



NUMERICAL METHODS WITH PYTHON PROGRAMMING

29.MAY-21.JUL.2023

SAP OVERVIEW

This SAP aims to introduce numerical methods to undergraduate students with some basic Python programming language skills and some mathematics skills in differentiation and integration. Students should have some prior knowledge of working with a computer, editing files, and downloading and installing software.

The students will acquire general skills in elementary numerical analysis, and knowledge and techniques associated with problems and engineering sciences applications.

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

LEARNING OUTCOMES

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

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Organised by: Polytechnic of Leiria
TUS

DATE From **29 May to 21 July 2023**
Face-to-Face Week: TUS, Limerick, Ireland
17-21 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 students.

HOW TO APPLY

Fill in the application form ([QR or website](#))



DEADLINE FOR APPLICATIONS

28 April 2023

CONTACT DETAILS

carlos.campos@ipleiria.pt



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SELECTION CRITERIA

Students will be selected based on the fulfilment of requirements, CV and information provided in a video and/or in a motivation letter.

A maximum of 5 places will be reserved for each of the two host institutions (IPL/ESTG and TUS) and a maximum of 3 places will be reserved for each of the five RUN-EU partners.

The total number of students to be selected is 25. Selection will always be based on requirements and submitted applications concerning motivation.

The selection team will also take steps toward ensuring diversity and representativity.

LEARNING AND TEACHING STRATEGY

Active learning, learner-centred teaching, collaborative methods.

Live sessions (whole class/group work), independent (group/individual) work + mentor support, site visits in Portugal

Platform: Teams

COURSES LEADERS | LECTURERS

Ana Lemos (Polytechnic of Leiria)

Carlos Campos (Polytechnic of Leiria)

Sajjad Sajjadi (TUS)

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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 - Ireland: 270€

Austria - Ireland: 270€

Finland - Ireland: 380€

Hungary - Ireland: 330€

Athlone/Thurles - Limerick: 36€

The Netherlands - Ireland: 260€

Subsistence

The subsistence grant for Ireland is 900€, except for students who already come from TUS Limerick.

MEANS AND CRITERIA FOR ASSESSMENT

Individual participation (attendance): 20%

Group project: 80% (20% Interim Presentation + 60% Final presentation). Active participation from all students of each group is mandatory in both group presentations.

Self-assessment, teacher assessment based on project outcomes.

CERTIFICATION

The 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.



NUMERICAL METHODS WITH PYTHON PROGRAMMING

PROGRAMME AT A GLANCE

WEEK 1 - 29.MAY-2.JUNE.2023 - ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	20h00	21h00	22h00	23h00	
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	19h00	20h00	21h00	22h00	
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	18h00	19h00	20h00	21h00	
MONDAY 29/5												WELCOME & OPENING SESSION SAP PRESENTATION
TUESDAY 30/5												LECTURE
WEDNESDAY 31/5												TEAM WORK
THURSDAY 1/6												TEAM WORK
FRIDAY 2/6												LECTURE

SHORT
ADVANCED
PROGRAMME



RUN REGIONAL
UNIVERSITY
NETWORK
EUROPEAN UNIVERSITY

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PROGRAMME AT A GLANCE

WEEK 2 - 5-7.JUNE.2023 - ONLINE

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GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	20h00	21h00	22h00	23h00	
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	19h00	20h00	21h00	22h00	
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	18h00	19h00	20h00	21h00	
MONDAY 5/6												LECTURE
TUESDAY 6/6												TEAM WORK
WEDNESDAY 7/6												LECTURE



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PROGRAMME AT A GLANCE

WEEK 3 - 12-14.JUNE.2023 - ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	20h00	21h00	22h00	23h00	
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	19h00	20h00	21h00	22h00	
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	18h00	19h00	20h00	21h00	
MONDAY 12/6												TEAM WORK
TUESDAY 13/6												LECTURE
WEDNESDAY 14/6												LECTURE



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PROGRAMME AT A GLANCE

WEEK 4 - 20-23.JUNE.2023 - ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	20h00	21h00	22h00	23h00	
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	19h00	20h00	21h00	22h00	
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	18h00	19h00	20h00	21h00	
TUESDAY 20/6												TEAM WORK
WEDNESDAY 21/6												LECTURE
THURSDAY 22/6												LECTURE
FRIDAY 23/6												TEAM WORK



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PROGRAMME AT A GLANCE

WEEK 5 - 28-30.JUNE.2023 - ONLINE

GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	20h00	21h00	22h00	23h00	
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	19h00	20h00	21h00	22h00	
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	18h00	19h00	20h00	21h00	
WEDNESDAY 28/6												TEAM WORK
THURSDAY 29/6												LECTURE
FRIDAY 30/6												CLOSING SESSION



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PROGRAMME AT A GLANCE

WEEK 6 - 17-21.JULY.2023 - FACE-TO-FACE WEEK - LIMERICK

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 17/7		OPENING SESSION PRESENTATION	DEFINING WORKING GROUPS DEFINING COACHING			LUNCH BREAK		PROJECT DEVELOPMENT PYTHON PROGRAMMING			
TUESDAY 18/7		PROJECT DEVELOPMENT PYTHON PROGRAMMING				LUNCH BREAK		PROJECT DEVELOPMENT PYTHON PROGRAMMING			
WEDNESDAY 19/7		PROJECT DEVELOPMENT PYTHON PROGRAMMING				LUNCH BREAK		CULTURAL VISITS			
THURSDAY 20/7		ENTERPRISE VISITS				LUNCH BREAK		PREPARATION OF PRESENTATION			
FRIDAY 21/7		PROJECT PRESENTATION				LUNCH BREAK		GROUP LEARNING REFLECTION	OVERALL QUALITY ASSESSMENT		

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NUMERICAL METHODS WITH PYTHON PROGRAMMING

WEEK 1

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29 MAY		MONDAY 18h00-21h00 GMT - ONLINE										
GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	20h00	21h00	22h00	23h00	
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	19h00	20h00	21h00	22h00	
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	18h00	19h00	20h00	21h00	
MONDAY 29/5												WELCOME & OPENING SESSION
												SAP PRESENTATION

Welcome & Opening Session SAP Presentation

- 🕒 18h00-21h00
- 👥 Group Work
- 👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)

📄 In this welcome and opening session, the participants will do their individual presentations. Afterwards, professors will present the objectives, programme, and schedule of the course.



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WEEK 5

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30 JUNE		18h00-21h00 GMT - ONLINE										
GMT+2	11h00	12h00	13h00	14h00	15h00	16h00	17h00	20h00	21h00	22h00	23h00	
GMT+1	10h00	11h00	12h00	13h00	14h00	15h00	16h00	19h00	20h00	21h00	22h00	
GMT	9h00	10h00	11h00	12h00	13h00	14h00	15h00	18h00	19h00	20h00	21h00	
FRIDAY 30/6												CLOSING SESSION

Closing Session

🕒 18h00-21h00

👥 Group Work

👤 Ana Lemos (Polytechnic of Leiria) + Carlos Campos (Polytechnic of Leiria) + Sajjad Sajjadi (TUS)

📄 In this closing session, the participants will do their individual evaluation of the SAP lectures, and contents and will indicate the positive/negative aspects of this SAP.

Afterwards, the professors will do the presentation about the 'Face-to-Face' or 'Erasmus Week' at TUS Limerick from 17 to 21 July.



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WEEK 6

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17 JULY

MONDAY 9h30-18h00 - LEIRIA

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
LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
MONDAY 17/7		OPENING SESSION PRESENTATION	DEFINING WORKING GROUPS DEFINING COACHING			LUNCH BREAK		PROJECT DEVELOPMENT PYTHON PROGRAMMING			

Opening Session Presentation

- 🕒 9h30-11h00
- 👥 Team Building
- 👤 All lecturers

Defining Working Groups Defining Coaching

- 🕒 11h00-13h00
- 👥 Team Building
- 👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)
- 📄 Teaming, individual presentation, goals for the SAP and instructions for group work.
Select the topics of the group projects and planning activities.

Project Development Python Programming

- 🕒 15h00-18h00
- 👥 Team Work, Coaching
- 👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)
- 📄 Project development and Python programming with coaching support.



NUMERICAL METHODS WITH PYTHON PROGRAMMING

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18 JULY

TUESDAY 9h30-18h00 - LEIRIA

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	
LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00	
TUESDAY 18/7		PROJECT DEVELOPMENT PYTHON PROGRAMMING				LUNCH BREAK	PROJECT DEVELOPMENT PYTHON PROGRAMMING					

Project Development Python Programming

- 🕒 9h30-13h00
- 👥 Team Work, Coaching
- 👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)
- 📄 Project development and Python programming with coaching support.

Project Development Python Programming

- 🕒 15h00-18h00
- 👥 Team Work, Coaching
- 👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)
- 📄 Project development and Python programming with coaching support.



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19 JULY

WEDNESDAY 9h30-18h00 - LEIRIA

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
LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
WEDNESDAY 19/7		PROJECT DEVELOPMENT PYTHON PROGRAMMING				LUNCH BREAK	CULTURAL VISITS				

Project Development Python Programming

- 🕒 9h30-13h00
- 👥 Team Work, Coaching
- 👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)
- 📄 Project development and Python programming with coaching support.

Cultural Visits

- 🕒 15h00-18h00
- 👥 Group Work
- 👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)
- 📄 Guided tour of the city and historical monuments.



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20 JULY

THURSDAY 9h30-18h00 - LEIRIA

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
LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
THURSDAY 20/7		ENTERPRISE VISITS				LUNCH BREAK		PREPARATION OF PRESENTATION			

Enterprise Visits

- 🕒 15h00-18h00
- 👥 Group Work
- 👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)
- 📄 Enterprise visits.

Preparation of Presentation

- 🕒 15h00-18h00
- 👥 Team Work, Coaching
- 👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)
- 📄 Preparation of presentation.



NUMERICAL METHODS WITH PYTHON PROGRAMMING

WEEK 6

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21 JULY

FRIDAY 9h30-18h00 - LEIRIA

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
LOCAL TIME	9h00	10h00	11h00	12h00	13h00	14h00	15h00	16h00	17h00	18h00	19h00
FRIDAY 21/7		PROJECT PRESENTATION				LUNCH BREAK	GROUP LEARNING REFLECTION		OVERALL QUALITY ASSESSMENT		

Project Presentation

🕒 9h30-13h00

👥 Group Work

👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)

📄 Presentations of group work will be given by participants in this session.

Group Learning Reflection

Overall Quality Assessment

🕒 15h00-18h00

👥 Group Work

👤 Ana Lemos (Polytechnic of Leiria)
Carlos Campos (Polytechnic of Leiria)
Sajjad Sajjadi (TUS)

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