SHORT
ADVANCED
PROGRAMME

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NETWORK
EUROPEAN UNIVERSITY

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NUMERICAL METHODS WITH PYTHON PROGRAMMING
2nd EDITION

7.JUN–26.JUL.2024

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Organised by: IPLeiria
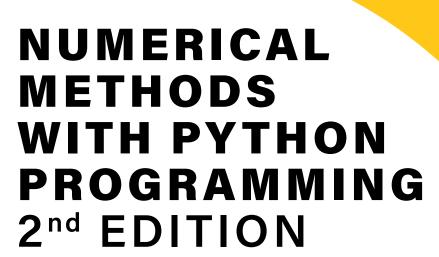TUS

SAP OVERVIEW

This SAP aims to introduce numerical methods to undergraduate students with some basic knowledge of the Python programming language and some mathematical knowledge of differentiation and integration.

Students should have some prior knowledge of working with a computer, editing files and downloading and installing software, and will acquire general skills in elementary numerical analysis, as well as knowledge and techniques related to problems and applications in engineering sciences.

In this SAP we propose to use the Python framework provided by Anaconda (www.anaconda.com) and the teaching will be supported by Jupyter Notebook. It is assumed that if students use their computers in class, they will already have the Anaconda framework installed on their computers.

LEARNING OUTCOMES

At the end of this RUN-EU SAP, you will be able to:
· Develop abstract thinking skills and acquire basic concepts related to programming language.
· Know and understand the concepts of elementary numerical analysis and describe their properties.
· Apply the concepts of elementary numerical analysis to modelling and problem solving.
· Use basic numerical methods and understand their properties.
· Use and implement specific software to solve numerical problems.
· Apply critical thinking when analysing the results obtained.
· Interpret and critically analyse text, which involves knowledge of numerical analysis.
· Achieve greater accuracy and clarity in thinking and speaking.

DATE From **7 June to 26 July 2024**
Face-to-Face Week: IPLeiria, Portugal
22–26 July

MODE OF DELIVERY Blended

LANGUAGE OF INSTRUCTION English

ECTS CREDITS 3

ACADEMIC RECOGNITION
To be defined by each home higher education institution. Generally, most students will have this SAP certified in their diploma supplement, as a minimal condition.

ELIGIBLE PARTICIPANTS
All RUN-EU undergraduate and postgraduate students.

HOW TO APPLY
Fill in the application form **(QR or website)**

DEADLINE FOR APPLICATIONS
14 May 2024

CONTACT DETAILS
carlos.campos@ipleiria.pt

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SELECTION CRITERIA

Background, motivation, wide representation of subject areas/fields and balanced participation of RUN-EU member institutions.

A maximum of 35 students will be selected for this programme.

The selection team will also take steps towards ensuring a diverse and representative group of students.

LEARNING AND TEACHING STRATEGY

Active learning, learner-centred teaching, collaborative methods.
Problem solving tasks; discussions; project work; role play; presentations; peer teaching/learning.
Live sessions (whole class/group work), independent (group/individual) work + mentor support, site visits in Portugal

Platform: Teams

COURSES LEADERS | LECTURERS

Ana Lemos (IPLeiria)
Carlos Campos (IPLeiria)
Sajjad Sajjadi (TUS)
Teresa Abreu (IPCA)

PHYSICAL MOBILITY | SCHOLARSHIPS AVAILABLE

The selected students will receive travel grants based on the travel distance and the subsistence costs in the country the SAP is offered in.

Travel
Portugal – Portugal: €40
Ireland – Portugal: €270
Finland – Portugal: €470
The Netherlands: €330
Austria – Portugal: €330
Spain – Portugal: €230
Belgium – Portugal: €230

Subsistence
The subsistence grant for Portugal is €460, except for students who already come from IPLeiria.

MEANS AND CRITERIA FOR ASSESSMENT

Active participation.
Learner portfolio.
Final presentation.
Reflection.

CERTIFICATION

Participants who successfully complete this RUN-EU SAP will receive a Certificate of Participation and a Transcript of Records jointly issued by the organising institutions.

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PROGRAMME AT A GLANCE

WEEK 1 ▪ 7.JUNE.2024 ▪ ONLINE

	GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
	GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
	GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
FRIDAY 7/6										WELCOME & OPENING SESSION		

WEEK 2 ▪ 10-14.JUNE.2024 ▪ ONLINE

MONDAY 10/6										TEAM WORK	
TUESDAY 11/6										TEAM WORK	
WEDNESDAY 12/6										TEAM WORK	
THURSDAY 13/6										LECTURE	
FRIDAY 14/6										LECTURE	

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PROGRAMME AT A GLANCE

WEEK 3 ▪ 17−21.JUNE.2024 ▪ ONLINE

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	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

Day											
MONDAY 17/6									TEAM WORK		
TUESDAY 18/6									TEAM WORK		
WEDNESDAY 19/6									LECTURE		
THURSDAY 20/6									LECTURE		
FRIDAY 21/6									TEAM WORK		

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PROGRAMME AT A GLANCE

WEEK 4 ▪ 1–5.JULY.2024 ▪ ONLINE

	GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
	GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
	GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
MONDAY 1/7										TEAM WORK		
TUESDAY 2/7										LECTURE		
WEDNESDAY 3/7										TEAM WORK		
THURSDAY 4/7										LECTURE		
FRIDAY 5/7										TEAM WORK		

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PROGRAMME AT A GLANCE

WEEK 5 ▪ 8–12.JULY.2024 ▪ ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
MONDAY 8/7									LECTURE		
TUESDAY 9/7									TEAM WORK		
WEDNESDAY 10/7									LECTURE		
THURSDAY 11/7									TEAM WORK		
FRIDAY 12/7									LECTURE		

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PROGRAMME AT A GLANCE

WEEK 6 ▪ 15–18.JULY.2024 ▪ ONLINE

	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

MONDAY 15/7									TEAM WORK		
TUESDAY 16/7									TEAM WORK		
WEDNESDAY 17/7									TEAM WORK		
THURSDAY 18/7									CLOSING SESSION		

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PROGRAMME AT A GLANCE

WEEK 7 ▪ 22–26.JULY.2024 ▪ FACE-TO-FACE WEEK ▪ LEIRIA

	GMT+2	11h00	12h00	13h00	114h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
	GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
	LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

MONDAY 22/7
OPENING SESSION / PRESENTATION | DEFINING WORKING GROUPS / DEFINING COACHING | LUNCH BREAK | PROJECT DEVELOPMENT PYTHON PROGRAMMING

TUESDAY 23/7
PROJECT DEVELOPMENT PYTHON PROGRAMMING | LUNCH BREAK | PROJECT DEVELOPMENT PYTHON PROGRAMMING

WEDNESDAY 24/7
ENTERPRISE VISITS | LUNCH BREAK | CULTURAL VISITS

THURSDAY 25/7
PROJECT DEVELOPMENT PYTHON PROGRAMMING | LUNCH BREAK | PREPARATION OF PRESENTATION | PROJECT PRESENTATION

FRIDAY 26/7
GROUP LEARNING REFLECTION | PROJECT PRESENTATION

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WEEK 1 & 2

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7 & 10 JUNE	17h00–19h00 GMT · ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

| FRIDAY 7/6 | | | | | | | | | | | WELCOME & OPENING SESSION |

Welcome & Opening Session

🕐 17h00–19h00
👥 Group Work
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 In this welcome and opening session, participants will make their presentations.
The lecturers will then present the objectives, programme and timetable of the course.

| MONDAY 10/6 | | | | | | | | | | | TEAM WORK |

Python Reviewing

🕐 17h00–19h00
👥 Team Work
👤 Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Teresa Abreu (IPCA)

📄 In this lecture, we will begin to overview Python's data types, functions and control structures. During the lecture, several examples will be presented and students will have the opportunity to solve programming exercises related to this topic.
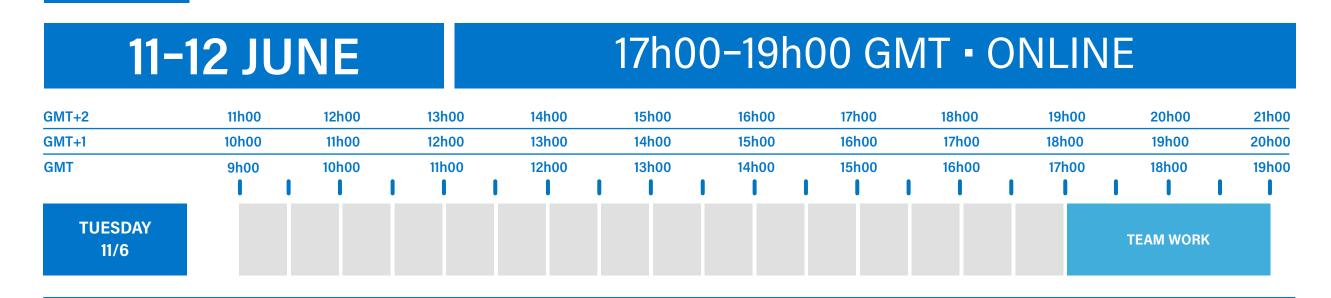
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WEEK 2

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11–12 JUNE	17h00–19h00 GMT · ONLINE

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GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

TUESDAY 11/6 ⟶ TEAM WORK

Python Reviewing

🕐 17h00–19h00
👥 Team Work
👤 Teresa Abreu (IPCA), Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria)

📄 In this lecture, we will continue to review topics in the Python programming language, such as lists, tuples and traditional Python modules, namely the math, random and numpy modules. During the lecture, several examples will be presented and students will have the opportunity to solve programming exercises on this topic.

WEDNESDAY 12/6 ⟶ TEAM WORK

Python Reviewing

🕐 17h00–19h00
👥 Team Work
👤 Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Teresa Abreu (IPCA)

📄 In this lecture we will complete our overview of the Python programming language with dictionaries, graphics, text and comma-separated values (CSV) files. During the lecture, several examples will be presented and students will have the opportunity to solve programming exercises related to this topic.

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WEEK 2

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13-14 JUNE	17h00–19h00 GMT · ONLINE

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GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

| WEDNESDAY 12/6 | | | | | | | | | | | LECTURE |

Solutions of Equations in One Variable

🕐 17h00–19h00
Lecture
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 The lecture starts with an introduction to the topic of nonlinear equations and their solution by numerical methods. After learning how to find roots by the graphical method, two numerical methods for finding numerical solutions of a nonlinear equation in an unknown are introduced: the bisection method and the fixed point method. Examples are given for each method and the students have the opportunity to solve some exercises.

| FRIDAY 14/6 | | | | | | | | | | | LECTURE |

Solutions of Equations in One Variable

🕐 17h00–19h00
Lecture
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 The lecture will begin with a review of the previous lecture, followed by an introduction to the Newton-Raphson method for solving nonlinear equations with one unknown. Some examples will be given and the students will have the opportunity to solve exercises on this topic. The lecture will continue with the implementation of the algorithms corresponding to the numerical methods studied using Python programming and their use in practical applications.

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WEEK 3

17-18 JUNE	17h00–19h00 GMT · ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

MONDAY 17/6 — TEAM WORK

Solutions of Equations in One Variable

🕐 17h00–19h00
👥 Team Work
👤 Teresa Abreu (IPCA), Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria)

📄 In this lecture we will continue to develop Python programming implementations of the numerical methods studied and their use in practical applications.

TUESDAY 18/6 — TEAM WORK

Solutions of Equations in One Variable

🕐 17h00–19h00
👥 Team Work
👤 Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Teresa Abreu (IPCA)

📄 In this lecture we will continue to develop Python programming implementations of the numerical methods studied and their use in practical applications.

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19-20 JUNE	17h00–19h00 GMT · ONLINE

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GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

| WEDNESDAY 19/6 | | | | | | | | | | LECTURE | |

Polynomial Interpolation

🕐 17h00–19h00

🖧 Lecture

👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 The lecture begins with a preview of polynomial interpolation and will then develop with the presentation of the Lagrange interpolation method, the divided differences method and the Newton divided differences interpolation method.
Examples of the application of these methods will be studied and the students will have the opportunity to solve exercises.

| TUESDAY 20/6 | | | | | | | | | | LECTURE | |

Polynomial Interpolation

🕐 17h00–19h00

🖧 Lecture

👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 The lecture starts with a review of the last lecture. Then the theoretical concepts and examples of inverse interpolation and Hermite interpolation will be presented. Students will work on solving exercises that include practical applications.
The lecture ends with Python programming implementations of these methods and practical applications.

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WEEK 3 & 4

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21 JUNE & 1 JULY | 17h00–19h00 GMT · ONLINE

	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

| FRIDAY 21/6 | | | | | | | | | | | TEAM WORK |

Polynomial Interpolation

🕐 17h00–19h00
👥 Team Work
👤 Teresa Abreu (IPCA), Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria)

📄 In this lecture, Python programming implementations of Lagrange interpolation, divided differences and Newton interpolation are developed and practical applications are presented.

| MONDAY 1/7 | | | | | | | | | | | TEAM WORK |

Polynomial Interpolation

🕐 17h00–19h00
👥 Team Work
👤 Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Teresa Abreu (IPCA)

📄 In this lecture, Python programming implementations of inverse interpolation and Hermite interpolation are developed and practical applications are presented.

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2–3 JULY	17h00–19h00 GMT · ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

| TUESDAY 2/7 | | | | | | | | | | LECTURE | |

Discrete Least Squares Approximation

🕐 17h00–19h00
Lecture
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

The lecture will begin with an introduction to the topic of function approximation, in particular discrete least squares, followed by the concepts of linear and polynomial models. Linearisation techniques and their application to exponential and power models are covered. Examples of the application of these methods will be studied and students will have the opportunity to complete some application exercises.

| WEDNESDAY 3/7 | | | | | | | | | | TEAM WORK | |

Discrete Least Squares Approximation

🕐 17h00–19h00
Lecture
👤 Teresa Abreu (IPCA), Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria)

In this lecture, we will develop Python programming implementations of linear, polynomial, exponential, power and general models. The implemented scripts will be used to solve practical applications.

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4–5 JULY	17h00–19h00 GMT · ONLINE

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GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

THURSDAY 4/7								LECTURE

Discrete Least Squares Approximation

🕐 17h00–19h00
📋 Lecture
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 The lecture will begin with an overview of the last lecture, and we will continue with Python programming implementations of the discrete least squares methods studied. We will then study theoretical concepts and examples of multiple linear regression. Students will have the opportunity to complete application exercises related to these topics. The lecture will continue with the implementation of these numerical techniques using Python programming implementations, followed by practical applications.

FRIDAY 5/7								LECTURE

Discrete Least Squares Approximation

🕐 17h00–19h00
📋 Lecture
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 In this lecture we will develop Python programming implementations of general models and multiple linear regression. The implemented scripts will be used to solve practical applications.

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NUMERICAL METHODS WITH PYTHON PROGRAMMING
2nd EDITION

WEEK 5

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8–9 JULY	17h00–19h00 GMT · ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

| MONDAY 8/7 | | | | | | | | | LECTURE | | |

Numerical Integration

- 🕐 17h00–19h00
- Lecture
- 👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

- 📄 The aim of this lecture is to present some numerical methods for approximating definite integrals.
  The lecture will start with an introduction to numerical integration, followed by the presentation of the Trapezoidal, Simpson and Gauss-Legendre rules, illustrated with examples.
  Students will have the opportunity to apply these concepts by solving the exercises provided.

| TUESDAY 9/7 | | | | | | | | | TEAM WORK | | |

Numerical Integration

- 🕐 17h00–19h00
- Team Work
- 👤 Teresa Abreu (IPCA), Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria)

- 📄 In this lecture, Python programming implementations of Trapezoidal, Simpson and Gauss-Legendre rules are developed and applied in practical exercises.

NUMERICAL METHODS WITH PYTHON PROGRAMMING
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WEEK 5

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	10–11 JULY	17h00–19h00 GMT · ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

| WEDNESDAY 10/7 | | | | | | | | | | LECTURE | |

Numerical Integration

🕐 17h00–19h00
📋 Lecture
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 In this lecture, we continue to study numerical methods for numerical integration.
Students will have the opportunity to apply these concepts by solving the exercises provided.

| THURSDAY 11/7 | | | | | | | | | | TEAM WORK | |

Numerical Integration

🕐 17h00–19h00
📋 Team Work
👤 Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Teresa Abreu (IPCA)

📄 In this lecture we will continue the Python programming implementations for numerical integration methods.
The implemented scripts will be used to solve practical applications.

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WEEK 5 & 6

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12 & 15 JULY	17h00–19h00 GMT · ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

| FRIDAY 12/7 | | | | | | | | | | LECTURE | |

Ordinary Differential Equations

🕐 17h00–19h00
🗓 Lecture
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 This lecture will introduce the numerical approximation of the solution of initial value problems for ordinary equations.
Some theoretical concepts on this topic will be presented along with the Euler and Runge-Kutta methods.
We will study examples and solve exercises involving the application of these numerical methods.

| MONDAY 15/7 | | | | | | | | | | TEAM WORK | |

Ordinary Differential Equations

🕐 17h00–19h00
🗓 Team Work
👤 Teresa Abreu (IPCA), Sajjad Sajjadi (TUS), Ana Lemos (IPLeiria), Carlos Campos (IPLeiria)

📄 In this lecture, Python programming implementations of Euler and Runge-Kutta methods are developed, followed by the solution of practical applications, ways of presenting the solution, and discussion of the results.

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WEEK 6

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16-17 JULY	17h00–19h00 GMT · ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

TUESDAY 16/7										LECTURE

Numerical Methods

🕐 17h00–19h00
📋 Lecture
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 This session is dedicated to practical work with examples and exercises using all the topics covered in the previous lectures. A programming project will be started during this session.

WEDNESDAY 17/7										LECTURE

Numerical Methods

🕐 17h00–19h00
📋 Lecture
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 This session is dedicated to practical work, with examples and exercises using all the topics covered in the previous lectures. During this session we will complete the programming project.

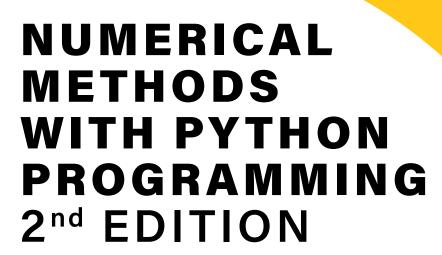TUS · POLITÉCNICO DE LEIRIA · IPCA INSTITUTO POLITÉCNICO DO CÁVADO E DO AVE · HAMK Häme University of Applied Sciences · NHL STENDEN university of applied sciences · FHV Vorarlberg University of Applied Sciences · UNIVERSIDAD DE BURGOS · howest university of applied sciences

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WEEK 6

18 JULY	17h00–19h00 GMT · ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

FRIDAY 18/7																CLOSING SESSION

Closing Session

🕐 17h00–19h00
🔀 Group Work
👤 Ana Lemos (IPLeiria), Carlos Campos (IPLeiria), Sajjad Sajjadi (TUS), Teresa Abreu (IPCA)

📄 In this final session, the participants will give their evaluation of the SAP lectures and contents, indicating the positive/negative aspects of this SAP.
Afterwards, the SAP coordinators will give a presentation about the Face-to-Face or 'Erasmus Week' in Leiria (IPLeiria) from 22 July to 26 July 2024.

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WEEK 7

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22 JULY	MONDAY 9h00–17h00 · LEIRIA

GMT+2	11h00	12h00	13h00	114h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

| MONDAY 22/7 | OPENING SESSION / PRESENTATION | DEFINING WORKING GROUPS / DEFINING COACHING | LUNCH BREAK | PROJECT DEVELOPMENT PYTHON PROGRAMMING | | | |

Opening Session
Presentation

- 🕐 9h30–10h30
- 👥 Team Building
- 👤 All lecturers

Defining Working Groups
Defining Coaching

- 🕐 10h30–12h00
- 👥 Team Building
- 👤 Ana Lemos (IPLeiria)
  Carlos Campos (IPLeiria)
  Sajjad Sajjadi (TUS)
  Teresa Abreu (IPCA)

- 📄 Team building, individual presentation, objectives for the SAP and instructions for group work. Selection of topics for group projects and planning activities.

Project Development
Python Programming

- 🕐 14h00–17h00
- 👥 Team Work, Coaching
- 👤 Ana Lemos (IPLeiria)
  Carlos Campos (IPLeiria)
  Sajjad Sajjadi (TUS)
  Teresa Abreu (IPCA)

- 📄 Project development and Python programming with coaching support.

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23 JULY	TUESDAY 9h00–17h00 · LEIRIA

GMT+2	11h00	12h00	13h00	114h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

TUESDAY 23/7	PROJECT DEVELOPMENT PYTHON PROGRAMMING	LUNCH BREAK	PROJECT DEVELOPMENT PYTHON PROGRAMMING				

Project Development Python Programming

🕐 9h00–12h00
🖧 Team Work, Coaching
👤 Ana Lemos (IPLeiria)
   Carlos Campos (IPLeiria)
   Sajjad Sajjadi (TUS)
   Teresa Abreu (IPCA)

📄 Project development and Python programming with coaching support.

Project Development Python Programming

🕐 14h00–17h00
🖧 Team Work, Coaching
👤 Ana Lemos (IPLeiria)
   Carlos Campos (IPLeiria)
   Sajjad Sajjadi (TUS)
   Teresa Abreu (IPCA)

📄 Project development and Python programming with coaching support.

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24 JULY	WEDNESDAY 9h00–17h00 · LEIRIA

GMT+2	11h00	12h00	13h00	114h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00	
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00	
LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	

WEDNESDAY 24/7	ENTERPRISE VISITS	LUNCH BREAK	CULTURAL VISITS		

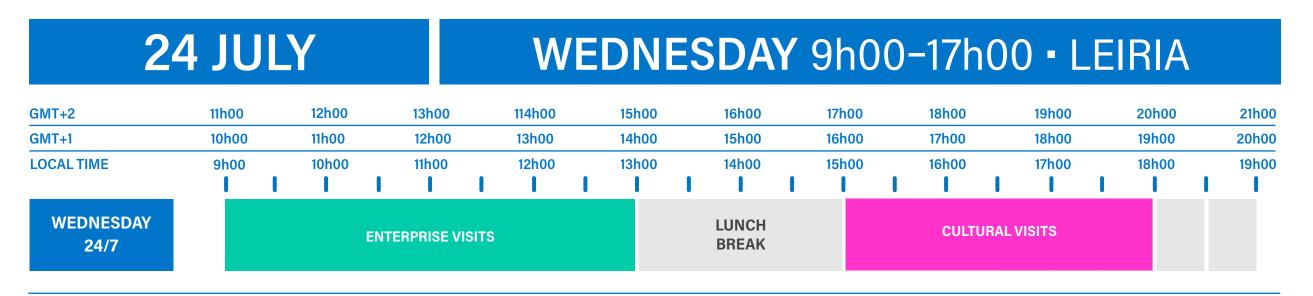## Enterprise Visits

🕐 9h00–13h00
📊 Cultural Activity
👤 Ana Lemos (IPLeiria)
Carlos Campos (IPLeiria)
Sajjad Sajjadi (TUS)
Teresa Abreu (IPCA)

📄 Enterprise visits.

Cultural Visits

🕐 15h00–18h00
📊 Cultural Activity
👤 Ana Lemos (IPLeiria)
Carlos Campos (IPLeiria)
Sajjad Sajjadi (TUS)
Teresa Abreu (IPCA)

📄 Guided tour of the city and historical monuments.

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25 JULY	THURSDAY 9h00–17h00 · LEIRIA

GMT+2	11h00	12h00	13h00	114h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

THURSDAY 25/7	PROJECT DEVELOPMENT PYTHON PROGRAMMING	LUNCH BREAK	PREPARATION OF PRESENTATION	PROJECT PRESENTATION			

Project Development Python Programming

- 🕐 9h00–12h00
- 🖧 Team Work, Coaching
- 👤 Ana Lemos (IPLeiria)
  Carlos Campos (IPLeiria)
  Sajjad Sajjadi (TUS)
  Teresa Abreu (IPCA)

- 📄 Project development and Python programming with coaching support.

Preparation of Presentation

- 🕐 14h00–15h30
- 🖧 Team Work, Coaching
- 👤 Ana Lemos (IPLeiria)
  Carlos Campos (IPLeiria)
  Sajjad Sajjadi (TUS)
  Teresa Abreu (IPCA)

- 📄 Preparation of presentation.

Project Presentation

- 🕐 15h30–17h00
- 🖧 Team Work, Coaching
- 👤 Ana Lemos (IPLeiria)
  Carlos Campos (IPLeiria)
  Sajjad Sajjadi (TUS)
  Teresa Abreu (IPCA)

- 📄 In this session, participants will present their group work.

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26 JULY	FRIDAY 9h30–18h00 · LEIRIA

GMT+2	11h00	12h00	13h00	114h00	15h00	16h00	17h00	18h00	19h00	20h00	21h00
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	20h00
LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00

FRIDAY 26/7	GROUP LEARNING REFLECTION / PROJECT PRESENTATION										

Group Learning Reflection
Overall Quality Assessment

🕐 9h00–10h00
👥 Group Work
👤 Ana Lemos (IPLeiria)
Carlos Campos (IPLeiria)
Sajjad Sajjadi (TUS)
Teresa Abreu (IPCA)

📄 · Group Learning Reflection (all)
· Individual Learning Reflection Report
  + Mobility Assessment (students)
· SAP Self-reflection Report (SAP coordinators)
· LearnWell

Project Presentation

🕐 10h00–12h00
👥 Team Work, Coaching
👤 Ana Lemos (IPLeiria)
Carlos Campos (IPLeiria)
Sajjad Sajjadi (TUS)
Teresa Abreu (IPCA)

📄 In this session, participants will present their group work.