**Programme for the course Discrete Mathematics, SF2736, at KTH, fall 2010.**

**Teacher and examiner**:

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**Textbook**: N.L. Biggs: Discrete Mathematics (Second edition).

**Syllabus**: See the plan for the lectures on the next page.

**Examination**: A written examination will take place on December 13 at 14.00 to 19.00. The examination consists of ten problems divided into three parts. Part I consists of five problems, Part II consists of three problems. Part III consists of two problems that are of more complex nature than those of Part I and Part II. To pass the exam it is sufficient to solve the first five problems, but to get the highest grade it is necessary to further solve at least one of the problems of Part III, and all problems of Part II. The grades will be A, B, C, D and E for passing, and further Fx will imply a possibility to make a supplementary exam, shortly after the original exam, in order to get the grade E.

**Homework**: There will be five voluntary homeworks that have to be delivered by the students to the examiner at certain terms. Each correct homework will give one bonus point at the final exam and added to the points of part I in the exam

# Schedule for the lectures

| Day | | Content | Chapter |
|---|---|---|---|
| 26/10 | 1 | A diophantine equation and prime number factorization | 8 |
| 27/10 | 2 | Fundamental theorem of arithmetics, modular arithmetic | 8, 13.1 |
| 28/10 | 3 | $Z_n$ and the theorems of Euler and Fermat | 13.2-13.3 |
| 29/10 | 4 | Some applications: RSA and Chinese remainder theorem | |
| 1/11 | 5 | Problem session. | |
| 2/11 | 6 | Relations, equivalence relations and partial orders | 7.2 |
| 4/11 | 7 | Functions, pigeon hole principle, cardinality of infinite sets | 5, 6 |
| 5/11 | 8 | Problem session | |
| 8/11 | 9 | Combinatorics, multinomial coefficients | 10.1-10.2, 10.4-10.5 |
| 9/11 | 10 | Binomial theorem | 11.1-11.3 |
| 11/11 | 11 | Principle on inclusion exclusion, Möbius inversion formula | 10.3, 11.4-11.5 |
| 12/11 | 12 | Partitions and Stirling numbers | 12.1-12.3 |
| 16/11 | 13 | Problem session | |
| 17/11 | 14 | Groups, elementary facts and examples | 20.1-20.4 |
| 18/11 | 15 | Subgroups, cosets and the theorem of Lagrange | 20.5-20.8 |
| 19/11 | 16 | Permutations | 10.6, 12.4-12.6 |
| 22/11 | 17 | Problem session | |
| 23/11 | 18 | The lemma of Burnside and counting | 21.1-21.4 |
| 25/11 | 19 | Error correcting codes | 24.1-24.4 |
| 26/11 | 20 | Generating functions and partition of positive integers | 25.4, 26.1-26.5 |
| 29/11 | 21 | Problem session | |
| 30/11 | 22 | Graphs, Eulerian and Hamiltonian graphs, colourings | 15.1-15.7 |
| 1/12 | 23 | Planar graphs | |
| 3/12 | 24 | Bipartite graphs and matchings | 17.1-17.6 |
| 6/12 | 25 | The max-flow min-cut theorem | 18.1-18.4 |
| 9/12 | 26 | Problem session | |
| 10/12 | 27 | Repetition | |
| 13/12 | | Exam 14.00-19.00 | |