Course syllabus

Beräkningsprogrammering
Scientific Computing

FMNF15, 6 credits, G2 (First Cycle)

Valid for: 2020/21
Decided by: PLED F/Pi
Date of Decision: 2020-04-01

General Information

Main field: Technology.
Compulsory for: V2
Language of instruction: The course will be given in Swedish

Aim

The course provides a basic understanding of how to apply computational tools to write programs to simulate and visualize various problems in civil engineering. The student should experience technical computations as a useful tool. The course should stimulate further studies.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

• be able to answer questions about the MATLAB syntax and the online help function.
• be able to describe the Matlab output corresponding to a sequence of (possible incorrect) commands.

Competences and skills
For a passing grade the student must

• be able to write computational programmes needed in later courses in the civil engineering programme.
• be able to visualize, interpret and evaluate numerical results.
• be able to report solutions and numerical results in written and graphical form.

Judgement and approach
For a passing grade the student must write a well structured report in suitable terminology on the numerical solution of a computational project within civil engineering.

**Contents**

Files, editing. MATLAB’s basic functions: arithmetic operations, vectors, matrices, simple graphics functions. Syntax: [for], [if-then-else], [while]. Built-in functions, user-written functions, and m-files. Linear systems of equations. Non-linear equations. Least squares fitting of measurement data. Numerical integration. Interpretation and critical assessment of results. Applications and project work.

**Examination details**

- **Grading scale:** UG - (U,G) - (Fail, Pass)
- **Assessment:** Written exam and a computational project.

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.

**Parts**

- **Code:** 0117  **Name:** Project  **Credits:** 1.5  **Grading scale:** UG  **Assessment:** Computational project  **Contents:** See above.

- **Code:** 0217  **Name:** Scientific Calculation  **Credits:** 4.5  **Grading scale:** UG  **Assessment:** Written examination

**Admission**

- **Admission requirements:**
  - FMA420 Linear Algebra or FMA656 Mathematics, Linear Algebra or FMAA20 Linear Algebra with Introduction to Computer Tools or FMAA55 Mathematics, Linear Algebra or FMAB20 Linear Algebra

- **Assumed prior knowledge:** FMAA05 Calculus in One Variable and FMAB30 Calculus in Several Variables

- **The number of participants is limited to:** No

- **The course overlaps following course/s:** FMN140, FMN065

**Reading list**

- Exercise material is provided by the department.

**Contact and other information**

- **Course coordinator:** Anders Holst, Studierektor@math.lth.se
- **Teacher:** Johan Helsing, helsing@maths.lth.se
- **Course coordinator:** Studerandeexpeditionen, expedition@math.lth.se
- **Course homepage:** http://www.maths.lu.se/utbildning/numerisk-analys/courses-in-numerical-analysis/

- **Further information:** The applications are taken from structural design, building physics, hydrology and hydraulics. The students will work on a larger project, which is developed...
in cooperation with the teacher in Structural mechanics.