ETSI Informática

University of Málaga

Foundations of Computer Science

Course Guide
2025-2026

Welcome

We welcome you to study at the **School of Computer Science at the University of Malaga** (ETSI Informática – UMA). In this course guide, which is first and foremost designed to help incoming students to plan their studies during the exchange period, you will find descriptions of all the courses taught in English at our School during the academic year **2025-2026**. Further inquiries will be handled by the contact teachers and the International Coordinator of the School:

Inmaculada Fortes Ruiz
international-mobility.informatica@uma.es

Also, the International Office is there to help you:

Patricia Prados y Diana Gardumi
incoming@uma.es
http://www.uma.es/relaciones-internacionales/

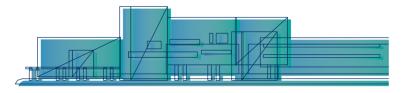We hope you will enjoy your stay at University of Malaga!

http://www.uma.es

For more information and the official programs* visit our website:

http://www.informatica.uma.es

* Disclaimer: This document is a succinct translation of the original programs in Spanish. In no case the contents of this translation may be interpreted as a replacement or modification of the conditions specified in the original documents.

Academic Calendar

ESCUELA TÉCNICA SUPERIOR DE INGENIERÍA INFORMÁTICA

CALENDARIO OFICIAL GRADOS 25|26

septiembre 2025

L	M	X	J	V	S	D
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

octubre 2025

L	M	X	J	V	S	D
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

noviembre 2025

L	M	X	J	V	S	D
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

diciembre 2025

L	M	X	J	V	S	D
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

enero 2026

L	M	X	J	V	S	D
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

febrero 2026

L	M	X	J	V	S	D
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

marzo 2026

L	M	X	J	V	S	D
23	24	25	26	27	28	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

abril 2026

L	M	X	J	V	S	D
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

mayo 2026

L	M	X	J	V	S	D
27	28	29	30	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

junio 2026

L	M	X	J	V	S	D
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

julio 2026

L	M	X	J	V	S	D
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

agosto 2026

L	M	X	J	V	S	D
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

septiembre 2026

L	M	X	J	V	S	D
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

1er semestre/1st term: De/From 09/09/2025 a/to 19/12/2025. 2º semestre/2nd term: De/From 16/02/2026 a/to 05/06/2026. Exámenes convocatoria extraordinaria/Extraordinary exams (instructional days): De/From: 20/10/2025 a/to 07/11/2025. Exam. 1er sem. 1ª Ord/1st Term 1st Exams: De/From 07/01/2026 a/to 27/01/2026. Exam. 1er sem. 2ª Ord/1st Term 2nd Exams: De/From 04/02/2026 a/to 13/02/2026. Exam. 2º sem. 1ª Ord/2nd Term 1st Exams: De/From 08/06/2026 a/to 27/06/2026. Exam. 2º sem. 2ª Ord./2nd Term 2nd Exams: De/From 04/07/2026 a/to 15/07/2026.

- Lectivo/Instructional Day
- Inicio y fin de semestre/Start & end of term
- Exámenes ordinarios/Ordinary exams
- No lectivo/No lectures
- Exámenes extraordinarios/Extraordinary exams
- Actividades culturales/Cultural Activities (Hackers week)
- Festivo/Public Holiday

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E.T.S. INGENIERÍA INFORMÁTICA
UNIVERSIDAD DE MÁLAGA

Course Syllabi

CODE   101

NAME   Electronic Foundations

Credits   6 ECTS

Period   Fall Semester

Course Specifications
This subject aims to provide a comprehensive overview of the different aspects of digital electronics, starting from a level of physical devices and reaching a description of logical devices. The course is composed of theory lessons, problem solving classes and laboratory practices.

Objectives and contents
The main objective of the subject is to provide the students with a first approach to the electronics fundamentals of informatics, helping them to understand the basic elements behind common computer devices (such as processors, memories, etc.) and their operation.

Contents
1. Electronic concepts
2. Electronic devices
3. Switching electronics. Logic families
4. Introduction to digital systems
5. Gate-based combinational analysis and design
6. Combinational logic blocks
7. Sequential logic

Assessment
Regarding the assessment of the subject, it is performed taking into account laboratory practices (30%) and a final exam (70%). Besides, there are two mid-course exams. Passing the mid-course exams implies removing their content from the final exam.

Lecturer
Dr. Andrés Trujillo León
atrujilloleon@uma.es
Room 1513-D (Escuela de Ingenierías)

CODE 102

NAME Physical Foundations of Computer Science

Credits 6 ECTS

Period Fall Semester

Course Specifications
The course aims to provide computer engineering students with the knowledge that will enable them to understand the basic physical aspects of electronic devices, especially those related to computer technologies. The methodology is a combination of lectures, problem solving classes and practical laboratory classes. The course also aims to collaborate in inculcating the procedures and rigor of the scientific method within the framework of the development of their future work as engineers.

Objectives and contents
This course develops the fundamentals of electromagnetic theory and quantum and solid-state physics, with emphasis on semiconductors and computer applications.

Contents
1. Electric Field.
2. Magnetic Field.
3. Electromagnetic waves.
4. Fundamentals of Quantum Physics.
5. Introduction to Solid-State Physics.
6. Semiconductor Physics.

Assessment

Continuous evaluation with a partial exam of the first part of the course and a laboratory exam. There will be a final exam for the second part of the course, with the possibility of retaking the partial exam of the first part for those students who have not passed it previously.

Lecturer
Dr. Emilio Ruiz Reina
eruizr@uma.es
Room 2.3.5A-B

Course Syllabi

CODE   103

NAME   Introduction to Programming

Credits   6 ECTS

Period   Fall Semester

Course Specifications
Learning computer programming. Most of the hard work in this course will be done in front of a computer. The theoretical background and concepts are not complex and are previously discussed beforehand in the classes.

Objectives and contents
The main objective is to acquire correct programming skills. A general programming language is used. References are made to other languages and techniques. The focus is on acquiring skills in algorithmic construction and code organisation. An understanding of the underlying concepts of computer science and a light approach to its formal basis will provide the necessary background.

Contents:
1. Computer science and programming
2. Introduction to a programming language
3. Procedural abstraction
4. Structured data types

Assessment
Class attendance is compulsory. Apart from the unavoidable final exam, there will be at least two mid-term exams. Each practical, homework exercise, class activity and participation in forums and mid-term exams will be part of a continuous assessment.

Lecturer
Dr. Juan Falgueras Cano
juanfc+bil@uma.es
Room 3.2.19

Course Syllabi

CODE 104

NAME Discrete Mathematics

Credits 6 ECTS

Period Fall Semester

Course Specifications

Lectures in the lecture room. Problem solving with and without computers support in the lecture room. Individual work is required.

Objectives and contents

The Discrete Mathematics contents of this course provide a solid foundation in mathematics and analytical reasoning, while providing the mathematical tools necessary for analysis, optimization and decision making in software design and development. Their understanding allows evaluating the efficiency of algorithms, optimizing computer systems and developing intelligent software solutions based on data analysis.

Contents:

1. Preliminary concepts and Number Theory.
2. Sets, functions, counting and recurrence relations.
3. Binary relations and graphs.
4. Classical Logic.

Assessment

In general, in the assessment of students, their attitude and work during the teaching sessions will be assessed. In the practical sessions of the course, the student's active work will be encouraged to solve the exercises proposed in each of the topics. In all sessions, the student will be able to use the computer software recommended in the course.

FIRST ORDINARY CALL:

The course will be subject to continuous assessment, which will consist of the submission of completed activities and exercises, with or without computer support, in-class work, questionnaires distributed throughout the course and midterm exams. The number of assessments will depend on the organization and progress of the course and may be influenced by the coordination criteria established by the School and the actual size of the classes.
The course content is divided into four topics. The final grade for the course is a weighted average with the following weights: 25% for Topic 1, 30% for Topic 2, 25% for Topic 3, and 20% for Topic 4. To calculate the final grade, the average grade for Topics 1 and 2 must be greater than or equal to 3, and the same applies to the average grade for Topics 3 and 4.

Course Syllabi

The weight of the course assessment during the teaching period will be 100%.

On the date scheduled by the School for the first regular session, exams will be held to make up for topics failed during the teaching period (wxMaxima and written assessment). The grade obtained for each topic in the make-up exam will replace the corresponding grade for that subject obtained during the teaching period, and the weighted average grade, which will determine the final grade, which will be recalculated.

A student's grade will only be transferred to their oficial records if they pass the course by continuous assessment or seat for the first regular call of the course in January.

SECOND ORDINARY CALL:

On the date scheduled by the School, the exam covering the entire course must be taken, which will account for 100% of the grade. The grade obtained will be recorded in the official examination report along with the corresponding grade.

EXTRAORDINARY CALL:

   On the date scheduled by the School, the exam covering the entire course must be taken, which will account for 100% of the grade. The grade obtained will be recorded in the examination report along with the corresponding grade.

Lecturer

Dra. Mª Carmen Fernández Gago

mcgago@uma.es

Room: 2.2.21

Course Syllabi

CODE 105

NAME Business Organisation

Credits 6 ECTS

Period
First term

Course Specifications

The professional development of students enrolled in this degree programme, regardless of the sector in which they may operate, requires a thorough understanding of the nature of managerial functions, entrepreneurial leadership, and the challenges associated with these areas.
Upon successful completion of the course, students will have acquired foundational knowledge that enables them to comprehend how a business operates, its strategic behaviour, and the issues arising within its various subsystems (management, production, marketing, finance and investment, and human resources). Additionally, they will have developed a basic understanding of entrepreneurship, having explored in depth the process of creating and developing a business idea through the formulation of a Business Plan.

Objectives and contents
1. To provide training for the practice of management within organisations.
2. To introduce key concepts related to Planning, Organising, Leading, and Controlling.
3. To present the core functional areas of production, marketing, finance, and human resources.
4. To foster an understanding of the importance and distinctive nature of the managerial function, its necessity across all types of organisations, and its relevance to social progress and well-being, corporate social responsibility, and business ethics.
5. To understand the decision-making process and apply relevant techniques to the various managerial functions.

Contents
1. The Company and the Entrepreneur
2. Competitiveness in Business
3. Management Subsystem
4. Production Subsystem
5. Commercial Subsystem
6. Financing Subsystem
7. Investment Subsystem
8. Human Resources Subsystem
9. The company and the IT sector

Course Syllabi

Assessment
The assessment of the subject is carried out taking into account
Practices (40%) and a final exam (60%).

Lecturer
Dra. Virginia Herrera Pérez
virginia.herrera.p@uma.es

Room: 2.007.L Despacho - E. INGENIERÍAS

Assessment
The assessment of the subject is carried out taking into account
Practices (40%) and a final exam (60%).

Lecturer
Dra. Virginia Herrera Pérez
virginia.herrera.p@uma.es

Course Syllabi

CODE   201

NAME   Analysis and Design of Algorithms

Credits   6 ECTS

Period   Fall Semester

Course Specifications
Flipped-classroom model. In-classroom activities: discussion sessions, problem solving sessions, laboratory work; Individual work: online lectures, problem assignments.

Objectives and contents
The objectives of the course are (1) knowing the main techniques for algorithm design (i.e., being able to apply these for solving specific problems and being able to reason about their applicability and suitability) and (2) attaining adequate knowledge about algorithmic complexity (i.e., analyze the algorithms built, reason about their efficiency and perform comparisons among algorithms).

The course is organized in two thematic parts, a short one dealing with algorithm analysis (introductory topics, computational complexity) and another one –which will comprise most of the course– tackling algorithm design (including techniques such as divide-and-conquer, dynamic programming, greedy algorithms, backtracking and branch-and-bound).

The overall focus of the course is on applied matters and practical problem solving with algorithms. Programming knowledgeability in Java is assumed.

Assessment
A continuous assessment methodology is used: partial tests and several lab projects will be conducted during the semester. The final mark will be based on their outcome plus a bonus obtained by actively participating in class (e.g., delivering proposed assignments, solving problems in class, etc.).

Lecturer
Dr. Carlos Cotta Porras
ccottap@lcc.uma.es
Room 3.2.49

Course Syllabi

CODE 202

NAME Databases

Credits 6 ECTS

Period

Course Specifications

Lectures in the classroom will introduce the foundations of Conceptual Dababase Design an Relational Database Management Systems. Practical activities will allow the students to learn how to handle a commercial database manager system. The student will put in practice the basic topics and tools concerning database systems. This course is mainly developed in the labs, directly interacting with professional database software.

 Objectives and contents

The objectives are to learn the concepts of the Conceptual Modelling and the Relational Database Model and to use these elements via a commercial database manager. Contents include the Entity-Relationship and Relational models, the data definition language and data manipulation language of SQL and an introduction to the database architecture.

Assessment

There will be 2 main activities to be developed and evaluated in the semester: database design (project activity) and database implementation by using the Oracle software (lab activity). A final exam regarding SQL language (lab activity) and a questionnaire completes the evaluation. The students have to engage in all the activities, participate in every evaluation milestone, and show a minimum level in all of them.

Lecturers

José F. Aldana Montes

jfaldana@uma.es

Room 3.2.5

Course Syllabi

CODE   203

NAME   Computer Organization

Credits   6 ECTS

Period   Fall Semester

Course Specifications
Lectures in the classroom, individual work, questionnaires on-line by virtual campus and laboratory work
Objectives and contents
The objective of the subject is to understand the internal organization of a computer (from a hardware point of view).
Contents:

Theory

Topic 1. Improving Processor Performance with Pipelining (50%)
a. Performance Measurement and Amdahl's Law
b. RISC-V Pipelining
c. Data Hazards
d. Control Hazards
e. Advanced Parallelism

Topic 2. Memory Hierarchy (30%)
a. Introduction
b. Cache Memory
c. Improving Memory System Bandwidth: Interleaving
d. Virtual Memory: Paging

Topic 3. Input/Output and Peripherals (20%)
a. Devices, Controllers, and Input/Output Ports
b. Input/Output Programming:
a. Programmed I/O
b. Interrupt-Driven I/O
c. Direct Memory Access (DMA)

Lab Work

Lab 1. RISC-V Pipelining
Lab 2. Cache
Lab 3. Input/Output
Lab 4. Advanced Code Optimization Techniques

Assessment

There will be no final exam in the first ordinary session, where the continuous assessment method is applied. This continuous assessment will consist of mandatory partial tests (C1, C2, C3) conducted throughout the course, which will cover the theoretical and practical content of the three course topics. There is no minimum required score for each test, except for the final test of the course, which requires a minimum score of 3 (out of 10). Based on the test results, a weighted average grade will be calculated as follows:

average_grade = 0.50*$C1$ + 0.30*C2 + 0.20*C3

The exams will be held in laboratories. During the exams, students will not have access to AI tools.

To calculate the final grade, students with an average_grade of 5 or higher may receive up to 1 additional point from activities proposed by the teaching staff throughout the course, with the final grade capped at 10.

Lecturer
Prof. Dr. Julio Villalba Moreno
jvillalba@uma.es
Room 2.2.38

Course Syllabi

CODE 204

NAME Data Structures

Credits 6 ECTS

Period Fall Semester

Course Specifications
Lectures and laboratory work.

Objectives and contents
This course provides an in-depth exploration of data structures, which are essential for organizing large datasets to enable efficient algorithmic processing. Aimed at students with prior experience in imperative programming using languages such as C, and object-oriented programming with Java, the course offers a comprehensive introduction to the most significant data structures in the field of Computer Science.

Participants will gain insights into various implementations of these structures using previously mentioned programming languages. The course will analyse and compare the performance of these implementations, providing a clear understanding of their efficiencies. Additionally, the practical application of these data structures in solving diverse problems will be demonstrated, highlighting their importance in computational tasks.

Contents
1. C Programming Language Review. An examination of dynamic memory management and the implementation of array-based and linked data structures in C.
2. Java Programming Language Review. A study of linear data structures in Java, including stacks, queues, lists, sets, bags, dictionaries, and priority queues.
3. Trees in Java. Coverage of binary search trees, heaps, and balanced trees, along with different data structure implementations based on trees.
4. Hash Tables in Java. An analysis of hash functions, collision resolution techniques, and the use of hash tables to implement various data structures.
5. Graphs in Java. Exploration of both directed and undirected graphs, including depth-first and breadth-first traversals and topological sorting.

Assessment
Continuous assessment during some laboratory sessions and on computer examinations.

Lecturer
Dr. José E. Gallardo
jegallardo@uma.es
Room 3.2.50

CODE 205

NAME Statistics Methods

Credits 6 ECTS

Period Fall Semester

Course Specifications
Classes will be held in the classroom, including problem-solving sessions both with and without the use of computers. Individual effort is expected from students.

Objectives and contents
The course has a dual focus: on the one hand, to describe the usual concepts and procedures in statistical analysis, probability calculation, and hypothesis testing, by proposing and solving small-scale problems; and on the other hand, to code these procedures using the R language, which allows for solving problems involving large volumes of data. It is recommended to learn the language in the early stages of the educational process to enable problem-solving at both levels.

Contents
1. Descriptive Statistics: Descriptive Statistics for One and Multiple Variables.
2. Statistical Models: Simple and Multiple Linear Regression. Statistical Modelling.
3. Time Series: Time Series Decomposition.
4. Probability Calculation: Probability. Random Variables and Distributions. Notable Distributions.
5. Statistical Inference: Point Estimation and Confidence Intervals. Parametric Hypothesis Testing. Non-Parametric Estimation.

The assessment model will be as follows:

- Two partial exams will be conducted during the course.

- If the arithmetic mean of both partial exams is 5 or higher, the student will pass the subject and will not need to take the final exam.

- If the mean is below 5, the student will have to take the final exam covering all the subject material at the official examination session.

Remaining Examination Sessions: The assessment will consist of a single exam.
A student will be considered as NOT PRESENTED for the subject if they do not attend any partial exams or the final exam, and will be considered PRESENTED if they attend any partial exam or the final exam.

Lecturer
Dr. Iván Atencia Mc.killop
iatencia@ctima.uma.es
Room 2.2.16

Course Syllabi

CODE 305

NAME Intelligent Systems

Credits 6 ECTS

Period Fall Semester

Course Specifications
Lectures, written exercises, individual work, programming laboratory practices.

Objectives and contents
This is a first course in Artificial Intelligence (AI). AI is 'the art of creating machines that perform functions that require intelligence when performed by people' (Kurzweil, 1990). The aim is to provide a knowledge of the fundamental techniques of present AI and also some fluency in the use of Python and some of its libraries. Course contents include: decision trees; linear and logistic regression; artificial neural networks; search and planning.

Assessment
There are three written exams: two midterm exams covering part of the theoretical content, and a final exam covering the last part of the theoretical content and a quiz about programming and data analysis.
Also, there are mandatory programming exercises, to be coded in Python. Therefore, programming skill is a prerequisite.

Lecturer
Dr. Lorenzo Mandow
lmandow@uma.es
Room: 3.2.38

CODE 920

NAME Computational Intelligence

Credits 4.5 ECTS

Period Fall Semester

Course Specifications
The course is based on lectures in which the main ideas of the course are given as specific details of the problems and algorithms to be discussed and applied should be taken from reading the suggested related scientific publications. For each of the topics of the course, a computer-based practice should be carried out together with a report of the work done and the results obtained.

Objectives and contents
The objective of the course is that the students acquire the knowledge and abilities needed in order to choose and apply computational intelligence algorithms for solving real problems in bioinformatics.

Contents:
1. Clustering algorithms application to DNA microarray data.
2. Classification algorithms application for prediction of disease evolution.
3. Evolutive algorithms application to feature selection.
4. Probabilistic algorithms application to sequence detection and alignment.

Assessment
Continuous assessment is based on class participation, on the elaboration of reports and on two partial tests, with which the student can pass the course. A final exam is also possible as an alternative to pass this subject.

Lecturers
Dra. Rafaela Benítez
benitez@lcc.uma.es
Room 3.2.21

Dr. Miguel Ángel Molina
miguelangel@lcc.uma.es
Room 3.3.2.I.

Course Syllabi

CODE   106

NAME   Calculus for Computing

Credits   6 ECTS

Period   Spring Semester

Course Specifications
The training activities will be based on theory, problems, and practical classes, and on the student's personal work with the exercises and other material provided by the lecturer.

The development of the classes will pursue the continuous interaction of the teacher with the student, seeking a balance between the presentation of the theoretical contents of the subject and the performance of practical activities, encouraging the use of mathematical software as a support tool for the acquisition of the competences of the subject.

During the problem classes in the classroom, the active work of the student will be encouraged to solve the exercises proposed in each of the topics and will carry out practical work with the computer, introducing the use of mathematical software (WA, Geogebra, Maxima, etc.) in the resolution of the exercises.

Objectives and contents
In this subject, the fundamentals for solving mathematical problems involving knowledge of differential and integral calculus are developed.
Contents
1. Elementary functions. Solving equations and systems. Complex numbers.
2. Differential calculus.
3. Integral calculus.
4. Sequences and series.

Assessment

The course will follow a continuous evaluation procedure based on the delivery of tasks, which include the practical part of the course, and on the performance of partial evaluation tests. To this end, the contents of the course will be grouped into two blocks: block A (topics 1 and 2) and block B (topics 3 and 4).

For each block, a practical evaluation activity will be required (with a weight of 20%) and a partial test (with a weight of 80%).

At the end of the continuous evaluation process, the student's final mark will be the weighted average of the marks obtained in each of the blocks. The weighting is as follows: 40% for block A and 60% for block B.

Students who have obtained a grade lower than 5 in the weighted average may take an exam on the date set by the ETSII, where they will have the opportunity to improve the mark of one or both blocks in a second chance.

Course Syllabi

SECOND ORDINARY CALL

On the date scheduled by the ETSII, students will take a comprehensive exam of the entire content of the subject. The mark obtained will be included in the minutes.

Lecturer
Dr. Sergio Ortega Acosta
sergio.ortega@uma.es
Room 2.2.19

CODE   107

NAME   Algebraic Structures

Credits   6 ECTS

Period   Spring Semester

Course Specifications

Lectures in the lecture room. Problem solving with and without computers support in the lecture room. Individual work is required.

Objectives and contents

The course on Algebraic Structures for Computing will set the foundations for the students to be trained on specific formal languages that will be useful for them in future courses such as 'Algorithms Design', 'Networks and Services', 'Automata Theory and Formal Languages' and many others.

Contents:

1.   Preliminary Concepts. Cardinality
    2.   Lattices and Boolean Algebra
    3.   Groups, Rings and Fields
    4.   Linear Equations Systems
    5.   Vector Space
    6.   Linear Transformations
    7.   Diagonalization
    8.   Inner Product and Euclidean Space

Assessment

The attitude and work done by the student during the classes will be taken into consideration. During the practical sessions of the course, the active participation of the student will be encouraged in order to solve the proposed exercises.

** First Call**

The course is divided into two thematic blocks, with equal weight for obtaining the successive grades and their transfer to the official records:

- Block 1. Consists of the topics:

  - Preliminaries. Cardinality.

  - Partially ordered Sets, lattices and Boolean algebras.

- Algebraic structures: groups, rings and fields. Coding theory.

- Block 2. The contents will be those related to linear algebra:

  - Linear equations systems.

  - Vector Space.

  - Linear transformations.

  - Diagonalization.

  - Euclidean Vector Space.

In the first ordinary call, the subject will follow a continuous evaluation. For each block, the following will be done:

- A midterm exam of the contents of the block, to be carried out in the lecture room, with a weighting of 85%.

- An individual practice to be done with a computer, during lectures. This practice has a weighting of 15%.

This weighting results in an independent rating for each block.

If a grade greater than or equal to 3.5 is achieved in both blocks, the average of both grades will be calculated. If said average is equal to or greater than 5, this will be the grade that is transferred to the official records in the first call.

On the date indicated by the School for the exam of the first call, two midterm exams will be held, one for each block. Each student has to take the midterm corresponding to each block where he or she has not obtained at least a 5.

The grade obtained in these midterms will replace the one achieved through continuous evaluation (midterms and practices) in the corresponding block, since these last midterms represent the final milestone of the continuous evaluation of the course.

After completing these midterm exams, the evaluation will follow the same scheme as in the continuous evaluation.

Those students who, having not passed the course through continuous assessment, do not take the corresponding midterm exams of the first call, on the date set by the School, will appear in the official records as "not presented."

**Second ordinary call and extraordinary calls **

If the first call is not passed, on the date proposed by the School a single exam will be taken on the complete content of the course, the grade of which will be the one that is transferred to the official records.

Course Syllabi

Part-time students

Part-time students may take the exams of each call on the date scheduled by the School, whose grade will be the one that is transferred to the minutes.

Lecturer
Dra. Mª Carmen Fernández Gago
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Room 2.2.21

CODE   108

NAME   Introduction to Software Engineering

Credits   6 ECTS

Period   Spring Semester

Course Specifications

The course is mainly based on lectures in which student participation is encouraged through classroom debates and collaborative development of exercises. Students will work on assignments both individually and in groups. Lab work will be used to teach selected software engineering tools and to develop the ability to apply the theoretical knowledge in practical scenarios. Extra activities include peer reviews, writing essays and solving proposed exercises.

Objectives and contents

This is an introductory course in Software Engineering. As such and given the wide domain of the subject in terms of techniques and tools, the course is necessarily dense in content. We cover the concepts, processes, techniques, tools, and standards that affect the development of a software project with a focus on the aspects of code management, version control, testing and quality assurance. Our goal is to provide students with a good understanding of the pillars of software development that will provide them with the necessary skills to successfully take courses on other specific areas of software engineering.

Assessment

Continuous assessment of the student participation in lectures, debates, and lab sessions throughout the course. Evaluation of student assignments. Written and practical (on computer) examinations.

Lecturer

Dr. Javier Cámara Moreno

jcamara@uma.es

Room 3.3.2.II

Course Syllabi

CODE   109

NAME   Advanced Programming I

Credits   6 ECTS

Period   Spring Semester

Course Specifications
Lectures where the theoretical concepts are described. Individual and laboratory work where the students put in practice these theoretical concepts using the Java programming language.

Objectives and contents
The course introduces students to object oriented design and programming using the Java programming language.

Contents
1. Introduction in Java to Object Oriented Programming Fundamentals: classes, objects, methods, messages, composition, variables, predefined types.
2. Inheritance and interfaces. Single and multiple inheritance, interface implementation, abstract classes, static and dynamic binding.
3. Exception management. Error handling with exceptions. Throwing exception, definition of tailored exception classes.
4. Basic predefined Java classes. System basic classes (java.lang), system utility classes (java.util), input/output in java (java.io).
5. Collections. Generic programming in Java. Predefined Java collections (lists, sets) and maps.

Assessment
Attending the lectures and the laboratory sessions, short questions to be answered during lectures, short programs to be developed during laboratory sessions, partial and final exams in the laboratory.

Lecturer
Dr. José Mª Álvarez Palomo
jmalvarez@uma.es
Room 3.2.6

Course Syllabi

CODE   110

NAME   Computer Technology

Credits   6 ECTS

Period   Spring Semester

Course Specifications
The course follows an active learning methodology where students work in varying teams, solve exercises, and upload and present the solutions in class. We work with several features in the CV system such as tasks, workshops and fora.

Objectives and contents
Go into the wonderful world of the computer processor. The student designs processors based on Boolean logic and observes its functioning based on code we feed it. We get a feeling for the language the processor understands based on creating assembly code. The design follows the new RISC-V conventions.

Assessment
The English of the student is promoted due to interacting in the team work and discussions and presentations. The assessment of the course is done in a continuous way by providing 7 small tests evaluating each part after it is finished. Moreover, handed in assignments in the GUAC system are assessed. Those assignments are directly used in the individual evaluations.

Lecturer
Dr. Eligius M.T. Hendrix
eligius@uma.es https://sites.google.com/site/eligiushendrix/
Room 2.116D (Escuela de Ingenierías)

Course Syllabi

CODE 206

NAME Foundations of Artificial Intelligence

Credits 6 ECTS

Period Spring Semester

Course Specifications

Lectures, written exercises, individual work, programming laboratory practices.

Objectives and contents

This is a first course in Artificial Intelligence (AI). AI is 'the art of creating machines that perform functions that require intelligence when performed by people' (Kurzweil, 1990). The aim is to provide a knowledge of the fundamental techniques of present AI and also some fluency in the use of Python and some of its libraries. Course contents include: decision trees; linear and logistic regression; artificial neural networks; search and planning.

Assessment

There are three written exams: two midterm exams covering part of the theoretical content, and a final exam covering the last part of the theoretical content and a quiz about programming and data analysis.

Also, there are mandatory programming exercises, to be coded in Python. Therefore, programming skill is a prerequisite.

Lecturer

Dr. José Luis Pérez de la Cruz
ccia@uma.es
Room: 3.2.24

Course Syllabi

CODE   207

NAME   Advanced Programming II

Credits   6 ECTS

Period   Spring Semester

Course Specifications
Lectures where theoretical concepts, problems and algorithms are explained in the classroom whereas, in the laboratory, every student puts in practice these concepts resolving well-defined problems following the guidelines of the teacher. The course follows a practical approach using the Scala and Java programming languages.

Objectives and contents
The main objectives are to learn functional and parallel programming in contrast to traditional programming models. Classical problems are shown as well as their solutions following different approaches and the syntactic and semantics resources provided by Scala. A last objective is to learn how to create programs with GUI (Graphical User Interfaces) using a well-founded methodology.

Contents
1. Functional programming.
2. Concurrency: main concepts.
3. Concurrency: communication and synchronization.
4. Event driven programming.

Assessment
There are 3 midterm exams on i) functional programming, ii) semaphores and iii) monitors/locks, each with a value of 30%. Each exam must be passed with a minimum of 4 over 10. A passed exam is kept (no need to repeat it) in any ordinary call of the course. The remaining 10% of the mark corresponds to a home task on Java GUI.

Lecturer
Dr. Sergio Gálvez Rojas
galvez@uma.es
Room 3.2.33

Course Syllabi

CODE 208

NAME Networks and Services

Credits 6 ECTS

Period Spring Semester

Course Specifications
The course includes lectures, problem-solving sessions, individual work, and laboratory sessions.

Objectives and contents
This course provides an overview of computer networks, starting with the basics of networking, including their structure and how networks are organized.

Contents
It introduces layered models, such as the Internet models, and the standards that define network protocols and operations. The discussion of network access and link control includes the services and functionalities of the link layer, focusing on multiple access networks, local area network (LAN) technologies, and other specialized networking technologies. Network Interconnection Protocols and Internet Services cover VLANs, and IP protocols (IPv4 and IPv6), including Internet routing. It also explores transport layer services, discussing protocols like UDP and TCP, along with network programming with sockets APIs. Additionally, it presents classical Internet services such as DNS, the World Wide Web, and email among others, and advanced Internet services, such as cloud computing, multimedia, and other cutting-edge elements.

Assessment
The acquisition of concepts is evaluated considering: class attendance and participation; midterm and final exams (70% aprox.). The practical part of this course counts 30% of the final score.

Lecturer
Dra. Lidia Fuentes
lfuentes@uma.es
Room 3.2.8

CODE   209

NAME   Operating Systems

Credits   6 ECTS

Period   Spring Semester

Course Specifications

The course includes lectures about fundamental concepts involved in the internal design of any Operating System. It also includes laboratory work about programming complex software services on the POSIX of the UNIX family of operating systems.

It requires deep and strong knowledge of the hardware structure of the computer (knowledge of previous subjects like Computer Technology and Computer Structure is compulsory, as the concepts will appear frequently during description of the implementation of the OS).

Note for Erasmus students

If you come from a **non Computer-Science or Information Technology degree**, you are advised to **not choosing this subject**.

If your Erasmus supervisor recommends you to take it, please refer him or her to contact the lecturers (guille@ac.uma.es) to discuss the suitability of this subject. We have a recurring series of badly advised students that fail to understand the theory of the subject because of the lack of previous knowledge.

Just being an experienced programmer is not enough as a base to approach this subject.

Objectives

The subject focuses on the Operating System as an interface between the developer and the computer hardware in a general-purpose system. Any kind of usage of the computer is done through the Operating Systems and never directly:

- Many abstractions offered by programming languages (like threads, processes, files, network sockets, memory allocation, etc.) are not part of the programming language. Instead, the OS implements them and the languages just call the through system calls. This is why all programming languages offer the same abstractions.

- Security is also implemented in the Operating System. The concept of user and access permissions does not exists in the hardware but created and managed by the code of the OS. That includes controlling the access to the hardware resources by the programmer.

With these concepts in mind, you will understand that High Level Languages are only one more layer on top of OS software. You will become a better programmer understanding that any language is just generating code that uses the common OS

implementation of resources. In this sense, you will be able to focus on management of resources more than on the language itself.

Contents

1. Processes and threads.

2. Process scheduling.

3. Memory management.

4. Input/output subsystem.

Laboratories

5. The UNIX programming environment: Programming on the POSIX standard.

6. Low-level binary files.

7. Communication through the Operating System (shared memory and queues).

8. Signals and processes.

9. Graceful termination of service programs.

Assessment

For the standard student, continuous evaluation of the progress is compulsory. There will be NO FINAL exam at the end of the course.

If the student misses an intermediate exam laboratory work (with exception of properly documented causes like medical reasons, severe illness or decease of close relatives, etc.) the final score will be NOT EVALUATED.

Assessment involves two parts. To pass the subject, it is required to pass both parts with a minimum score of 5:

- Evaluation of knowledge of theory and solving of problems during the course. This evaluation will be done through two kinds of events:

    o Intermediate exams.

    o Exercises interleaved with theory classes. Attendance to classes is compulsory.

- Evaluation of the laboratory work. Evaluation will include two kind of events:

    o Handing in the output of the laboratories through the Virtual Campus.

    o Exercises interleaved with laboratory sessions. Attendance to sessions is compulsory.

Course Syllabi

Lecturers

Dr. Ricardo Quislant: (theory sessions)
quislant@uma.es
Room 2.2.25

Dr. Guillermo Pérez (laboratory sessions)
gperez@uma.es
Room 2.2.34

Course Syllabi

CODE 210

NAME Automata Theory and Formal Languages

Credits 6 ECTS

Period Spring Semester

Course Specifications
The course is mainly based in lectures in which student participation is encouraged through the presentation of exercises, individual work, and group work. Extra activities include writing essays and solving proposed exercises.

Objectives and contents
The course gives a basic introduction to the classic and contemporary theory of formal languages and automata theory.

Contents
Include the following topics: Mathematical preliminaries, Alphabets and Grammars, Regular Expressions, Finite automata, Regularity conditions, Context Free Languages, Introduction to computation, The Turing Machine, Recursive functions, The "While" language, Equivalence theorem, Universality, Formal limits of computation.

Assessment
The course contents will be evaluated in 4 blocks. A minimum of 5 is needed in each of the 4 blocks to pass the course, and for achieving this, the students have one opportunity during the continuous evaluation and a second and third ones in the two ordinary final exams calls. The final grade will be obtained by averaging the best grades obtained from each of the 4 blocks plus some extra points from proposed activities.

Lecturer
Dr. Leonardo Franco
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