Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
INF315	Discrete Mathematics	5	3	0	0	3	4

Prerequisites	
Admission Requirements	
Language of Instruction	French
Course Type	Compulsory
Course Level	Bachelor Degree
Objective	Error correcting codes play a fundamental role in data transfer or data storage problems. A solid arithmetic infrastructure is needed to be able to assimilate the functioning of these codes and, later, modern encryption systems. In fields such as physics, biology and game theory, complex and evolutionary events under the assumption of stochasticity can be modeled with a matrix. Analysis of this matrix reveals the behavior of the system and, in particular, the state to which it will converge. The aim of this course is to provide students with the necessary arithmetic and information theory background to examine the above-mentioned systems in general; It can be summarized as explaining system modeling through topics such as error correction codes and Markov chains.
Content	1. Arithmetic: Extended Euclidean algorithm and finding GCD of 2 integers 2. Arithmetic: Solution of Diophantine equations and congruence systems 3. Arithmetic: Convergence speed of Euclidean algorithm 4. Error correction codes: Presentation and first examples 5. Error correction codes: Hamming distance, number of detected and corrected errors 6. Error correcting codes: Generator matrices of linear codes 7. Error correction codes: Control matrices of linear codes and error correction via syndrome 8th Midterm Exam 9. Circular codes: Presentation and first examples 10.Cyclic codes: Generating polynomials of cyclic codes 11. Markov chains: Introduction and first examples 12. Markov chains: Transition matrix and transition diagram of a Markov chain 13. Markov chains: Convergence theorem of transition matrices 14. Markov chains: Search and interpretation of boundary configurations
References	

Theory Topics

Week	Weekly Contents
1	1. Arithmetic: Extended Euclidean algorithm and finding GCD of 2 integers
2	2. Arithmetic: Solution of Diophantine equations and congruence systems
3	3. Arithmetic: Convergence speed of Euclidean algorithm
4	4. Error correction codes: Presentation and first examples
5	5. Error correction codes: Hamming distance, number of detected and corrected errors
6	6. Error correcting codes: Generator matrices of linear codes
7	7. Error correction codes: Control matrices of linear codes and error correction via syndrome
8	Mid term exam
9	9. Circular codes: Presentation and first examples
10	10.Cyclic codes: Generating polynomials of cyclic codes
11	11. Markov chains: Introduction and first examples
12	12. Markov chains: Transition matrix and transition diagram of a Markov chain
13	13. Markov chains: Convergence theorem of transition matrices
14	14. Markov chains: Search and interpretation of boundary configurations