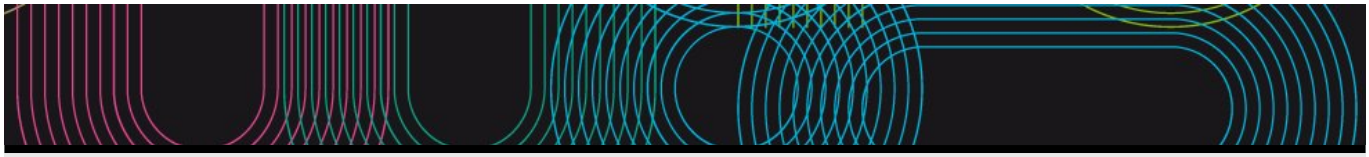

IDENTIFYING DATA				
Programming I				
Subject	Programming I			
Code	V05G301V01105			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Rodríguez Hernández, Pedro Salvador			
Lecturers	Caeiro Rodríguez, Manuel García Duque, Jorge González Castaño, Francisco Javier López Bravo, Cristina Mikic Fonte, Fernando Ariel Rodríguez Estévez, Judith Soledad Rodríguez Hernández, Pedro Salvador Sousa Vieira, Estrella			
E-mail	pedro.rodriguez@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	The aim of the course is to provide students with basic skills to program in a high level language. The programming paradigm followed is that of "structured programming". English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
B9	CG9: The ability to work in multidisciplinary groups in a Multilanguage environment and to communicate, in writing and orally, knowledge, procedures, results and ideas related with Telecommunications and Electronics.
C6	CE6/T1: The ability to learn independently new knowledge and appropriate techniques for the conception, development and exploitation of telecommunication systems and services
C12	CE12/T7: The knowledge and use of basics in telecommunication networks, systems and service programming.
D2	CT2 Understanding Engineering within a framework of sustainable development.
D4	CT4 Encourage cooperative work, and skills like communication, organization, planning and acceptance of responsibility in a multilingual and multidisciplinary work environment, which promotes education for equality, peace and respect for fundamental rights.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
Express the solution of a simple problem by means of algorithms using top-down design.	C12
Identify the data needed to solve a problem and associate them with appropriate datatypes based on their features (size, range, associated operators)	C12
Code simple algorithms using the basic types of statements: assignment, selection and iteration.	C12
Declare and define functions with a proper use of parameters.	C12
Handle I/O operations and file management.	C12
Define and use structured data types.	C12

Define and manage dynamic data structures (lists, stacks, queues and trees).		C12	
Create modules and library functions and use them in programs.		C6 C12	
Predict the result of a sequence of statements, knowing the input data.		C12	
Handle basic tools in an integrated development environment: text editor, compiler, linker, debugger and documentation tools.		C6	
Develop a small scale project following all the phases: requirements analysis, design, implementation, testing and documentation.	B4 B9	C6 C12	D2 D4

Contents

Topic	
Lecture 1: The algorithm and the programming languages.	1. A computer's structure and operation 2. How the program gets into the computer 3. C Programming language 4. The process of developing programs 5. Simple Programming Examples 6. Software engineering concepts
Lecture 2: Grammar and basic elements of C language.	1. Basic elements of a C program 2. Identifiers 3. Expressions 4. Declaration and initialization 5. The assignment statement 6. Formatted input/output
Lecture 3: Iteration and selection statements	1. Control statements 2. Decision statements: (a) if statement (b) if-else statement (c) switch statement 3. Iteration statements: (a) do-while statement (b) while statement (c) for statement 4. Statements for altering the control flow: break and continue statements
Lecture 4: Arrays and pointers	1. Data Structures 2. Arrays: (a) One-dimensional arrays (b) Two-dimensional arrays 3. Strings 4. Copy of arrays
Lecture 5: Functions	1. Function declaration and definition 2. Functions with no parameters 3. C inter function communication: local, global and static variables 4. Functions with parameters by value
Lecture 6. Pointers	1. Pointers 2. Pointer arithmetic 3. Dynamic memory allocation 4. Arrays and pointers 5. Pointers to pointers 6. Functions with parameters by reference 7. Command line arguments
Lecture 7: Files	1. Introduction: Types of files 2. Text files in C 3. Declaration 4. File opening and closing 5. File management 6. Operations on characters 7. Operations on strings 8. Formatted operations
Lecture 8: Structured type variables	1. Introduction: Structured data types 2. struct type. Declaration 3. struct type. Operations 4. Pointers and struct type 5. struct as parameters 6. Creation of data types
Lecture 9: Lists	1. Introduction: the need for dynamic data structures 2. Dynamic data structures 3. Linked lists (a) Types (b) Most common operations

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	2	0	2
Lecturing	24	24	48

Laboratory practical	30	20	50
Laboratory practice	4	20	24
Objective questions exam	2	18	20
Problem and/or exercise solving	1	5	6

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Introductory activities	Introduction to theoretical and practical activities.
Lecturing	Professors present the main theoretical contents related to the subject These sessions can include the development of works and programs by the students. Through this methodology the competencies CE12 and CT2 are developed.
Laboratory practical	During the first part of the term the student codifies, compiles and documents simple programs guided by the instructor. In this laboratory, the Ubuntu Linux operating system and the gcc compiler will be used. Some of these activities can require the submission of a report in order to be evaluated. Through this methodology the competencies CG4, CG9, CE6, CE12, CT2, and CT4 are developed.

Personalized assistance

Methodologies	Description
Lecturing	The professors will provide individual attention to the students along the term, solving their doubts and questions. Questions will be answered during the master sessions or during tutorial sessions. The professors will establish timetables for this purpose at the beginning of the term. This schedule will be published on the subject website. Tutorial sessions could also be agreed by appointment. The tutorial schedule of the professors is avaliable in their Moovi profiles: https://moovi.uvigo.gal/user/view.php?id=11584 https://moovi.uvigo.gal/user/view.php?id=11583
Laboratory practical	The professors will provide individual attention to the students along the term, solving their doubts and questions about the laboratory practises. Questions will be answered during the lab sessions or during tutorial sessions. The professors will establish timetables for this purpose at the beginning of the term. This schedule will be published on the subject website. Tutorial sessions could also be agreed by appointment. The tutorial schedule of the professors is avaliable in their Moovi profiles: https://moovi.uvigo.gal/user/view.php?id=11584 https://moovi.uvigo.gal/user/view.php?id=11583 https://moovi.uvigo.gal/user/view.php?id=59589 https://moovi.uvigo.gal/user/view.php?id=11342 https://moovi.uvigo.gal/user/view.php?id=11665 https://moovi.uvigo.gal/user/view.php?id=11299 https://moovi.uvigo.gal/user/view.php?id=11585 https://moovi.uvigo.gal/user/view.php?id=11338

Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practice	The student will take 2 midterm laboratory tests consisting in the development of small programs on the computer. Each of these tests will assess the student's progress on a portion of the laboratory practical exercises. The final laboratory test will assess the student's progress on the practical exercises as a whole.	50	B4 B9	C6 C12	D2 D4
Objective questions exam	The student will take 1 midterm theoretical test that may consist of: - short answer questions - multiple choice questions This exam will assess individually the student's mastery of the concepts introduced in the lecture sessions. The final theoretical exam will also contain this type of questions.	40	B4	C12	
Problem and/or exercise solving	The theoretical exams will have a part consisting of problem and/or exercise solving	10	B4	C12	

Other comments on the Evaluation

Following the guidelines specific to the degree program, each student will have 2 opportunities (the **ordinary** and **extraordinary** calls) to pass the course.

Furthermore, in the ordinary call, there will be 2 evaluation procedures (**continuous** and **global**).

ASSESSMENT TESTS

Throughout the semester, several intermediate assessment tests will be given. Specifically, there will be two **Midterm LaboratoryTests** (PL1 and PL3) and one **Midterm TheoreticalTest** (PT2). The schedule of the different intermediate assessment tests will be approved by the Academic Degree Committee (CAG) and will be available at the beginning of the semester.

During the regular examination period of the School, the **Final Theoretical Test** (ETF) and the **Final Laboratory Test** (EFL) will be given.

During the extraordinary examination period of the School, the **Extraordinary Theoretical Test** (ETX) and the **Extraordinary Laboratory Test** (EXL) will be given.

Each theoretical test may include short-answer and/or multiple-choice questions, as well as problem-solving and/or exercise resolution questions. It assesses students' knowledge of the content covered in the lectures.

All the practical exercises are mandatory. Prior to each laboratory test, it will be necessary to have uploaded to Moovi all the corresponding assignments for that test. Each laboratory test consists of making modifications to the submitted practical exercises. It evaluates those submitted practical exercises.

ORDINARY CALL

Each student taking this course may choose between the 2 evaluation procedures: continuous assessment and global assessment.

Taking the second midterm test (PT2) will be interpreted as the decision to choose continuous assessment. No taking it will be interpreted as the decision to choose global assessment.

CONTINUOUS ASSESSMENT

The condition for passing the course using the continuous assessment procedure is obtaining a final grade (NFC) equal to or higher than 5.

The final grade for continuous assessment will be calculated as the weighted arithmetic mean of the midterm and final test grades. It will be given by the following expression:

NFC = 0.6 NPP + 0.2 ETF + 0.2 EFL

Where:

NPP is the Midterm Test Grade, calculated as the weighted arithmetic mean of all midterm tests, according to the following expression:

NPP = (1PL1 + 3PT2 + 2*PL3) / 6

ETF is the grade obtained on the Final Theoretical Test.

EFL is the grade obtained on the Final Laboratory Test.

A minimum grade of 2.5 points will be required in the three components of this grade (NPP, ETF, and EFL). If the student fails to reach this minimum in any of them, the final grade for continuous assessment will be at most 4.0 (Fail).

Continuous assessment consists of the tests detailed in this guide, which are not recoverable. In other words, if a student cannot complete them within the specified timeframe, the teaching staff is not obliged to repeat them.

Before each test, the date and procedure for reviewing the grades will be indicated. Students will have the option to know the grade of each test and review the correction within approximately 2 weeks.

GLOBAL ASSESSMENT

The condition for passing the course using the global assessment procedure is obtaining a final grade (NFG) equal to or higher than 5.

This method will consist of the same final tests as the continuous assessment, although with different weights. The final grade for global assessment will be given by the following expression:

NFG = (ETF + EFL) / 2

A minimum grade of 2.5 points will be required in the two components of this grade (ETF and EFL). If the student fails to reach this minimum in any of them, the final grade for global assessment will be at most 4.0 (Fail).

Each student taking the final tests for the course will have both grades calculated: the final grade for continuous assessment (NFC) and the final grade for global assessment (NFG). The higher of the two grades will be awarded as the final grade in the ordinary call.

The grade will be "No-show" if the student does not attend any test after the first Midterm Test (PL1).

EXTRAORDINARY CALL

Each student who does not pass the course in the ordinary call will have a second opportunity.

In the extraordinary call, the condition for passing the course is obtaining a final grade (NFX) equal to or higher than 5.

The final grade in the extraordinary call will be given by the following expression:

NFX = (NTX + NXL) / 2

Where:

NTX is the Extraordinary Theoretical Grade: if the student takes the Extraordinary Theoretical Test, NTX will be the grade obtained in that test:

NTX = ETX

If not, NTX will be the theoretical grade obtained in the ordinary call:

NTX = 0.6 PT2 + 0.4 ETF

NXL is the Extraordinary Laboratory Grade: if the student takes the extraordinary Laboratory Test, NXL will be the grade obtained in that test:

NXL = EXL

If not, NXL will be the laboratory grade obtained in the ordinary call:

NXL = 0.2 PL1 + 0.4 PL2 + 0.4 EFL

A minimum grade of 2.5 points will be required in the two components of this grade (NTX and NXL). If the student fails to reach this minimum in any of them, the final grade in the extraordinary call will be at most 4.0 (Fail).

END-OF-PROGRAM TEST

Following the guidelines specific to the degree program, students who have 3 or fewer courses remaining to graduate will have end-of-program test call in those courses.

In the end-of-program test call, the condition for passing the course is obtaining a final grade (NFX) equal to or higher than 5.

In this call, a test with short-answer and/or multiple-choice questions, as well as problem-solving and/or exercise resolution questions, will be conducted (End-of-program Theoretical Test, ETZ), and a laboratory test evaluating the lab work (End-of-program Laboratory Test, ELZ). The final grade in the end-of-program test call will be given by the following expression:

NFZ = (ETZ + ELZ) / 2

A minimum grade of 2.5 points will be required in the two components of this grade (ETZ and ELZ). If the student fails to reach this minimum in any of them, the final grade in the end-of-program test call will be at most 4.0 (Fail).

The grade obtained in any of the assessable tasks will be valid only for the academic year in which they are performed, meaning that no grade is carried over from one year to the next.

If plagiarism is detected on any of the assignments/tests, the grade will be Fail (0), and the teaching staff will report the incident to the School's administration for appropriate action to be taken.

The use of generative artificial intelligence (GAI) is permitted in the completion of academic activities for this subject. Its use must be ethical, critical, and responsible. If GAI is used, any results it provides should be critically evaluated, and any generated citations or references must be carefully verified. Additionally, it is recommended to disclose the tools used.

Sources of information

Basic Bibliography

Brian W. Kernighan, Dennis M. Ritchie, **The C Programming Language**, 1995, Prentice Hall, 1983

Brian W. Kernighan, Dennis M. Ritchie, **El Lenguaje de Programación C**, 1995, Prentice Hall, 1983

Manuel Caeiro Rodríguez, Enrique Costa Montenegro, Ubaldo García Palomares, Cristina López Bravo, J, **Practicar Programación en C**, 2014,

Complementary Bibliography

Ignacio Alvarado Aldea, Jose María Maestre Torreblanca, Carlos Vivas Venegas, Ascensión Zafra Cabeza, **100 Problemas Resueltos de Programación en Lenguaje C para Ingeniería**, 2017, Paraninfo, 2017

https://www.tutorialspoint.com/cprogramming/, **Learn C Programming**, 2021,

https://www.programiz.com/c-programming, **Learn C Programming**, 2021,

Stephen G. Kochan, **Programming in C**, 2014, Addison Wesley, 2005

Osvaldo Cairo Battistuti, **Fundamentos de Programación**, 2006, Pearson Education,

José Rafael García-Bermejo Giner, **Programación Estructurada en C**, 2008, Prentice Hall,

James L. Antonakos, Kenneth C. Mansfield Jr., **Programación Estructurada en C**, 2004, Prentice Hall, 1997

Jorge A. Villalobos S., Rubby Casallas G., **Fundamentos de Programación: Aprendizaje Activo Basado en Casos**, 2006, Prentice Hall,

Recommendations

Subjects that continue the syllabus

Informatics: Computer Architecture/V05G301V01109
Programming II/V05G301V01110

Other comments

Programming II course continues this course in the second semester of the first year.