

Course title: Coding and information theory

Course code	Course status	Semester	Number of ECTS credits	Lecture hours
131105032	Mandatory	V	4.5	3+0+1

Study program:

Basic academic studies, ELECTRICAL ENGINEERING, study program: Electronics, Telecommunications and Computer engineering (studies last for 6 semesters, 180 ECTS credits).

Prerequisites:

No prerequisites required.

Course aims:

Introduction to theoretical basics of an information theory, its practical use, as well as to basic types of codes, basic tools for creating codes and procedures in coding and decoding.

Teacher(s) and assistant(s) first and last names:

Ph.D. Igor Đurović and Ph.D. Ljubiša Stanković - teachers
M.Sc. Đuro Stojanović – assistant

Teaching method:

Lectures (which include exercises), home exercises, consultations and mini-project.

Course synopsis:

Preliminary weeks	Preparation and semester enrolment.
I week	Overview of probability theory elements needed during course.
II week	Information transfer channel model. Memoryless and source models with memory.
III week	Entropy, conditional entropy, joint entropy, mutual information.
IV week	Lossless data compression possibility. Asymptotic equipartition property.
V week	Basic codes for lossless data compression: Gray, RLE, differential, Huffman, LZ and arithmetic code.
VI week	First test
VII week	Free week
VIII week	Channel model. Shannon's theorem and possibility for an error correction.
IX week	Intuitive introduction of codes with an error detection and correction: ASCII code, rectangular code, triangular code, Hamming code.
X week	Hamming distance. Coding and decoding in matrix form. Syndrome.
XI week	Coding and decoding based on the prime polynomials. Elements of the arithmetic code theory.
XII week	Second test
XIII week	Summary of taught lessons. Basic elements of the field and group theory.
XIV week	BCH coding and decoding.
XV week	Some advanced coding techniques (Reed-Solomon, Reed Muller, non-binary codes, convolution and turbo codes). Mini-project defence.
XVI week	Final exam
Final week	Administrative procedures.
XVIII-XXI week	Additional lessons, correction of the final exam and administrative procedures.

STUDENT WORKLOAD

per week	per semester
Working hours: 4.5 credits x 40/30 = 6 hours	Teaching and the final exam: (6 hours) x 16 = 96 hours
Working hours structure: 3 hours for teaching 1 hour for exercises (consultations regarding mini-project and home exercises commenting) 2 hours for individual work, including consultations and home exercises.	Necessary preparation (before semester): 2 x (6 hours) = 12 hours Total work hours for the course: 4.5 x 30 hours = 135 hours Additional hours for preparing correction of the final exam, including the exam taking: up to 27 hours. Work hours structure: 96 hours (lectures) + 12 hours (preparation) + 27 hours (additional work)

Lessons attendance is mandatory for students, as well as doing home exercises, mini-project and both tests.

Literature: Basic:

D. B. Drajić: "Uvod u teoriju informacija i kodovanje," Akademska misao, Beograd.

Additional:

V. Sinković: "Informacija, simbolika i semantika," Školska knjiga, Zagreb.
I. Đurović: Handout.

The forms of knowledge testing and grading:

- Home exercises carry 5x1 points.
- Each test carries 20 points (40 points total).
- Mini-project carries 20 points.
- Final exam carries 35 points.

Student gets the passing grade by collecting 51 points at least.

Special remarks for the course: The teaching is organized for student groups with 60 students maximum, and laboratory exercises for groups with 5 students maximum. If needed, the course can also be taught in English.

Teacher(s) who provided the information: Ph.D. Igor Đurović

Remark: www.etfprog.cg.ac.yu and igordi@cg.ac.yu