requirements established for each type of assessment. In this case, the final grade will be calculated as the weighted average of all the grades obtained in each part.

PLAGIARISM

Any form of fraud or plagiarism by a student in an evaluative activity will be penalized according to the UFV's Code of Conduct. Plagiarism includes any attempt to deceive the evaluation system, such as copying exercises, exams, practices, assignments, or any other type of submission, either from another student or unauthorized materials or devices, with the intention of making the professor believe they are the student's own work.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

Ferdinado Satacroce Git Essentials: Create, Merge, and Distribute Code with Git is an excellent primer for any Git beginner. 2nd Revised edition

Mariot Tsitoara Beginning Git and GitHub Apress; 1st Edition. edition (December 1, 2019)

Jon Duckett HTML and CSS: Design and Build Websites 1st Edition

Martínez-Barea, Juan El mundo que viene: descubre por qué las próximas décadas serán las más apasionantes de la historia de la humanidad 4th Edition

James Garrett, Jesse The Elements of User Experience: User-Centered Design for the Web and Beyond 2nd Edition, Berkeley

Additional

Thompson, B. Tu página web/Barcelona Molino, 2000

Nielsen, Jakob Designing Web Usability: The Practice of Simplicity 1st Edition