SYLLABUS

Programming for Scientific Computing 7.5 credits D7066E

Programmering för tekniskt vetenskapliga beräkningar

Course syllabus admitted: Spring 2024 Sp 3 - Present

DECISION DATE
2023-02-15

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Programmering för tekniskt vetenskapliga beräkningar

Second cycle, D7066E

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Datateknik	Computer Technology

Entry requirements

30 credits in completed courses in Mathematics including linear algebra and analysis in one and more variables, corresponding to following courses: M0047M Differential Calculus, 7.5 credits, M0048M Linear algebra and calculus, 7.5 credits, M0049M Linear algebra and Differential Equations, 7.5 credits and M0055M Multivariable Calculus, 7.5 credits.
Programming in Python or another programming language and basic statistics, e.g. D0009E Introduction to programming, 7.5 credits, S0008M   Probability Theory and Statistics eller motsvarande 7.5 credits or equivalent.

Good knowledge of English, equivalent to English 6.

Selection

The selection is based on 30-285 credits

Course Aim

Knowledge and Understanding

- Understand advanced software engineering concepts, including object-oriented and data-oriented software design, modeling class diagrams and relations, debugging, code profiling, and code refactoring
- Have knowledge about discretisation techniques for solving continuous problems, and iterative methods for solving nonlinear problems
- Have knowledge about high-performance computing concepts, and the importance of using efficient methods and tools

Skills and Abilities

- Be able to implement selected mathematical theory, physical models and machine learning models using numerical software libraries in a structured and conceivable way
- Be able to design and implement modular software solutions for scientific computing using object-oriented programming and re-usable libraries
- Be able to select and use efficient library implementations of methods for scientific computing

Judgement and Assessment

- Be able to systematically evaluate the efficacy of software solutions for scientific computing, including execution speed, computing requirements, and accuracy
- Be able to describe ethical and sustainability aspects of computing

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Contents

With the increasing complexity of software used in science and engineering, the requirements on the software development cycle as well as the execution efficiency are changing. The aim of this course is to provide knowledge about modern programming and software design concepts with a focus on scientific computing applications. A considerable part of the course is focused on hands-on exercises.

Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.
Lectures, read and view self-study material, programming and simulation exercises, self-assessment of learning with peer-review. Exercises can include scientifically or industrially related problems and data.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.
Hand-in assignments in English with oral presentation in English, including a final technical report.
Written self-assessment.
Oral examination.

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Course offered by

Department of Computer Science, Electrical and Space Engineering

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0001	Oral exam and self-assessment	G U 3 4 5	4	Mandatory	S24	
0002	Exercises	U G#	3.5	Mandatory	S24	

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

Syllabus established

by Robert Brännström 2023-02-15

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