	UE-COM3: Advanced Coding	Semester 1
Contributes to	M2 MICAS	

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Volume:	30h	**3 ects**
Hours:	Lectures: 19.5h, Exercises: 9h	
Assessment:	Final Exam	
Language:	English	

Objectives:
The course provides the state-of-the-art of modern coding theory, along with the corresponding iterative decoding algorithms and an overview of applications in engineering.

Outcomes:
On completion of the course students should be able to:
- Construct a modern (turbo/LDPC/polar) code
- Design a probabilistic decoding algorithm adapted to any modern code construction
- Assess the performances of a modern code for a selected application

Prerequisites
- Introduction to Probability and Statistics
- Introduction to Information Theory
- Introduction to Communication Theory

Syllabus
- Turbo codes:
  - encoding using code concatenation
  - iterative (turbo) decoding
  - code design and performance analysis
- Low-density parity-check (LDPC) codes:
  - construction using sparse graphs
  - iterative decoding
  - code design and performance analysis
- Polar codes:
  - information theory origin
  - code construction
  - efficient decoding algorithms
- Coding theory for selected applications:
  - storage
  - cryptography
  - codes in standards

Bibliography:

- C. Heegard and S.B. Wicker, "Turbo coding", Kluwer Academic Publishing, 1999.
- B. Vucetic, "Turbo codes : principles and applications", Kluwer Academic Publishing, 2000.
- T. Richardson and R. Urbanke, "Modern coding theory", Cambridge University Press, 2008.