

# Syllabus

for course at advanced level

**Numerical Solutions of Differential Equations**  
**Numerisk behandling av differentialekvationer**

**7.5 Higher Education**  
**Credits**  
**7.5 ECTS credits**

<b>Course code:</b>	BE7008
<b>Valid from:</b>	Autumn 2008
<b>Date of approval:</b>	2007-08-28
<b>Department</b>	Department of Mathematics (incl. Math. Statistics)
<b>Subject</b>	Mathematics
<b>Specialisation:</b>	A1N - Second cycle, has only first-cycle course/s as entry requirements

## Decision

This syllabus has been approved by the Board of the Faculty of Science at Stockholm University, August 28, 2007.

## Prerequisites and special admittance requirements

For course admission knowledge equivalent to Applied Numerical Methods, FL, 9 HECs (BE3007), English B/English 6 from Upper Secondary School level, is required.

## Course structure

Examination code	Name	Higher Education Credits
THEO	Theory	3
PROJ	Project	1.5
LABO	Practical Exercises	3

## Course content

a. The course covers numerical treatment of initial value problems, boundary value problems and eigenvalue problems for ordinary and partial differential equations. Relevant linear algebra, well-posedness, convergence, stability, error estimates, finite differences, finite elements, finite volumes, method of lines, modern iterative methods, problems with shocks. Practical exercises and application oriented projects.

b. The course includes the following items:

- Theory, 3 HECs
- Project, 1.5 HECs
- Practical Exercises, 3 HECs

## Learning outcomes

After taking the course the student will be able to:

- design, implement and use numerical methods for computer solution of scientific problems involving differential equations
- follow specialized and application-oriented technical literature in the area
- understand properties of different classes of differential equations and their impact on solutions and proper numerical methods
- use commercial software with understanding of fundamental methods, properties, and limitations

## Education

The education consists of lectures, practical exercises and project with presentation.

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.

### **Forms of examination**

a. Examination for the course is in the following manner: measurement of knowledge of the item Theory takes place through written and/or oral examination, and of the element Project through written and oral presentations.

b. Grading is carried out according to a 7-point scale related to learning objectives:

A = Excellent  
B = Very Good  
C = Good  
D = Satisfactory  
E = Sufficient  
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 pass of the item Practical Exercises, and participation in all other compulsory education.

e. Students who fail to achieve a pass grade in an ordinary examination have the right to take at least further four examinations, as long as the course is given. The term “examination” here is used to denote also other compulsory elements of the course. Students who have achieved a pass grade on an examination may not retake this examination in order to attempt to achieve a higher grade. Students who have failed to reach a pass grade on two occasions have the right to request that a different teacher be appointed to set the grade of the course. A request for such appointment must be sent to the departmental board.

### **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 occasions during a two-year-period after the end of giving the course. A request for such examination must be sent to the departmental board.

### **Limitations**

The course may not be included in a degree together with the course Numerical Solutions of Differential Equations, Advanced Course (BT3150), or the equivalents.

### **Misc**

The course is given as an individual course.

### **Required reading**

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