UCLouvain

lingi2348

2018

Information theory and coding

5 credits	30.0 h + 15.0 h	Q2

Teacher(s)	De Vleeschouwer Christophe (compensates Macq Benoît) ;Louveaux Jérôme ;Macq Benoît ;Pereira Olivier ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	• Information representation: decorrelation coding and entropic coding. • Information security: cryptographic coding. • Information correction: channel coding theory and error-correcting codes.
Aims	Given the learning outcomes of the "Master in Computer Science and Engineering" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: • INFO1.1-3 • INFO2.2 • INFO5.2 • INFO6.4 Given the learning outcomes of the "Master [120] in Computer Science" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: 1 • SINF1.M1 • SINF2.2 • SINF5.2 • SINF6.4 Students completing this course successfully will be able to • explain the notions, methods and results that are used in the analysis and design of information representation, protection and correction systems. • present not only general results that determine the possibilities offered by information theory, but also effective compression, security and correction methods. • provide some design tools for multimedia (image, sound, data) information coding. - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	Written examination covering both theory and exercises.
Teaching methods	The course consists of magistral courses as well as exercice sessions to explore the different aspects of the theory.
Content	• Basic notions in information theory; mutual information and entropy. • Discrete source coding by fixed length-codes and variable-length codes. • Decorrelation coding and coding gain notions. • Basic notions in cryptology; secret-key and public-key cryptographic coding systems. • Discrete memoryless channel; capacity notion; noisy channel coding theorem. • General block coding theory; role of the minimum distance. • Linear codes: generator matrix and parity-check matrix; syndrome decoding. • Study of certain classes of linear block codes: cyclic codes and Reed-Solomon codes. • Introduction to convolution codes.
Inline resources	Moodle https://moodleucl.uclouvain.be/course/view.php?id=5483
Bibliography	• R.G. Gallager, "Information Theory and Reliable Communication" , John Wiley, 1968. • F.J. MacWilliams and N.J.A. Sloane, "The Theory of Error-Correcting Codes" , North-Holland, 1977.
Other infos	Background: • LFSAB1402 : solid basic knowledge in computer science • LFSAB1103 : solid basic knowledge in mathematics

Faculty or entity in charge	INFO

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Data Science Engineering	DATE2M	5		
Master [120] in Computer Science and Engineering	INFO2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Computer Science	SINF2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		
Master [120] in data Science: Information technology	DATI2M	5		