Application for funding of faculty common course 2020
Ansökan om medel för fakultetsgemensam forskarutbildningskurs 2020

English course title  An Introduction to Mathematica
Kursnamn på engelska

Swedish course title An Introduction to Mathematica
Kursnamn på svenska

Extent (credits)  5
Omfattning (högskolepoäng)

Language of instruction  English
Undervisningsspråk

Recommended prerequisites Students should be familiar with linear algebra, calculus and basic programming. No previous knowledge of Mathematica is assumed
Rekommenderade förkunskaper

General course objective/s and learning outcomes (Also specify which PhD examination goals that are addressed/covered. Describe how.)
Kursens syfte och mål (Beskriv vilka mål för examen på forskarnivå som beaktas och på vilket sätt.)

By the end of the course, students will be able to:

1. Understand the basic structure of computer algebra systems
2. Implement various algorithms in the Mathematica language
3. Use efficiently functional and rule-based programming
4. Test and optimize Mathematica code
5. Design and set up their own Mathematica package
6. Install simple functions written in C/C++ into Mathematica with MathLink
7. Use Mathematica to solve problems in mathematics, physics and chemistry
8. Apply symbolic programming to their research

Course contents
Kursinnehåll

1. An introduction to computer algebra systems and symbolic programming
2. The basics of Mathematica as a programming language (symbolic expressions, vectors and matrices, conditional expressions, loops)
3. Substitutions and patterns
4. Linear algebra and calculus with Mathematica
5. Different programming styles in Mathematica: procedural, functional and rule-based programming
6. Graphics
7. MathLink interface (how to install C/C++ functions into Mathematica)
8. Elements of optimization, parallel programming
9. Writing your own Mathematica package
10. Applications in Mathematics, Physics, Chemistry

Instruction (course structure)
Undervisning (kursens uppläggning)

– 10 lectures (20 h total)
– 4 problem-solving sessions in which students work in groups (8 h total)
– 1 or 2 additional overview sessions may be held at the beginning of the course to support students who need some extra help with the material
– Lecture notes will be handed out during the course

The main planned changes with respect to the 2019 iteration of the course are as follows:
– A stronger group work component will be introduced. Students will be asked to work in teams for the problem-solving sessions, and each team will include students from different departments. In this way, my course can provide a valuable opportunity for students to develop their teamwork skills in the context of interdisciplinary collaborative work. This feature of the course presents some similarities with the "Experts in Teams" courses offered at Uppsala and other Nordic universities.
– The module on MathLink/interface with C/C++ will be expanded.
– 1 or 2 additional overview lectures will be held at the beginning of the course.
Given the mixed composition of the 2019 students (some students already have very good programming skills with Mathematica, others are just beginning), this is a necessary step to adjust instruction to the students' needs and to retain students throughout the course.

Assessment (form of examination)
Examination (examinationsformer)
hand-in problems during problem-solving sessions (50%, the students work in groups), final project (50%)

Course examiner (name, e-mail)  Marco Chiodaroli, marco.chiodaroli@physics.uu.se
Examinator (namn, e-post)

Department with main responsibility  Physics and Astronomy
Huvudansvarig institution

Contact person/s (course responsible teacher) Marco Chiodaroli, marco.chiodaroli@physics.uu.se
Kontaktperson/er (kursansvarig lärare) (namn, e-post)

Course dates/period  Fall Semester 2020, Period 1
Kurs datum/period

Maximum number of participants  35
Antal platser

Submit the application for admission to  Marco Chiodaroli
Skicka anmälan till kursen till

Submit the application not later than  Apr 15, 2020
Skicka anmälan senast