## Syllabus

## for course at first level

## Applied Numerical Methods <br> Tillämpade numeriska metoder

### 7.5 Higher Education Credits 7.5 ECTS credits

Course code:<br>Valid from:<br>Date of approval:<br>Department<br>BE3009<br>Main field:<br>Specialisation:<br>\section*{Autumn 2014}<br>2013-10-07<br>Department of Mathematics (incl. Math. Statistics)<br>Scientific Computing<br>G1F - First cycle, has less than 60 credits in first-cycle course/s as entry requirements

## Decision

This syllabus has been approved by the Board of the Faculty of Science at Stockholm University, 7 October 2013.

## Prerequisites and special admittance requirements

For course admission knowledge equivalent to Numerical Methods, FL, 7,5 HECs (BE3003) is required

## Course structure

| Examination code | Name | Higher Education Credits |
| :--- | :--- | ---: |
| LABO | Practical Exercises | 4.5 |
| THEO | Theory | 3 |

## Course content

a. The course covers:

- numerical treatment of ordinary and partial differential equations;
- numerical solution of large linear systems of algebraic equations;
- solution of differential equations with discretization by difference methods and finite element methods;
- solution of linear systems of equations by direct and iterative methods;
- orientation about mathematical modeling and about software for scientific computing.
b. The course includes the following elements:
- Theory, 3 HECs
- Practical Exercises, 4.5 HECs


## Learning outcomes

It is expected that the student after taking the course will be able to:

- for a given mathematical model, identify the problem type and suggest a suitable algorithm for the numerical solution;
- implement an algorithm in a programming language suitable for numerical solution of a mathematical model;
- identify suitable software for numerical solution of problems from scientific and engineering applications; utilise computer tools for simulation and visualization of mathematical models in science and engineering; - recognize and construct simple model problems for the analysis of stability and accuracy of a numerical
model;
- among several possble numerical methods choose a method that is efficient.


## Education

The education consists of lectures, exercises, and practical exercises.
Participation in practical exercises is compulsory. The examiner may rule that a student is not obliged to participate in certain compulsory education, if there are special grounds for this, after consultation with the relevant teacher.

The instruction is in English.

## Forms of examination

a. Examination for the course is in the following manner: measurement of knowledge of the item Theory takes place through written examination, and the item Practical Exercises through oral and written presentation.
b. Grading is carried out according to a 7-point scale related to learning objectives:

A = Excellent
B $=$ Very Good
C $=$ Good
D = Satisfactory
$\mathrm{E}=$ Sufficient
$\mathrm{Fx}=$ Fail
F = Fail
c. Grading criteria for the course will be distributed at the start of the course.
d. A minimum grade of $E$ is required to pass the course, together with participation in all compulsory education.
e. Students who receive a failing grade on a regular examination are allowed to retake the examination as long as the course is still provided. The number of examination opportunities is not limited. Other mandatory course elements are equated with examinations. A student who has received a passing grade on an examination may not retake the examination to attain a higher grade. A student who has failed the same examination twice is entitled to have another examiner appointed at the next examination. Such requests should be made to the department board.
The course has at least two examinations for each academic year in the years in which instruction is provided. Intervening years include at least one examination.
f. Students awarded the grade Fx are given the opportunity to improve their grade to E. The examiner decides the supplementary assignments to be performed and the pass mark criteria. The supplementary assignments will take place before the next examination session.

## Interim

Students may request that the examination is carried out in accordance with this syllabus even after it has ceased to apply. This right is limited, however, to a maximum of three times during a two year period after course instruction has ended. Requests must be made to the departmental board. The provision also applies in the case of revisions to the course plan.

## Limitations

The course may not be included in a degree together with the course Applied Numerical Methods,
Intermediate Course (BT2040), Applied Numerical Methods, FL (BE3007), Applied Numerical Methods, FL (BE3008), Numerical Methods for Physicists II, SL (BE7001), or the equivalents.

## Misc

The course is offered as a separate course.

## Required reading

Course literature is decided by the departmental board and is described in an appendix to the syllabus.

