Fourier series and the discrete Fourier transform.
Lecturer - Valeriy Serov.

This course provides a self-contained treatment of classical one-dimensional Fourier series at the beginning graduate level. It is assumed that the reader is familiar with the rudiments of Riemann-Stieltjes integrals on the real line and with complex analysis of one complex variable. The approach which is used in the course is mostly classical and concrete, preferring explicit calculations to existential arguments. All very well-known result of one-dimensional Fourier series and Fourier transform (Riemann-Lebesgue, Riesz - Fischer, Dirichlet-Jordan, Zigmund, Bernstein, Peetre, Whittaker-Shannon-Kotel'nikov and some others) are proved in this course. All functional spaces (Lebesgue, Hölder, Sobolev, Besov, Nikol'skii) are introduced by special manner in the course and they are used in the proofs of main results. There are numerous examples and exercises.

On successful completion of this course, the student will be able to

- calculate the Fourier coefficients of a given integrable function
- check the conditions which guarantee point wise convergence of Fourier series
- check the conditions which guarantee absolute convergence of Fourier series
- calculate the discrete Fourier transform of a given function

There is lecture notes for the course in English which is prepared by the lecturer and it is partly based on the books:

CONTENTS

1. Preliminaries.
2. Formulation of Fourier series.
3. Fourier coefficients and their properties.
8. Besov and Hölder spaces.
11. Formulation of discrete Fourier transform and its properties.
12. Connection between discrete Fourier transform and Fourier transform.
13. Some applications of discrete Fourier transform.