

Faculty common course 2021

English course title: Advanced Scientific Programming with Python

Swedish course title: Avancerad Vetenskaplig Programmering i Python

Extent (credits): 3

Language of instruction: English

Recommended prerequisites: Students should be familiar with programming but no previous knowledge of Python is required as we will provide all material necessary.

Learning outcomes of the course: The aim of this course is to teach best practices in scientific programming such that students become more effective programmers and eventually spend less time coding and more time doing research. They will be introduced to a range of tools that will enable to be more productive. Furthermore, with the concepts taught in this course, students will be able to produce well-documented and tested code making their work clearer, more reproducible and useful to others. This will improve the students' ability to independently attack a wide range of scientific problems with a variety of computational methods.

Specify which learning outcomes of the doctoral degree that are address/covered (see appendix 1 of the call or the template of ISP). Describe how: The course provides the student with knowledge and understanding, including specialist knowledge, in the area of scientific data analysis. It also helps create familiarity with a variety of analysis methods. The final project also exercises the students' ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames and to review and evaluate such work.

Course contents:

This course covers the best practices in scientific programming with Python. The decision to use Python is based on the fact that it is commonly used in research across many disciplines. Contents of this course are:

- Introduction to the UNIX shell
- Using git repositories for organizing and sharing code
- Interactive Python programming (Jupyter notebooks)
- Test-driven software development and documentation
- Advanced Numpy/Scipy
- Data containers (HDF5, h5py, pandas)
- Performance (cython, C extensions, multiprocessing, MPI and CUDA)

Instruction (course structure):

The course will be taught as a 1 week (40 hours) seminar with many hands-on examples. Students will work in pairs on a computer/laptop.

Assessment (form of examination): Examination is based on attendance (> 90%) and participation in an individual coding project (10 hours).

Course examiner (name, e-mail): Filipe Maia (Filipe.Maia@icm.uu.se)

Department with main responsibility: ICM

Contact person/s (course responsible teacher) (name, e-mail): Filipe Maia (Filipe.Maia@icm.uu.se) and Tomas Ekeberg (tomas.ekeberg@icm.uu.se)

Course dates/period: Spring 2021

Maximum number of participants: 40

Submit the application for admission to: Filipe Maia (Filipe.Maia@icm.uu.se)

Submit the application not later than: 2020-12-31