

# Math 342 - Term 1, Fall 2024

## Algebra and Coding Theory

**Instructor:** Kalle Karu  
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**Lectures:** TuTh 12:30-2, BUCH A103.

**Textbook (optional):** *A First Course in Coding Theory* by R. Hill.

**Web site:** The Canvas course page will have more detailed information.

**Course description.** Math 342 is not about computer programming or writing computer code. Coding theory here means the theory of error correcting codes. This is the science of how to send data so that errors of transmission can be detected and corrected. We will use abstract algebra to construct and study good error correcting codes. It is a remarkable fact that highly abstract subjects such as algebra, number theory, algebraic geometry, which appear completely useless for real life problems, all have applications in coding theory.

A short list of topics: Error-correcting codes via abstract and linear algebra. Emphasis on proofs and computation. Finite fields, Hamming distance and error-correction, upper and lower bounds on the size of a code, linear codes, groups and cosets, encoding and decoding schemes.

**Homework.** We will have a homework roughly every week. Homeworks are posted on Canvas and you have to upload your solutions also to Canvas.

**Exams.** We will have two midterm exams on Tuesdays, Oct. 15 and Nov. 19, during regular class hours. The final will be a 2½-hour exam scheduled by the university.

**Final Grade.** Your final grade will be based on your performance on homework (15%), midterms (35%) and final exam (50%).

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