Institut for Matematik og Datalogi
Syddansk Universitet

February 1, 2002
JFB

Discrete Mathematics with Applications – F02 – Lecture 1

Textbook

Kenneth H. Rosen, *Discrete Mathematics and Its Applications*, Fourth edition, McGraw-Hill, Inc., 1999.

Note that answers to the odd-numbered exercises can be found at the back of the book. In addition, some concepts used in the exercises are defined between exercises, so when a problem uses a concept or notation not defined in the text, you should look to see if it is defined a bit before the problem in some question.

Some topics which will be covered in the course are not adequately covered in the text. These are covered in the notes entitled "Noter til DM11" and can be bought in the bookstore. These notes and the textbook by Rosen are required. The bookstore also has a compendium of exams given in the DM11 course. These are relevant since there will be significant overlap in the topics covered. There are, unfortunately, no earlier exams from this course, since it has never been given before. Copies of the most recent exams from DM11 can be found on the course's Web page. Copies of the overheads used in DM11 in 1996 will be given out next week.

Format

The course will be taught by Joan Boyar and Klaus Meer. The lectures will probably be in English. There will be weekly assignments (which are not obligatory) which you should be prepared to discuss in the discussion section (examinatorier) the week after the problems are assigned. There will usually be more problems assigned than there is time to discuss them; the extra problems will give you extra training.

In general, lectures will be on Mondays and discussion sections on Wednesdays. In week 7, however, there will be a Maple lab in the terminal room on Monday, February 11, 10:15–12:00. There will be a lecture on Wednesday, February 13. The first set of problems will be discussed on Wednesday, February 6, and the second set on Wednesday, February 20.

There will also be some required assignments. Those assignments must be approved in order to take the written exam in June. Thus, they are formally considered an "exam", and you may not work with others on these assignments. More similarity than would occur by chance will be considered "eksamenssnyd".

The weekly notes and other information about the course is available through the WorldWideWeb. Use the URL:

http://www.imada.sdu.dk/~joan/discmath/index.html.

Please do not hesitate to contact Joan Boyar or Klaus Meer if you have questions concerning the course. Joan Boyar has office hours on Tuesdays and Fridays, 9:15–10:00. Klaus Meer's office hours will be announced later.

Lecture, February 4

We begin with an introduction to the course. Then, we will cover most of sections 1.1 through 1.5 in the textbook. Section 1.8 will not be covered in this course since it is covered in DM02 (but notice the Maple example with power sets).

Lecture, February 13

We will finish sections 1.1 through 1.7 of chapter 1 and begin on sections 3.1 through 3.3 of chapter 3. Sections 3.4 and 3.5 of chapter 3 will be skipped, since they are covered in other courses. (If you have not already seen this material, please read it.) The section of the notes, entitled "Structural Induction", will be covered in connection with chapter 3.

Laboratory 10:15–12:00 Monday, February 11, in the terminal room

The command to start up a Maple session is **xmaple**. The **Help** menu is in the upper righthand corner. From there, get the **New User's Tour**. Read sections 1, 2, and 4 of that (you can skip the part about spreadsheets). You should now be ready to define your own functions.

Try typing `?implies` to get help on boolean operators, including `implies`.

Now, define your own version of `implies` as a function `implies2`, which maps a pair of inputs, for example `(p,q)` to the result $p \to q$. (See Table 6 at the top of page 18 in the textbook.) Try your function on some pairs of boolean values, for example `implies2(false,false);`.

Use **help** to find out about **for** loops and **print** statements in Maple. Use nested **for** loops to check your function `implies2` on all four possible pairs of boolean inputs.

Use nested **for** loops to check a couple of the tautologies from the textbook. For example, you could determine whether or not the problems 12 and 13 on page 20 contain tautologies: $(\neg p \wedge (p \to q)) \to \neg q$ and $(\neg q \wedge (p \to q)) \to \neg p$.

Type `?powerset` to find out how to use the `powerset` function in Maple. Use it to experiment with sizes of power sets. Try different small values, such as 4, 6, 8, etc. When does it start taking a long time to compute and print them? You may need to use the **STOP** button in Maple. Do not try anything as large as 20.

Problems to be discussed on February 6

7.a, 8.b, 8.c, 10.b, 10.c, 26, and 28 from section 1.2.
35, 40 and 44 from section 1.3.
7, 14, 16, and 26 from section 1.4.