

Module Name	Advanced Topics of Information Theory
Module Number	Eul-ET-E-AInfT, Eul-IST-E-AInfT
Responsible Lecturer	Prof. Dr.-Ing. Rafael F. Schaefer rafael.schaefer@tu-dresden.de
Qualification Objectives	After completing the module, students are familiar with and understand advanced information-theoretic models, tools, and results. They are able to independently apply these to practical problems in communications engineering, particularly in the design and analysis of modern and future communication systems. Furthermore, they can evaluate these systems with respect to their fundamental limits, are familiar with the state of the art, and are aware of open and current research questions in information theory.
Contents	The module covers advanced information-theoretic models, concepts, and methods as a foundation for the design, analysis, and evaluation of efficient, reliable, and secure communication systems. Topics include: - Generalized transmission models for realistic representation of practical system properties, e.g., for value- and/or time-continuous and memory-dependent signal transmission, and the necessary generalization of information-theoretic metrics and tools. - Information-theoretic models for advanced communication scenarios, e.g., with multiple participants and in networks. - Extended communication requirements, e.g., considering not only reliability criteria but also security, energy efficiency, or sensor aspects. - Non-asymptotic information-theoretic analyses for communication applications with strict latency constraints. - Non-classical communication approaches, e.g., in the context of identification and quantum communication.
Teaching and Learning Forms	2 hours per week of lectures, 2 hours per week of exercises, and self-study. The language of instruction for lectures and exercises may be German or English and will be determined by the lecturer at the beginning of the semester and announced accordingly.
Prerequisites for Participation	The competencies acquired in the module "Information Theory" are required.
Usability	The module is an elective module in the elective area "Competence Deepening" according to § 6 paragraph 3 of the study regulations and § 33 paragraph 4 of the examination regulations for the main study program in the field of Information Technology in the diploma program Electrical Engineering. Furthermore, it is an elective module in the elective area "Competence Deepening" according to § 6 paragraph 3 of the study regulations and § 33 paragraph 3 of the examination regulations for the main study program in the field of Communications Engineering in the diploma program Information Systems Engineering. The module creates the prerequisites for the modules that list it under "Prerequisites for Participation."
Prerequisites for the Award of Credit Points	Credit points are awarded when the module examination is passed. The module examination consists of a written exam lasting 120 minutes.
Credit Points and Grades	5 credit points can be earned through the module. The module grade corresponds to the grade of the examination performance.
Frequency of the Module	The module is offered every winter semester.
Workload	The total workload is 150 hours.

Duration of the Module	The module lasts one semester.
-------------------------------	--------------------------------