

Course syllabus

Programutveckling för tekniska tillämpningar Software Development for Technical Applications

VSMN20, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED V

Date of Decision: 2023-03-21

General Information

Elective for: F4, F4-bs, M4, Pi4-bs, V4-ko

Language of instruction: The course will be given in English on demand

Aim

The course aims at giving the student ability to develop complex computation software for technical applications, including graphical user interfaces.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to explain how a major computational code is structured.
- be able to explain how Python as a script language can be used to interact with other languages and software.
- be able to explain basic principles for visualisation and presentation of computational results.

Competences and skills

For a passing grade the student must

- be able to use the programming language Python for implementing user interface with handling of input data, text based and graphical presentation of results and coupling to a computational program.

- be able to use available code from Internet or other sources.
- be able to use graphical development tools for Python.
- be able to present developed code orally as well as in written form.
- be able to localise and correct programming errors.

Judgement and approach

For a passing grade the student must

- be able to discuss how different programming languages can be integrated to give an optimal result in a projekt.
- be able to survey and evaluate computer code.

Contents

The course consists mainly of an applied program development task based on the finite element method. The program shall contain both computational code and a graphical user interface. The program development is divided into several subtasks, each representing an assignment to be turned in. The computer code developed must be tested and documented, and be presented at an oral exam.

To carry out the task, the student must acquire knowledge in the programming languages to be used. The task is designed in such a way that the degree of difficulty gradually increases for each subtask. In the tasks the following features are included: information about hardware, system software, graphical user interfaces, structuring of computer software, and implementation of element routines, mesh generation and visualisation. Furthermore, short descriptions of software and hardware systems for high performance computations, commercial finite element codes and their structure including pre- and post processors.

Examination details

Grading scale: UG - (U,G) - (Fail, Pass)

Assessment: Compulsory written assignments. Oral examination including presentation of the computer code developed and acting as opponent on other student's presentation of computer code.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Admission requirements:

- VSMN25 The Finite Element Method - Flow Analysis: part Design Assignments 2.5 hp OR VSMF05 Engineering Modelling: Analysis of Structures OR FHLF01 Finite Element Method OR FHLF10 Finite Element Method and Introduction to Strength of Materials OR FHLF20 Finite Element Method

The number of participants is limited to: No

The course overlaps following course/s: VSM032

Reading list

- Jonas Lindemann et al.: Utdelade Arbetsblad. Worksheets for each week of the course. Together they constitute the final assignment.
- Andreas Edholm: Meshing and visualisation routines in the Python version of CALFEM File.

- Andreas Edholm: User guide for pycalfem GeoData, pycalfem mesh & pycalfem vis.
- Jonas Lindemann: Föreläsningsslides.
- Jonas Lindemann: Ingenjörens guide till Python. Studentlitteratur, 2019, ISBN: 9789144126739.

Contact and other information

Course coordinator: Jonas Lindemann, Jonas.Lindemann@construction.lth.se

Examinator: Professor Kent Persson, kent.persson@construction.lth.se

Course homepage: <http://www.byggmek.lth.se>