Actividades Transversales de Doctorado
Universidad Politécnica de Cartagena
Curso 2020/21

1. Información general de la actividad /General course information					
Nombre/ Name	COMPUTATION FOR RESEARCH				
Nivel /Level	Doctorado				
Modaliad de impartición / Teaching mode	Online				
Lengua impartición/ Language	English				
ECTS	1	**hours / ECTS**	30	**Total hours**	30

2. Datos del profesorado / Lecture data			
Profesor /Lecturer in charge	JUAN JOSE ALCARAZ ESPÍN		
Departamento o Servicio/ Department/Service	TECNOLOGÍAS DE LA INFORMACIÓN Y LAS COMUNICACIONES		
Area de conocimiento /Knowledge area	INGENIERÍA TELEMÁTICA (DATA NETWORKING)		
Despacho /Office location	OFFICE 14, ANTIGONES BUILDING		
Teléfono /Telephone	968 32 6544	**email**	Juan.alcaraz@upct.es
URL / WEB	http://ait.upct.es/~jjalcaraz/		
Horario de Atención /Office hours	Mondays 17:00 – 19:00, Thursdays 16:00-18:00		

3. Fechas por edición / Dates	
1ª edición / 1st edition-	
Fecha/Date	November 1st – July 30th
Horario/Hours	
2ª edición / 2nd edition	
Fecha/Date	
Horario/Hours	
3ª edición / 3rd edition-	
Fecha/Date	
Horario/Hours	

(añadir o eliminar tantas ediciones se haga. Si la docencia es continua a lo largo del curso se indicará solo en la 1ª edición)

4. Objetivos del curso/Course objectives

- To acquire an operative command of a general-purpose state-of-the-art computing language: Python.
- To use the essential tools and libraries available for scientific computing.
- To acquire hands-on experience with practical scientific computing algorithms.

5. Contenidos teóricos / Theory programme

- Unit 1: Introduction to Python (2h)
  - Installation
  - Python Scripting
  - Files and Functions
  - Control Structures
  - Types of Variables
  - IPython
- Unit 2: Numerical Computing with Python (4 h)
  - Vectorized computation
  - Random Numbers
  - Linear Algebra
  - Input and Output
  - Automating Numerical Experiments
  - Computing over Multiple Machines

- Unit 3: Survey of Advanced Numerical Techniques (4 h)
    - Monte Carlo Methods
    - Importance Sampling
    - Estimation of Derivatives
    - Stochastic Optimization

6. Contenidos prácticos / Practical programme

1. Introduction to Python (3h). Downloading and installing Python, and the development environment. Solving exercises of increasing difficulty for acquiring command on the Python syntax and scientific libraries and functions.
2. Programming Numerical Algorithms in Python (7h). The students should complete a set of exercises about the algorithms covered in Unit 3, or complete a smaller set of exercises and develop a programming project related to their research interests.

7. Sistema de evaluación/ System of evaluation

The system evaluation consists of two elements:

1) 7 practical exercises, involving writing Python code for implementing and evaluating the algorithms covered in the Course.
2) A short programming project developed by the student, involving the implementation of a script for solving a numerical problem related to the student's own research. The student should obtain the instructor's approval to his/her project proposal to before developing it.

To pass the activity, the student has two options:

1) To successfully complete 4 or more exercises.
2) To successfully complete 2 exercises and to develop a project.

8. Distribución horaria de los contenidos, incluyendo las tareas de los alumnos / Hours distribution

Activity	Location	Student work	Hours
Theory Lectures	Online (Aula Virtual UPCT)	Read materials and watch videos	**10**
		Homework: study of the theory contents	**4**
Practical Session 1	Online (Aula Virtual UPCT)	Install the Anaconda distribution, implement basic scripts, and run IPython to execute the commands seen in theory	**3**
Practical Session 2	Online (Aula Virtual UPCT)	Complete the basic exercise set	**3**
Practical Session 3	Online (Aula Virtual UPCT)	Complete the set of exercises or develop a programming project based on his/her own research interest.	**10**
			30