Programme Specification

Bachelor in Computer Engineering

universidad
SANJORGE
GRUPO SANVALERO

CONTENTS

1. PROFESSIONAL COMPETENCES

1.1. General competences

G1: Leadership capacity to be able to influence a group so they achieve some specific objectives collectively and efficiently.

G2: Innovative capacity to propose and find new and efficient ways to undertake any task and/or function within the professional environment - highly motivated by quality.

G3: Capacity to work in multidisciplinary teams to achieve common objectives, placing group interests before personal ones.

G4: Capacity to always commit to working responsibly - creating a strong sense of duty and fulfilment of obligations.

G5: Capacity to adapt to different environments while being positive and optimistic, orienting your behaviour towards the achievement of goals.

G6: Capacity to analyse and find a solution to complex problems or unforeseen situations which may arise while working in any type of socio-economic organisation.

G7: Capacity to work flexibly and with versatility to adapt to the needs and requirements of the work situation.

G8: Ability to communicate effectively about different matters in a variety of professional situations and with the different media available.

G9: Capacity to make decisions impartially and rationally.

G10: Critical and analytical capacity when assessing information, data and courses of action.

G11: Ability to get on in a multicultural or international environment, interacting with people of different nationalities, languages and cultures.

G12: Capacity to undertake professional activities with integrity, respecting social, organisational and ethical norms.

G13: Capacity to use individual learning strategies aimed at continuous improvement in professional life and to begin further studies independently.

G14: Capacity for abstraction to handle various complex knowledge models and apply them to examining and solving problems.

G15: Capacity to structure reality by means of linking objects, situations and concepts through logical mathematical reasoning.

1.2. Specific competences

E1: Capacity to understand the engineering profession and commitment to serve society under the corresponding professional code of conduct.

E2: Capacity to apply the intrinsic engineering principles based on mathematics and a combination of scientific disciplines.

E3: Capacity to recognise the technical principles and apply the appropriate practical methods satisfactorily to analyse and solve engineering problems.

E4: Capacity to maintain an open mind to innovation and creativity within the framework of the engineering profession.

E5: Capacity to assess the economic and business features of engineering activities.

E6: Capacity to apply quality assurance processes to processes and products.

E7: Capacity to work effectively in project teams, where appropriate assuming executive responsibilities, and consider the human, technological and financial sides.

E8: Capacity to communicate productively with clients, users and colleagues both orally and in writing, so as to pass on ideas, solve conflicts and achieve agreements.

E9: Capacity to maintain professional competences through independent learning and continuous improvement.

E10: Capacity to understand and assess the impact of technology on individuals, organisations, society and the environment, including ethical, legal and political factors, recognising and applying the pertinent standards and regulations.

E11: Capacity to remain up-to-date in the technological and business worlds in the area of information and communication technologies.

E12: Capacity to manage complexity through abstraction, modelling, 'best practices', patterns, standards and the use of the appropriate tools.

E13: Capacity to identify, assess and use current and emerging technologies, considering how they apply in terms of individual or organisational needs.

E14: Capacity to define, run and give classes for continuous training programs for the technical personnel.

E15: Capacity to understand and go along with the strategic objectives of the company where your are pursuing your professional career.

E16: Capacity to understand an application demesne so as to be able to develop suitable IT applications.

E17: Capacity to identify and analyse user needs with the intention of designing effective, usable IT solutions which can be incorporated into the user's operating environment.

E18: Capacity to identify and define the requirements to be satisfied by IT systems to cover the stated needs of organisations or individuals.

E19: Capacity to design and define the architecture of IT systems (software, hardware and communications) under the requirements agreed upon by the parties involved.

E20: Capacity to undertake the detailed design of the components of a project (procedures, user interface, equipment characteristics, communications system parameters, etc.).

E21: Capacity to perform tests that verify the validity of the project (functional, data integrity, performance of the computer applications, equipment, communications, etc.).

E22: Capacity to undertake implementation tasks which require a high degree of technical awareness in different spheres (programming, configuration of hardware and communications equipment, etc.).

E23: Capacity to design and implement security policies in order to preserve the integrity of the operational environment.

E24: Capacity to draw up and develop effective project plans for systems based on information and communication technologies.

E25: Capacity to analyse viability, design development plans, estimate resources, run and oversee the execution of software-intensive engineering projects.

E26: Capacity to define and manage quality policies for IT and communications systems, applying quantitative principles based on metrics and statistics.

E27: Capacity to write and maintain descriptive documentation of the origin, production and operability of IT systems.

2. PROGRAMME STRUCTURE

Subject	Type (CS/OB/OP)	Semester	Credits ECTS
First Year			
Professional Abilities and Principles	CS	I	6
Analysis and Calculus	CS	I	6
Physics: The Basics	CS	I	6
Civic Humanism	OB	I	6
Programming: The Basics	CS	Annual	6
English	CS	Annual	6
Algebra	CS	II	6
Statistics	CS	II	6
Business Economics & Administration	CS	II	6
Logic Systems	OB	II	6
			60
Second Year			
Discrete Mathematics	CS	III	6
Computer Architecture	OB	III	6
Formal Languages	OB	III	3
Programming OO I	OB	III	6
Data Structure	OB	III	6
English for Engineers	CS	Annual	6
Operating Systems	OB	IV	6
Information Systems	OB	IV	6
Lexical & Syntactic Analysis	OB	IV	3
Networks & Communications: The Basics	OB	IV	6
Programming OO II	OB	IV	6
			60
Third Year			
Administration of Operating Systems	OB	V	6
Man-Machine Interaction	OB	V	3
Software Engineering	OB	V	6
Intelligent Systems	OB	V	6
Networks & Communications I	OB	V	6
Optional Subject	OP	V	3
Administration of Servers	OB	VI	6
Networks & Communications II	OB	VI	6
Software Quality	OB	VI	3
Information Technologies	OB	VI	6
Mobile Applications	OB	VI	3
Optional Subject	OP	VI	3
Optional Subject	OP	VI	3
			60
Fourth Year			
Advanced Technologies	OB	VII	6
Project Management	OB	VII	6
Work Placement	OB	VII	6
Advanced Communications Systems	OB	VII	6
Optional Subject	OP	VII	3
Optional Subject	OP	VII	3
Network & Systems Security	OB	VIII	6
SI Solutions Design for Companies	OB	VIII	6
Optional Subject	OP	VIII	3
Optional Subject	OP	VIII	3
End of Degree Project (Indefinite)	OB	VIII	12
			60
		TOTAL ECTS	**240**

Optional Subjects:

Year	Subject	Type (CS/OB/OP)	Semester	Credits ECTS
Third Year	Advanced Computational Architecture	OP	VI	3
	Modelling & Animation	OP	V	3
	Web Languages & Standards	OP	V	3
	Website Accessibility, Usability & Re-engineering	OP	VI	3
	Advanced Programming for the Internet	OP	VI	3
	Concurrent and distributed programming*	OP	V	3
	Multimedia systems and information*	OP	VI	3
	Legal aspects and ethics in information management*	OP	VI	3
Fourth Year	Advanced Computational Architecture	OP	VIII	3
	Modelling & Animation	OP	VII	3
	Web Languages & Standards	OP	VII	3
	Website Accessibility, Usability & Re-engineering	OP	VIII	3
	Advanced Programming for the Internet	OP	VIII	3
	Concurrent and distributed programming*	OP	VIII	3
	Multimedia systems and information*	OP	VII	3
	Legal aspects and ethics in information management*	OP	VII	3

*These electives not be offered for the academic year 2015/16.

3. PROGRAMME CONTENTS

Year One

3.1. Professional Abilities and Principles

Credits: 6 **Type:** Basic

Contact hours: 72 **Study hours:** 78

Summary: Oral and written communication. Office software. Emotional intelligence. Professional code of conduct.

Learning outcomes:

Completing this subject, the student will be able to:

- Synthesise concepts and arguments and pass them on effectively.
- Interact in a situation involving various people.
- Exercise emotional self-control, empathise with the situation and self-motivate.
- Master text processing, presentation, spreadsheet, database, and mail management programmes.

3.2. Analysis and Calculus

Credits: 6 **Type:** Basic

Contact hours: 78 **Study hours:** 78

Summary:

Real and complex numbers. Real functions of real variables. Differential calculus and applications. Number sequences and series. Integral calculus and applications.

Learning outcomes:

After completing this subject, students will be able to:

- Handle and apply the basic analysis tools and concepts necessary to follow other subjects and solve problems related to computing.
- Apply analysis knowledge to the solving of optimisation, area, length or volume calculations, approximations, data representation, etc.
- Use the different numerical algorithms to solve diverse problems.
- Using suitable computing tools, implement different numerical calculus algorithms to make a computer solve analysis problems.
- Structure different situations, choosing significant mathematical properties of the objects to translate reality into appropriate mathematical models.
- Effectively communicate different formal undertakings and structures.
- Join and actively collaborate in a group to achieve common objectives.
- Rigorously reason and choose the option, among several, which best fits the characteristics of a specific problem.
- Accurately and correctly use the language and distinct symbolic, formal and technical mathematical operations.
- Use specific bibliography, complementary material and software aids used to understand different topics.

3.3. Physics: The Basics

Credits: 6 **Type:** Basic

Contact hours: 72 **Study hours:** 78

Summary:

Newtonian mechanics. Oscillations. Electromagnetism. Quantum mechanics and material structure.

Learning outcomes:

After completing this subject, students will be able to:

- Solve physical problems in a structured and coherent fashion to understand and apply the basic foundations of physics to specific cases and applications.
- Correctly use the units and dimensions of physical magnitudes as well as estimating their orders of magnitude.

Research, write, present, defend and critically assess basic theoretical and/or experimental topics.

3.4. Civic Humanism

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

The subject puts education in a central role in the Humanities, arguing for the defence of personal dignity and respect of personal freedoms, from a cross-discipline perspective within a context of a plural multicultural democratic society. The hope is to favour moral intelligence, i.e. the ability to effectively and righteously address the challenges and commitments necessitated by modern life through commitment and active participation. In short, the goal is to establish the bases to have a better person in a more just society through scientific rigour, as required by any academic discipline.

Learning outcomes:

After completing this subject, students will be able to:

- Understand the main ideological-driven reductionism and its influence on history.
- Understand the concept of the person applied to the social or individual human being and the selfish or collectivist restrictions.
- Know the habits of personal self-control which allow people to consider life projects and put them into practice.
- Identify the main elements of human interdependence, the basis for attitudes of social and professional commitment.
- Differentiate the cultural and political bases which enhance the development of the principles of solidarity, participation, subsidiarity and authority in civil society.
- Detect the ideological influences which communications professionals are exposed to on a daily basis while working.
- Address the problems and conflicts arising in professional work from a perspective of service not supremacy or manipulation.
- Give priority in personal comportment to the dignity of the other person over and above economic, social or individual interests.
- Engage others in the fight for personal dignity through free, responsible and creative professional action.
- Consider work itself as an opportunity to serve the common good.

3.5. Programming: The Basics

Credits: 6 **Type:** Basic

Contact hours: 72 **Study hours:** 78

Summary:

Introduction to and features of 'C'. Variables and operators. Data types. Flow control structures. Algorithms and pseudocode. Functions. Arrays (vectors & matrices). Dynamic memory. Data input & output, files.

Learning outcomes:

After completing this subject, students will be able to:

- Create algorithms which fulfil some set needs.
- Efficiently implement algorithms using 'C'.
- Comment source code.
- Correctly document programming work.
- Use written technical language.
- Check implementation errors in 'C'.
- Manage the development environment for 'C'.
- Speak properly in a technical environment.

3.6. English

Credits: 6 **Type:** Basic

Contact hours: 72 **Study hours:** 78

Summary:

Learn how to learn. Effective communication in English in an international social and professional environment Cultural differences. Socio-professional situations. Introduction to technical English. Pro-activity. Effective communication in English in an academic and professional environment Master classes and professional presentations - comprehension, notes.

Learning outcomes:

After completing this subject, students will be able to:

- Understand the main points of clear texts in standard English when they are about already known issues, whether from work, studying or leisure.
- Cope in the majority of possible situations in places where English is used.
- Produce simple, coherent texts about topics that are familiar or in which they have a personal interest.
- Describe experiences, events, wishes and hopes, as well as briefly justify their opinions or explain their plans.
- Apply their knowledge of English to tasks, projects or presentations related to computer engineering.

3.7. Algebra

Credits: 6 **Type:** Basic

Contact hours: 72 **Study hours:** 78

Summary: Basic algebra. Vector spaces, linear applications. Matrices. Determiners. Diagonalization of endomorphisms. Geometry. Linear programming.

Learning outcomes:

After completing this subject, students will be able to:

- Be rigorous in the study, treatment, presentation and extraction of conclusions for real problems with solutions using Linear Algebra, through the development of a capacity for abstraction and a degree of scientific, critical and coherent sense.
- Develop basic concepts and techniques in matrix algebra and the skill to apply them to solving linear systems.
- Understand and confidently handle concepts in vector space and homomorphism, studying the structures associated with both and specifically the connection with matrices, linear equation systems and vector calculus.
- Find the canonical form of endomorphisms and matrices and link them to their properties as geometric operators.
- Present and solve different optimisation problems in linear programming.
- Handle the concept of scaled product, their matrix expressions and the concept of orthonormalization to be applied to solving different geometric problems.
- Apply the basic algebraic tools to follow other subjects and solve problems related to computing.
- Structure different situations, conceptually isolate the significant mathematical properties of the objects to study and translate reality into appropriate mathematical models.
- Effectively communicate different formal undertakings and structures.
- Join and actively collaborate in a group to achieve common objectives.
- Rigorously reason and choose the option, among several, which best fits the characteristics of a specific problem.
- Accurately and correctly use the language and distinct symbolic, formal and technical mathematical operations.
- Use specific bibliography, complementary material and software aids used to understand different topics.

3.8. Statistics

Credits: 6 **Type:** Basic

Contact hours: 72 **Study hours:** 78

Summary:

Descriptive statistics. Regression. Random variable and probability. Statistical inference. Queueing theory.

Learning outcomes:

After completing this subject, students will be able to:

- Handle the basics of descriptive statistics in data processing and the interpretation of results corresponding to the study of specific events.
- Apply basic counting techniques when solving different problem types.
- Employ the classic distribution models and apply probability calculus techniques to the solving of problems related to random phenomena.
- Use statistical inference and apply predictive techniques to study specific situations.

3.9. Business Economics & Administration

Credits: 6 **Type:** Basic

Contact hours: 72 **Study hours:** 78

Summary:

The objective of this subject is to provide a broad overview of the company. This is achieved by looking at the various types of classification, characteristics, working areas, forms of financing and social and economic purposes, while also including the main foundations of microeconomic theory. Likewise, the intention is to provide the basic alignments that characterise an international company under the new management systems where design, manufacturing, commercialisation and customer service are distributed around different countries.

Learning outcomes:

After completing this subject, students will be able to:

- Analyse in-company costs.
- Assess investment alternatives.
- Understand the different financial states.
- Design the most suitable Hierarchy to optimise human resources based on the company type under study.
- Manage the planning and organisation of a company.
- Develop a Business Plan based on the models analysed.
- Analyse and identify the features of the real logistical marketing process in a company and perform a market analysis.
- Identify and use the basic human resources management and planning tools.

3.10. Logic Systems

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Fundamental logic blocks; Combinational analysis & design; Sequential analysis & design; Microprocessors: the basics.

Learning outcomes:

After completing this subject, students will be able to:

- Connect physical information with its mathematical and logic representation.
- Understand the different information codes and the data conversion between them.
- Analyse the main features of the different physical implementations of logic functions.
- Master the analysis and design of combinational logic systems.
- Know the current programmable logic devices and where they are used.
- Master the analysis and design of sequential logic systems.
- Understand the basic blocks which make up a microprocessor, how it operates and the link between the blocks.
- Know the main types of instructions that can be executed in a generic microprocessor

Year Two

3.11. Discrete Mathematics

Credits: 6 **Type:** Basic

Contact hours: 72 **Study hours:** 78

Summary: Set theory. Combinatorics. Logic. Modular arithmetic. Graph theory.

Learning outcomes:

After completing this subject, students will be able to:

- Develop basic concepts and techniques for propositional calculus and predicate logic and apply them to different rationales and demonstrations.
- Use combinatorics counting techniques and handle the recurrence relations which define them.
- Apply numerical theory to the analysis and design of algorithms in computing.
- Apply the concepts of modular arithmetic to different cryptography, deciphering and random number generation techniques.
- Represent and solve different problems using graphs.
- Structure different situations, choosing significant mathematical properties of the objects to translate reality into appropriate mathematical models.
- Effectively communicate different formal undertakings and structures.
- Join and actively work with a Reasoning group to achieve common objectives rigorously and choose the option, among various, which best fits the characteristics of a specific problem.
- Accurately and correctly use the language and distinct symbolic, formal and technical mathematical operations.
- Use specific bibliographic and complementary material to understand different topics.

3.12. Computer Architecture

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Principles of computer organisation. Data and control routes. Control cabling & microprogramming. Memory hierarchies. Machine and assembly language. Indexes of instructions. RISC & CISC architectures.

Learning outcomes:

After completing this subject, students will be able to:

- Connect physical information with its mathematical and logic representation.
- Understand the different information codes and the data conversion between them.
- Know and understand the current fundamentals of the architecture of computers.
- Know and understand the internal architecture of current microprocessors and their instruction set.
- Know the current programmable logic devices and where they are used.

3.13. Formal Languages

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

This subject is an introductory course into the fundamentals of languages, grammars and automatons and lays the ground for the implementation of compilers and interpreters. Among other concepts, the following will be covered: Alphabets, grammars, automatons, regular expressions and the Turing machine.

Learning outcomes:

After completing this subject, students will be able to:

- Master the different aspects of formal grammar.
- Write regular expressions and derive the formal automatons which analyse them.
- Understand the context-free grammars.
- Know the basic notions about complexity theory and the kinds of problems depending on their cost.

3.14. Object-Oriented Programming I

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Introduction to Object-Oriented Programming. UML diagrams. First steps in C++. Classes. Overloading operators. Legacy. Polymorphism. Templates. Exceptions. STL.

Learning outcomes:

After completing this subject, students will be able to:

- Create algorithms which fulfil some set needs.
- Efficiently implement algorithms using 'C'.
- Design components or processes which are adjusted to specific needs.
- Comment source code with the quality required.
- Correctly document programming work.
- Check implementation errors in programs in object-oriented language.
- Manage the development environment for a 'C'.

3.15. Data Structure

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Arrays, structures, pointers and chains. ADT (Abstract Data Type). Lists. Stacks. Queues. Hash tables. Trees. Graphs. Algorithmics.

Learning outcomes:

After completing this subject, students will be able to:

- Create algorithms which fulfil the needs established optimally and comply with specific quality standards.
- Efficiently implement algorithms.
- Comment source code with quality.
- Check implementation errors.
- Manage programming development environments.
- Create and manage data structures.

Optimise and assess algorithms.

3.16. English for Engineers

Credits: 6 **Type:** Basic

Contact hours: 72 **Study hours:** 78

Summary:

Work on the following professional aspects in English:
Effective presentations. Participation in meetings. Problem analysis and decision making. Effective negotiations. Product and process description. Work on the following professional aspects in English: job seeking; work interview; effective presentations II; reports, projects & articles; the professional portfolio.

Learning outcomes:

After completing this subject, students will be able to:

- Understand the main ideas in complex texts which cover specific or abstract topics, even when technical, as long as these are within their specialised field.
- Interact with native speakers with sufficient fluency and ease that the communication occurs with no effort on the part of either speaker.
- Produce clear, detailed texts on diverse topics, as well as defend a point of view on general topics giving the pros and cons of the different options.
- Apply their knowledge of English to tasks, projects or presentations related to computer engineering.

3.17. Operating Systems

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary: Theoretical matters on the design, use and basic administration of operating systems. Introduction to Operating Systems design. Classification and types of Operating Systems. File systems. Process models. Basic concepts for Memory Management. Memory administration and management.

Learning outcomes:

After completing this subject, students will be able to:

- Know the basic concepts of operating system design.
- Acquire design, administration and operating systems programming notions.
- Install, configure and use different environments and operating systems.
- Perform basic systems administration tasks.
- Start to develop system programs.

3.18. Information Systems

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Information systems & models. Database systems. Data modelling. Relational databases.

Learning outcomes:

After completing this subject, students will be able to:

- Understand and apply relational database theory to the designing of information systems.
- Understand and apply semi-structured data modelling theory to the designing of information systems.
- Understand and model the situation to be represented in an information system.
- Know the database communication languages (SQL).
- Construct software using high level languages with access to databases through integrated languages.

Install, administer and optimise a commercially used DBMS.

3.19. Lexical & Syntactic Analysis

Credits: 3 **Type:** Compulsory

Contact hours: 31.5 **Study hours:** 43.5

Summary:

Introducing the student to language compiling, interpretation and document conversion technologies in formats typically used in computing, e.g. XML. In addition, it establishes a useful knowledge base for Master's programmes connected to Language Processors, Artificial Intelligence and Knowledge Engineering, among others.

Learning outcomes:

After completing this subject, students will be able to:

- Correctly use technical terms associated with the theory and processes of compiling.
- Know and use the most typical tools for the automatic construction of compilers.
- Understand, create and modify lexical and semantic analysers with the tool.
- Know the main JavaCC configuration files.
- Define grammars that allow work with a given language and monitor the procedures necessary to implement a compiler that recognises this grammar.
- Recognise and distinguish the key factors among the different types of lexical and syntactic analysers seen in this subject.

3.20. Networks & Communications: The Basics

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Signs & systems: the basics. Telecommunication systems: the basics. Communications: the basics. Error detection and correction algorithms. Lossless and lossy data compression algorithms. Communication signal compression algorithms.

Learning outcomes:

After completing this subject, students will be able to:

Understand, use, design and program communications protocols.

3.21. Object-Oriented Programming II

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Introduction to the Java development environment. Basic syntax in Java. Java Object-Oriented Programming. API packages. Exceptions. Multi string programming. Graphics. JDBC. DOM and XML. Network programming.

Learning outcomes:

After completing this subject, students will be able to:

- Use Java Development Kit.
- Fully understand the core oriented programming concepts: instantiation, abstraction, legacy, encapsulation, interfaces and polymorphism.
- Use collections for storage and the Java exceptions system.
- Use the input/output system and different flow types.
- Work with strings and concurrent programming.
- Create a Java application with user graphics and events.
- Manage a connection to a database.

Year Three

3.22. Administration of Operating Systems

Credits: 6 **Type:** Compulsory
Contact hours: 72 **Study hours:** 78

Summary: Administer and maintain implemented operating systems. Start and stop. User management. Storage. Tuning and monitoring. Script programming.

Learning outcomes:

After completing this subject, students will be able to:

- Administer server operating systems, installing and configuring the software to ensure the system works correctly.
- Integrate free and proprietary operating systems, justifying and guaranteeing their interoperability.
- Install and configure server operating systems.
- Tackle the basic systems administrator tasks.
- Administer systems processes, describing them and applying security and efficiency criteria.
- Manage the automation of systems tasks, applying efficiency criteria and using graphic commands and tools.
- Remotely administer the network operating system, assessing its importance and applying security criteria.
- Administer network services to create company infrastructure.
- Administer internet services.
- Administer the directory service, interpreting specifications and integrating them into a network.

3.23. Man-Machine Interaction

Credits: 3 **Type:** Compulsory

Contact hours: 31.5 **Study hours:** 43.5

Summary:

Basics and motivation. User-focused development and assessment. Design principles. Graphic user interfaces. Usability. Communications and collaboration.

Learning outcomes:

After completing this subject, students will be able to:

- Analyse the man-machine interaction of a computing system.
- Assess the man-machine interaction of a computing system, noting the strong and weak points and proposing possible improvements.
- Understand the new input interfaces and how to use them optimally.
- Integrate computing processes and systems into day-to-day situations.

3.24. Software Engineering

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Developmental life cycles. Software processes. Systems engineering. Problem demesne modelling. Requirement analysis. Solution demesne analysis and modelling. Prototyping. Architectural design. Detailed design. Implementation. Maintenance and re-engineering.

Learning outcomes:

After completing this subject, students will be able to:

- Analyse user specifications.
- Model demesne problems.
- Synthesise solution demesne analysis models.
- Design solutions to problems.
- Master programming.
- Master methodologies for organised software construction.
- Understand and interpret descriptive software process documents.
- Interact in English in a work situation.
- Pursue research tasks.
- Productively work in a team.
- Generate technical documentation.

3.25. Intelligent Systems

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Foundations of Artificial Intelligence. Seeking and satisfying restrictions. Presentation of knowledge and reasoning.

Learning outcomes:

After completing this subject, students will be able to:

- Present knowledge using various methodologies.
- Design and construct algorithms for automatic reasoning.
- Identify the 'difficult' problems and formulate some adequate strategies using 'intelligent' methods and techniques.
- Read and understand the basic Intelligent Systems bibliography.

3.26. Networks & Communications I

Credits: 6 **Type:** Compulsory

Contact hours: 70 **Study hours:** 80

Summary:

Computer networks & OSI model. Introduction to TCP/IP protocol sets. Level I: Physical layer. Level II: Data link layer. TCP/IP protocols at Network Layer: IP, ARP, ICMP, RIP, etc. TCP/IP protocols at Transport Layer: UDP, TCP/IP, etc.

Learning outcomes:

After completing this subject, students will be able to:

- Assimilate, comprehend and manage protocols.
- Comprehend and use complex architectures and systems.
- Master the programming linked to this discipline.
- Work methodically.
- Interact in English in a work situation.
- Work productively in a team.
- Comprehend and produce technical documents in English.

3.27. Administration of Servers

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Install, configure and know about technical features of different services. Introduction and review of TCP/IP. File transfers. Directories. Web. Services connected to e-mail. Other services.

Learning outcomes:

After completing this subject, students will be able to:

- Know the theoretical features of server architecture.
- Understand high level network protocols.
- Install, configure and use different servers.
- Perform basic server administration tasks.

3.28. Networks & Communications II

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

TCP/IP protocols at Presentation Layer: SSL, TLS, MIME, etc. protocols. TCP/IP protocols at Application Layer: http, SMTP, FTP, Telnet, DNS, etc. protocols. VoIP service protocols. Service protocols.

Learning outcomes:

After completing this subject, students will be able to:

- Assimilate, comprehend and manage protocols.
- Comprehend and use complex architecture and systems.
- Master the programming linked to this discipline.
- Work methodically.
- Interact in English in a work situation.
- Work productively in a team.
- Comprehend and produce technical documents in English.

3.29. Software Quality

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Principles of software quality. Ensuring quality. Quality engineering. Quality metrics. Configuration management. Software testing. Test-driven development. Software inspection. Formal check. Failover.

Learning outcomes:

After completing this subject, students will be able to:

- Work methodically.
- Automate repetitive tasks.
- Anticipate potential problems.
- Analyse risks.
- Rigorously apply quality processes.
- Design solutions to problems.
- Master methodologies for organised software construction.
- Interact in English in a work situation.
- Work productively in a team.
- Apply mathematical techniques to engineering.

3.30. Information Technologies

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary: Concepts & applications. *Data warehousing*, *data marts* & *OLAP.* Data cleaning and preprocessing methods and algorithms. Data mining. Complex data types. *Web Data Mining.*

Learning outcomes:

After completing this subject, students will be able to:

- Understand data storage techniques and access methods.
- Undertake consultation processing and heuristic implementation of operations based on cost estimation.
- Create transaction processing, contemplating integrity, concurrency control and recovery techniques.

Establish database security and authorisation procedures.

3.31. Mobile Applications

Credits: 3 **Type:** Compulsory

Contact hours: 31.5 **Study hours:** 43.5

Summary:

This subject provides the knowledge necessary to tackle information systems development and mobility integration projects. There will also be an analysis of design strategies for disparate applications in mobility situations and the development platforms will be studied in different devices and systems, including Java 2 Micro Edition, Windows Mobile & Android.

Learning outcomes:

After completing this subject, students will be able to:

- Design mobile business applications.
- Develop applications for Android.

Create and innovate using mobile devices.

Year Four

3.32. Advanced Technologies

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary: This is about developing applications that use Http protocol through Servlets. Then the possibilities of JSP dynamic pages are presented. Web Services concept and handling are applied. Other resources for the development of pages, such as AJAX & MVC, are also studied. The contents taught are oriented towards developing a Web project.

Learning outcomes:

After completing this subject, students will be able to:

- Understand the object-oriented focus through distant objects.
- Use basic Servlet structure.
- Develop JSP applications which perform Web services.
- Apply AJAX technology.
- Manage the Java Enterprise Edition platform to develop large applications.

3.33. Project Management

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Software process modelling. Capability Maturity Model. Process adaptation. Feasibility analysis. Estimation of size & effort. Planning principles and techniques. Risk management. Progress metrics. Project monitoring and oversight techniques. The project plan. Interactions with stakeholders. Agile methodologies. Leadership.

Learning outcomes:

After completing this subject, students will be able to:

- Know the basics about business organisation and the importance of processes therein.
- Use TI tools efficiently.
- Work in a team to achieve some set objectives.
- Communicate professionally correctly.
- Know the techniques which allow processes to be improved in TI development, acquisition and services situations.
- Define indicators and metrics which allow for continuous improvement in negotiation and TI processes.
- Identify, analyse and design an organisation's negotiation processes.
- Know and apply the main process frameworks applicable to the TIs.

3.34. Work Placement

Credits: 6 **Type:** Compulsory

Contact hours: 150 **Study hours:** 0

Summary:

In-company implementation of the professional competences acquired over the degree course.

Learning outcomes:

After completing this subject, students will be able to:

- Apply the competences acquired to problem solving in professional circumstances.
- Organise and plan individual work for the needs identified by the company or project under development.
- Communicate with colleagues, clients and superiors in all areas that the placement requires.
- Be responsible and adapt to the company's regulations.

3.35. Advanced Communications Systems

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary: IP Version 6. Broadband access technologies. Passive optical networks: GPON, WDM-PON, etc. Radio access technologies: Wimax, Wifi, GSM,GPRS; UMTS, 3G, 3,5G, 4G, etc. Next Generation Networks (NGN). Emerging communications technologies.

Learning outcomes:

After completing this subject, students will be able to:

- Understand the implications, problems and benefits arising from the use of a wireless communications system.
- Assess different current radio communications systems and choose the most suitable for a proposed situation.
- Solve wireless network dimension problems.
- Understand the foundations, provisions and limitations of the main access and transport technologies using guided media.
- Propose the most suitable cable access or transport system depending on the characteristics of a specific deployment scenario.
- Solve design problems in a cable communications system which is able to carry distinct multimedia services.

3.36. Network & Systems Security

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Security for operating systems. Firewalls. Network security. Wireless security. Event register. Secure tunnels. Intrusion detection. Post-attack recovery.

Learning outcomes:

After completing this subject, students will be able to:

- Tackle design processes for secure systems.
- Use methodologies and systems whose purpose is guaranteeing information security.
- Apply network security measures and provide solutions in terms of firewalls, intrusion detection, etc.
- Develop applications that are secure from viruses and intrusions.
- Understand PKI and key public infrastructure.

3.37. SI Solutions Design for Companies

Credits: 6 **Type:** Compulsory

Contact hours: 72 **Study hours:** 78

Summary:

Business modelling techniques. Business patterns. REA (resource-events-agents) modelling. Enterprise Centric Computing. Model Driven Architecture. Customer Relationship Management (CRM). Enterprise Resource Planning (ERP). Accounting Information Systems (AIS).

Learning outcomes:

After completing this subject, students will be able to:

- Analyse the information needs considered in a situation and undertake all the stages in an information system construction process.
- Know and understand the economic, administrative, company and client environment to identify needs and provide optimal solutions.

3.38. End of Degree Project

Credits: 12 **Type:** Compulsory

Contact hours: 0 **Study hours:** 300

Summary:

Implementation, improvement and consolidation of the competences acquired during the degree through the undertaking of an engineering project in the field of computing and communications.

Learning outcomes:

After completing this subject, students will be able to:

Successfully undertake and defend a project within some of the areas of Computer Engineering.

Elective Subjects

3.39. Advanced Computational Architecture

Credits: 3 **Type:** Optional

Contact hours: 31.5 **Study hours:** 43.5

Summary: Principles of pipelining. Multiprocessors. Symmetric shared memory architectures. Distributed shared memory architectures. Storage systems. Memory hierarchy design. Interconnected networks and clusters. Grid computing.

Learning outcomes:

After completing this subject, students will be able to:

- Understand the architecture of multiprocessor systems.
- Understand grid computing.
- Develop programs which optimise the use of resources, making use of GPGPU techniques.

  Understand and assess memory systems in complex computing systems.

3.40. Modelling & Animation

Credits: 3 **Type:** Optional

Contact hours: 31.5 **Study hours:** 43.5

Summary: Review of linear algebra. The facial model. Solid body physics. Animation schematics. State machines. Kinematic mixing. Inverse kinematics. Locomotion. Procedural animation. Graphic particle systems. Surface simulation (skin, cloth, etc.). Collision detection. Comportment of the animation and artificial intelligence. Practical classes using animation software and programming with OpenGL.

Learning outcomes:

After completing this subject, students will be able to:

- Handle terms related to computer animation.
- Know and understand the basic techniques used in computer animation.
- Use different computer 3D animation applications and discuss their potential and disadvantages.
- Know the distinct areas where computer animation is applied.

3.41. Web Languages & Standards

Credits: 3 **Type:** Optional

Contact hours: 31.5 **Study hours:** 43.5

Summary: W3C, HTML, XHTML, CSS, XML, DOM, ECMAScript standards.

Learning outcomes:

After completing this subject, students will be able to:

- Understand the concept of standards, current specifications and the development process for them.
- Present and plan a Web site.
- Develop a Web site using the languages considered standard.

3.42. Advanced Programming for the Internet

Credits: 3 **Type:** Optional

Contact hours: 31.5 **Study hours:** 43.5

Summary: JavaScript, DHTML, database access, PHP, ASP, Java, AJAX.

Learning outcomes:

After completing this subject, students will be able to:

- Develop a Web site using advanced Web programming languages.
- Plan and monitor a Web site development project.

3.43. Website accessibility, usability and re-engineering

Credits: 3 **Type:** Optional

Contact hours: 31.5 **Study hours:** 43.5

Summary: Usability and accessibility of websites, usability and accessibility metrics, Spanish legislation, information architecture, interface design, web reengineering.

Learning outcomes:

After completing this subject, students will be able to:

- Communicate with customers and users to meet their goals and needs
- Use tools for creating quality websites.
- Validate web pages according to different standards.
- Document a technical project.
- Design prototypes of interfaces.
- Understand and apply the basic principles of user-centered design.
- Evaluate and design web pages following the principles of usability and accessibility
- Know what a website is missing and correct
- Understand the basic operations of Internet search engines and adapt the pages for this purpose interfaces
- Design and develop tests to evaluate interfaces

3.44. Concurrent and distributed programming

Credits: 3 **Type:** Optional

Contact hours: 31.5 **Study hours:** 43.5

Summary: Introduction to concurrent and distributed programming, synchronisation, messaging, client / server architectures, Petri nets ...

Learning outcomes:

After completing this subject, students will be able to:

- Understand the principles and methodologies of concurrent and distributed programming, especially the concepts of synchronisation and communication between processes
- Know the main difficulties in producing concurrent and distributed programs
- Understand the existing tools and models to address the task of concurrent and distributed programming
- Know programming languages that allow the use of the concept of competition

3.45. Multimedia systems and information

Credits: 3 **Type:** Optional

Contact hours: 31.5 **Study hours:** 43.5

Summary: Devices, controllers, signals and protocols. Multimedia authoring systems. Coding, processing and representation of multimedia data. Analysis and creation of audio and video content. Specific applications.

Learning outcomes:

After completing this subject, students will be able to:

- Know about the characteristics and components of multimedia systems
- Know how to analyse and design multimedia systems.
- Know how to use languages to create multimedia systems.
- Understand the standards and protocols for the creation of multimedia information.
- Understand the systems and architectures for the distribution of multimedia information.

3.46. Legal aspects and ethics in information management

Credits: 3 **Type:** Optional

Contact hours: 31.5 **Study hours:** 43.5

Summary: Legal foundations of the right to intellectual property. Trademarks and patents. Illegal Software and piracy. International law on intellectual property. Information privacy. Law of the right to privacy of information. Technological strategies. Freedom of expression. Cultural and international implications.

Learning outcomes:

After completing this subject, students will be able to:

- Know about the institutions related to ethics and professional ethics (professional associations, codes of conduct).
- Understand the legal rules applicable to professional practice, with emphasis on the Data Protection Act and the Business Information Society.
- Know how to analyse a professional situation to determine the applicable legislation.
- Train to develop a professional activity in the field of expertise and computer audit.
- Train for the practical development of an expert and auditor in IT.