






5.00 credits

30.0 h + 15.0 h

Q2

Teacher(s)	Louveaux Jérôme ;Macq Benoît ;Pereira Olivier ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> <li>• Information representation: decorrelation coding and entropic coding.</li> <li>• Information security: cryptographic coding.</li> <li>• Information correction: channel coding theory and error-correcting codes.</li> </ul>
Learning outcomes	<p><b>At the end of this learning unit, the student is able to :</b></p> <p>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:</p> <ul style="list-style-type: none"> <li>• INFO1.1-3</li> <li>• INFO2.2</li> <li>• INFO5.2</li> <li>• INFO6.4</li> </ul> <p>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:</p> <p>1</p> <ul style="list-style-type: none"> <li>• SINF1.M1</li> <li>• SINF2.2</li> <li>• SINF5.2</li> <li>• SINF6.4</li> </ul> <p>Students completing this course successfully will be able to</p> <ul style="list-style-type: none"> <li>• explain the notions, methods and results that are used in the analysis and design of information representation, protection and correction systems.</li> <li>• present not only general results that determine the possibilities offered by information theory, but also effective compression, security and correction methods.</li> <li>• provide some design tools for multimedia (image, sound, data) information coding.</li> </ul>
Evaluation methods	Written examination covering both theory and exercises. The exam may be divided into a closed-book part and an open-book part.
Teaching methods	The course consists of magistral courses as well as exercise sessions to explore the different aspects of the theory.
Content	<ul style="list-style-type: none"> <li>• Basic notions in information theory; mutual information and entropy.</li> <li>• Discrete source coding by fixed length-codes and variable-length codes.</li> <li>• Decorrelation coding and coding gain notions.</li> <li>• Basic notions in cryptology; secret-key and public-key cryptographic coding systems.</li> <li>• Discrete memoryless channel; capacity notion; noisy channel coding theorem.</li> <li>• General block coding theory; role of the minimum distance.</li> <li>• Linear codes: generator matrix and parity-check matrix; syndrome decoding.</li> <li>• Study of certain classes of linear block codes: cyclic codes and Reed-Solomon codes.</li> <li>• Introduction to convolution codes.</li> </ul>
Inline resources	Moodle <a href="https://moodleucl.uclouvain.be/course/view.php?id=5483">https://moodleucl.uclouvain.be/course/view.php?id=5483</a>
Bibliography	<ul style="list-style-type: none"> <li>• R.G. Gallager, "Information Theory and Reliable Communication", John Wiley, 1968.</li> <li>• F.J. MacWilliams and N.J.A. Sloane, "The Theory of Error-Correcting Codes", North-Holland, 1977.</li> </ul>
Other infos	Background: <ul style="list-style-type: none"> <li>• LEPL1106: solid basic knowledge in mathematics, signals and systems</li> </ul>

Faculty or entity in charge	INFO
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Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Electrical Engineering	<a href="#">ELEC2M</a>	5		
Master [120] in Computer Science and Engineering	<a href="#">INFO2M</a>	5		
Master [120] in Computer Science	<a href="#">SINF2M</a>	5		
Master [120] in Mathematical Engineering	<a href="#">MAP2M</a>	5		
Master [120] in Data Science Engineering	<a href="#">DATE2M</a>	5		
Master [120] in Data Science: Information Technology	<a href="#">DATI2M</a>	5		