MATEMATIK
Chalmers & GU

TMA372&MAN660; Partial Differential Equations, 2003

General information:

This is the first course on partial differential equations (PDE) in Engineering Mathematics (Teknisk Matematik), International Master Program in Mathematics (IMP), and Electrical Engineering (E3) at Chalmers. It is also considered for the students as well as some PhD program at Chalmers that find the content of the course relevant for their studies. Of course students who are not following these programs are also welcome. The course consists of 35 lecture hourse, 21 exercise hours and and gives 5 points.
Students of engineering programs: K, Kf and Kb cannot take this course. Similarly engineering physics students that have taken the PDE course TMA690 cannot take this course

Teachers:

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Lectures: Tuesdays, 13.15-16:00 in **KB** and Fridays, 8.00-9.45 in **HA3**.

Exercises: Tuesdays, 16.15-17.00: Group 1 in **KB**,
Wednesdays, 13.15-15.00: Group 2 (IMP) in **ML 10**.
Fridays, 10.00-11.45, Group 1&2 in **HA3**.

Literature:

K. Eriksson, D. Estep, P. Hansbo and C. Johnson, Computational Differential Equations, Studentlitera-ture 1996 (available at the Cremona book shop).

Home Assignments (Voluntary):

During the course two sets of assignments will be handed out. Each set will be divided in two parts. One part contains problems of the same type as on the final exam, but more complex and time consuming, the other part consists of computer exercises. You will account for your work by handing in the solutions to the problems and a short report on the computer work done. The home assignments can give a maximum of 12 bonus points on the final exam, where the computer exercises give 0-4 points each and the problems give 0-2 points each. (See the *course homepage* for further information on assignments).

◦ Assignment 1a, Assignment 1b (handed in no later than week4).

◦ Assignment 2a, Assignment 2b (handed in no later than week7).

Old exams with solutions: Examples of some old exams with solutions will be put on the course web-site.

Final Exam (Compulsary):

The final exam is written and will contain both problems and theory questions. The grades on the exam will be:

◦ **3:** 20-29 points
◦ **4:** 30-39 points
◦ **5:** 40-50 points

Examination dates: 2003-12-16, 8.45-13.45; 2004-04-13, 8.45-13.45, in V house; (examintion date in August will be decided later and onnounced by the departmeent), no aids allowed.

Weekly program:

(Chapters in parantheses will be covered "partially")

- **Week 1:** Chapters (5), 6 and (7)
- **Week 2:** Chapter 8
- **Week 3:** Chapter 9
- **Week 4:** Chapters 21 and (10)
- **Week 5:** Chapters (13), 14 and 15
- **Week 6:** Chapters 16 and 17
- **Week 7:** Chapters 18 and (19)

Suggestions for exercises

(Some of these exercises will be demonstrated)

The odd problems from **Övningsexemple i PDE1 TM**,

AND

Chapter 5: 5.11, 5.12, 5.17, 5.23, 5.27, 5.56

Chapter 6: 1: Give a varitional formulation of $-u'' + u = f$ in $(0,1)$, with $u(0) = u(1) = 0$.
2: Write a FEM-formulation with piecewise linear, continuous functions, and a uniform stepsize $h = 1/4$.
3: The same as above, but with piecewise quadratic functions.

Chapter 7: 7.3, 7.5, 7.24, 7.31 (prove in addition that there is exactly one minimum), 7.54

Chapter 8: 8.1, 8.3, 8.6, 8.7, 8.8, 8.11, 8.12, 8.15, 8.16, 8.18, 8.21, 8.22, 8.23, 8.32, 8.38, 8.41

Chapter 9: 9.4, 9.5, 9.7, 9.9, 9.10, 9.12, 9.13, 9.14, 9.19, 9.22, 9.23, 9.24, 9.26, 9.27, 9.28, 9.33, 9.43, 9.45, 9.46

Chapter 21: 21.1, 21.2, 21.3, 21.4, 21.5, 21.8, 21.9, 21.13

Chapter 14: 14.7, 14.10

Chapter 15: 15.5, 15.9, 15.11, 15.15, 15.20, 15.22, 15.24, 15.35, 15.39, 15.44, 15.45, 15.47

Chapter 16: 16.4, 16.7, 16.11, 16.14, 16.15, 16.18, 16.20

Chapter 17: 17.4, 17.8, 17.9, 17.10, 17.11, 17.13, 17.17, 17.18, 17.19, 17.20, 17.33

Chapter 18: 18.1, 18.3, 18.4, 18.5, 18.6, 18.9

- **I will emphasize one- and two-dimensional cases**
- **An example note-book, Övningsexemple i PDE1, TM** , consisting of problems from some previous exams and solutions to the odd problems; **Lösningar för udda uppgifter i PDE1, TM** in **Övningsexemple i PDE1, TM** , are now available in the course homepage.
- There will be a **course diary** on the web-site, describing the current process of lectures/ exercises.

M. Asadzadeh, 27 October 2003