KTH Teknikvetenskap

SF2729 GROUPS AND RINGS
COURSE PM
2012-2013

1. Course Plan

1.1. **Goals.** After the course, the student shall be able to pursue abstract reasoning concerning algebraic structures. The student shall be trained in logical thinking and in constructions of mathematical proofs. Algebraic structures appear in many disciplines within Science and Technology. The student shall be able to recognize and use such structures in his or her forthcoming work. Concretely, this means that the student shall be able to:

- Identify and describe fundamental algebraic structures such as groups, rings, and fields;
- Identify algebraic substructures such as subgroups, subrings, and ideals;
- Identify and describe relations between algebraic structures, such as homomorphisms and group actions;
- Define and use bijective functions between algebraic structures, with special attention to permutations;
- Use classical results in basic group theory and ring theory, such as Lagrange's theorem or Cauchy's theorem, to describe the structure of a group or a ring;
- Explain relations using mathematical proofs and logical reasoning;
- Formulate certain practical problems by means of algebraic structures.

1.2. **Content.** Groups, permutations, homomorphisms, group actions, rings, ideals, fields, vector spaces, and field extensions.

1.3. **Eligibility.** SF1604 Linear algebra or a corresponding course is required.

1.4. **Examination.** One written exam and one homework assignment for each lecture. [1] Grade scale A, B, C, D, E, Fx, F.

1.5. **Literature.** *A First Course in Abstract Algebra, 7th Edition* by John B. Fraleigh.

[1] Details about this in Section 3.

2. ACTIVITIES

The course is running for the whole semester with one lecture and one exercise session every week. During the lectures we will discuss the theoretical material and examples and the exercise sessions will be used for problem solving. Apart from this, it is important that the students take the time to study the material on their own and to practise problem solving.

3. EXAMINATION

3.1. **Homework assignments and final exam.** The course consists of two parts; the first on groups, the second on rings. Each part consists of seven lectures and seven exercise sessions. There will be a homework assignment corresponding to each lecture; each homework has value pass or fail.

The final exam consists of six problems, each of which can give up to 6 credits. The score from which the grade will be decided will be the better of the exam and a weighted average of the exam and the homeworks, where the exam is given weight 70% and homework 30%.

In short, score = $\lceil 36 \cdot \max(x/36, 0.7 \cdot x/36 + 0.3 \cdot h/14) \rceil$, where x is the score on the exam and h the number of homeworks with grade pass.

In order to pass the exam, a minimum of 18 credits is required. The grade Fx will be given for 16 or 17 credits. It can be upgraded to E by fulfilling an additional requirement, e.g., passing an oral exam.

The minimum requirements for the various grades are according to the following table:

Grade	**A**	**B**	**C**	**D**	**E**
Total credit	30	27	24	21	18

3.2. **Reexamination.** There will be a possiblility to retake the final exam. Information about the date and location will be available before the end of the course. The deadline for registration for this exam will be two weeks before the exam.

3.3. **Allowed aids.** No aids are allowed during the final exam. The homework assignments should be made by the student her- or himself. No copying from other students or from other sources is allowed. Collaborations should be clearly stated.

3.4. **Rules for exams and homework assignments.** In all examination the KTH rules for examination apply (cf. www.kth.se).

3.5. **Written presentation.** In the grading of all written examination, including the written exam and the homework assignments, the level of the presentation of the written solutions will determine part of the grade. This holds in particular for explanatory text.

4. ADMINISTRATION

4.1. **Contact information.** The following teachers and administrative personnel are involved in the course:

	Name	**email**	**telephone**
Lecturer	Martin Blomgren	blomgr@kth.se	
Lecturer and Examiner	Tilman Bauer	bauer.tilman@googlemail.com	
Exercise Session Teacher	Afshin Goodarzi	afshingo@math.kth.se	08-790 66 85
Course Secretary	Rose-Marie Jansson	jansson@math.kth.se	08-790 72 01

Observe that the course secretary only deals with questions regarding registration and reporting of results.

4.2. **Course web page.** On the web page of the course, all relevant information about the course will be found.

URL. http://www.math.kth.se/math/GRU/2012.2013/SF2729

5. TIME BUDGET

The course corresponds to a workload of 7.5 ECTS credits, which means 10 hours a week during the whole semester. In total, about 160 hours. We have lectures and exercise sessions using 60 of these hours, leaving 100 hours for studies.