UNIVERSIDADE LUSÍADA
LISBOA

Course Unit Program
Advanced Programming

Academic Year 2025/2026

1. Organic Unit

Faculty of Business and Economic Sciences

2. Course

Computer Engineering

3. Cycle

1st

4. Course Unit

Advanced Programming (L9018)

5. Scientific Area

6. Curricular Year

2nd

7. Type of Curricular Unit / Semester

2nd Semester

FUNDAÇÃO MINERVA CULTURA - ENSINO E INVESTIGAÇÃO CIENTÍFICA

Rua da Junqueira, 188 a 198 - 1349-001 LISBOA - Telefone 213 611 500 - Fax 213 638 307 - e-mail: info@lis.ulusiada.pt - https://www.lis.ulusiada.pt

8. Class type and workload (work time)

Theoretical classes:	
Practical classes:	
Theoretical-Practical Classes	30,00
Tutorial Guidance:	20,00

9. ECTS Credits

6,00

10. Scientific Area Coordinator

Prof. Doutor VÍTOR EMANUEL DE MATOS LOUREIRO DA SILVA PEREIRA

11. Regent

Prof. Doutor JOÃO JOSÉ AMARO AMADOR LEITÃO

12. Assistants

13. Teaching Language

Portuguese

14. General Objectives

The program aims to provide a solid foundation in imperative and object-oriented programming in C/C++. Students will learn to define and implement classes, apply inheritance, polymorphism and design patterns. Introduces good programming practices, use of modern tools such as Git and IDEs. The objective is to prepare students to develop robust and efficient software, using current methodologies and techniques.

15. Specific Objectives

The program focuses on imperative and object-oriented programming in C/C++, covering data types, operators, flow control, as well as inheritance, polymorphism and design patterns.
Prioritizes the use of modern tools such as Git and IDEs, promotes good programming practices and introduces basic modeling in UML. The objective is to enable students to develop robust software, applying design principles and mastering current development techniques.

16. Skills to be acquired

Program in C/C++ applying flow control, pointers, and dynamic memory allocation.
Define, implement, and test classes in C++, with encapsulation, constructors/destructors, and operator overloading.
Apply inheritance, polymorphism, and templates to design generic and reusable solutions.
Use the STL and design patterns (e.g., Singleton, Factory, Observer) to improve code quality.
Version code with Git, configure an IDE, and implement unit tests.

FUNDAÇÃO MINERVA CULTURA - ENSINO E INVESTIGAÇÃO CIENTÍFICA

Rua da Junqueira, 188 a 198 - 1349-001 LISBOA - Telefone 213 611 500 - Fax 213 638 307 - e-mail: info@lis.ulusiada.pt - https://www.lis.ulusiada.pt

17. Teaching Methodology

The methodology combines theoretical classes for conceptual foundations with laboratory practices, ensuring direct application of concepts. It is focused on practical projects and regular reviews to consolidate learning, encouraging the resolution of real problems in object-oriented programming.

18. Course Unit Program

1. Fundamentals of Imperative Programming in C/C++:
- Primitive and structured data types.
- Operators and expressions.
- Declaration, initialization and scope of variables.
- Flow control: choice and iteration instructions.
- Functions: definition, prototypes and calls.
- Memory manipulation: pointers and pointer arithmetic.
- Dynamic memory allocation.
2. Introduction to Object Oriented Programming in C++:
- Fundamental notions of classes and objects.
- Definition and implementation of classes.
- Information encapsulation and abstraction.
- Constructors and destroyers.
- Operator overload.
3. Advanced Object-Oriented Programming Techniques:
- Inheritance and composition.
- Polymorphism and abstract classes.
- Templates (generic classes and functions).
- Exception handling.
- Introduction to design patterns (Singleton, Factory, Observer).
4. Essential Tools and Good Practices:
- Use of standard libraries (STL).
- Introduction to Git and version control.
- Use of modern IDEs and basic configuration of the development environment.
- Basic notions of unit testing.

19. Assessment Methods

The assessment, consisting of 2 tests, follows the General Knowledge Assessment Regime.

20. Didactic Resources

Projector;
Personal computer;
C compiler and CLion IDE.

21. Sustainability Objectives

FUNDAÇÃO MINERVA CULTURA - ENSINO E INVESTIGAÇÃO CIENTÍFICA

Rua da Junqueira, 188 a 198 - 1349-001 LISBOA - Telefone 213 611 500 - Fax 213 638 307 - e-mail: info@lis.ulusiada.pt - https://www.lis.ulusiada.pt

SDG 4 - Quality Education: reinforces digital literacy and advanced programming skills (C/C++), fundamental to basic training in computer engineering.
SDG 8 - Decent Work and Economic Growth: promotes efficient programming practices and software quality, enhancing productivity and employability in technology-intensive sectors.
SDG 9 - Industry, Innovation and Infrastructure: develops technical skills that support innovation in software and efficient digital infrastructure.

22. Keywords

Object Oriented Programming;
C++.

FUNDAÇÃO MINERVA CULTURA - ENSINO E INVESTIGAÇÃO CIENTÍFICA

Rua da Junqueira, 188 a 198 - 1349-001 LISBOA - Telefone 213 611 500 - Fax 213 638 307 - e-mail: info@lis.ulusiada.pt - https://www.lis.ulusiada.pt

23. Main Bibliography

Author(s): Bjarne Stroustrup
Title: Programming: Principles and Practice Using C++
Edition: 3 Year: 2024
Local:
Publisher: Addison-Wesley Professional
ISBN Code:

Author(s): Donald Evan
Title: C++ For Object Oriented Programming
Edition: 1 Year: 2024
Local:
Publisher: Edição do Autor
ISBN Code:

Author(s): Stanley Lippman, Josée Lajoie, Barbara Moo
Title: C++ Primer
Edition: 5 Year: 2012
Local:
Publisher: Addison-Wesley Professional
ISBN Code:

24. Complementary Bibliography

Author(s): Herb Sutter, Andrei Alexandrescu, John Fuller
Title: C++ Coding Standards: 101 Rules, Guidelines, and Best Practices
Edition: 1 Year: 2004
Local:
Publisher: Addison-Wesley Professional
ISBN Code:

Author(s):
Title:
Edition: Year:
Local:
Publisher:
ISBN Code:

FUNDAÇÃO MINERVA CULTURA - ENSINO E INVESTIGAÇÃO CIENTÍFICA

Rua da Junqueira, 188 a 198 - 1349-001 LISBOA - Telefone 213 611 500 - Fax 213 638 307 - e-mail: info@lis.ulusiada.pt - https://www.lis.ulusiada.pt

UNIVERSIDADE LUSÍADA
LISBOA

Ficha técnica MIP / MIP Datasheet	
Título / Title	Course Unit Program 'PROGRAMAÇÃO AVANÇADA': Academic Year 2025/2026
Autor / Author	Prof. Doutor VÍTOR EMANUEL DE MATOS LOUREIRO DA SILVA PEREIRA
Classificação / Classification	-
Descritores / Descriptors	-
Colaborador(es) / Colaborator(s)	-
Data Hora / Date Time	
Formato de dados / Data Format	Texto / Text, PDF
Estatuto de utilização / Usage	Acesso público / Public Access
Relação / Relation	Version 1,0

(c) Universidade Lusíada, 2026

FUNDAÇÃO MINERVA CULTURA - ENSINO E INVESTIGAÇÃO CIENTÍFICA

Rua da Junqueira, 188 a 198 - 1349-001 LISBOA - Telefone 213 611 500 - Fax 213 638 307 - e-mail: info@lis.ulusiada.pt - https://www.lis.ulusiada.pt