

**SABANCI UNIVERSITY, Fall 2021**  
**MATH 561 - Algebraic Combinatorics**

**Lecturer:** Kağan Kurşungöz  
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**Office:** FENS 2010  
**Office Hours:** just find me.

**Class Hours:** M 15:40 - 16:30, FENS L 027  
T 12:40 - 14:30, FENS L 035.  
Zoom links to lectures are announced on SUCourse.

**Textbooks:**  
primary: Bruce E. Sagan, "The Symmetric Group", Springer,  
secondary: William Fulton, "Young Tableaux", LMS.

**Learning outcomes:** Upon completion of the course, student should be able to

- 1 - Construct irreducible, hence all, representations of abelian groups and the symmetric group over the complex numbers.
- 2 - Calculate the character table for all abelian groups and the symmetric group.
- 3 - Apply some important combinatorial algorithms such as RSK, Viennot's construction, jeu-de-taquin on permutations or pairs of Young tableaux.

**Topics:** I will assume familiarity with undergraduate algebra.  
(as time allows: )

- 1 - Matrix representations, G-modules.
- 2 - Complete reducibility and Maschke's theorem,
- 3 - Group characters,
- 4 - Restricted and induced representations,
- 5 - Basics of Young tableaux,
- 6 - Representations of the symmetric group,
- 7 - RSK, Viennot's construction, jeu-de-taquin,
- 8 - Basics of symmetric functions.

**Grading:** Your grade exclusively depends on the homework assignments.

Active participation in class will be expected and assessed, in the form of answering questions; or better, *asking* questions.

I may request one-on-one meetings to talk about your assignments, as well.

**Homeworks:** These will be assigned question by question in the lectures. They are due before the following Monday's class, to be uploaded on SUCourse+. Late assignments may be accepted with a penalty, or may not be accepted at all.

Once again, the students are responsible to follow the assignments and announcements both in class, and on SUCourse+.

**Academic Integrity:** All university policies on academic integrity apply to our course (more information on <https://www.sabanciuniv.edu/en/academic-integrity-statement>), and they will be enforced.