

Module Name	Information Theory
Module Number	Eul-ET-C-InfTh, Eul-IST-E-InfTh
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 fundamental problems, models, tools, and results of Shannon's Information Theory. They are acquainted with the essential principles of optimal data compression and the maximum achievable data rates for efficient and reliable data transmission, as well as their derivations. Students know the information measures and information-theoretic parameters required for analytical considerations, their properties, and operational significance, and can confidently apply them to problems in communication engineering.
Contents	The module covers the fundamentals of Shannon's Information Theory in the areas of source and channel coding. This includes abstract stochastic data and transmission models, the mathematical analysis of information measures such as entropy and mutual information and their interpretation in communication engineering, the information-theoretic analysis of time- and value-discrete memoryless models as well as their extensions to simple memory-based data and value-continuous transmission models, the conception of loss and reliability parameters, the derivation of theoretical limits for efficient data compression and maximum achievable data compression rates in the form of source coding theorems, the derivation of theoretical limits for efficient and reliable coded data transmission and maximum achievable data transmission rates in the form of channel coding theorems, and finally the development of criteria for optimal design and performance evaluation of communication systems.
Teaching and Learning Forms	2 hours per week of lectures, 2 hours per week of exercises, and self-study.
Prerequisites for Participation	Knowledge of probability theory is required, which can be acquired in the module Partial Differential Equations and Probability Theory.
Usability	The module is a compulsory module in the main study program of the field of Information Technology in the diploma program Electrical Engineering. Furthermore, it is an elective module in the elective area "Orientation" according to § 6 paragraph 3 SO and § 33 paragraph 3 PO of the main study program in the diploma program Information Systems Engineering. It creates the prerequisites for the modules that list this module in the field "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 summer semester.
Workload	The total workload is 150 hours.
Duration of the Module	The module lasts one semester.