

Data field	Explanation
Module number	WP01
German title / English title	Digitale Funkssysteme / Digital Radio Systems
Credits	5 ECTS
Workload	68 Contact hours (4 SWS Ü), 82 Hours of independent study
Subject coverage	Subject-Specific Specialization
Learning outcomes	Students understand the behavior of the mobile radio channel in LOS and NLOS multipath environments, as well as the most important transmission techniques used in modern spectrally efficient digital radio systems. They know how these techniques are applied to modern radio standards as i. e. LTE, WLAN and broadcast systems. Moreover, they have advanced practical experience in simulating and experimentally investigating digital radio systems.
Requirements	none
Level	1./2. Semester
Type of module	Seminar, Laboratory Training
Status	Required-Elective Module
Semesters when offered	Every semester
Method of assessment / Type of examination	The method of assessment / type of examination must be defined by the lecturer within the deadline determined in §19 (2) RSPO. Should the deadline pass without determination of the form of assessment in the module, the following method of assessment / type of examination applies: 50% Written examination, 50% Written laboratory report of the laboratory group with consultation
Grade assessment	See study and examination regulations
Equivalent modules	Modules with similar content
Content	<ul style="list-style-type: none"> • Introduction to digital radio systems and networks • Typical functional blocks of a digital radio system, mathematical system description for SISO case • Compendium of fundamental propagation effects in mobile radio channels • Description of the mobile radio channel in multipath environments for NLOS (Rayleigh fading) and LOS/NLOS (Rician fading) case • Radio channel characterization by power delay profile, delay spread, coherence bandwidth, Doppler spread and coherence time • Multiple Antenna Systems: mathematical fundamentals (matrix algebra, eigenvalues, SVD), system configurations, system description for MIMO case, diversity processing, spatial multiplexing, MIMO capacity • Digital radio systems based on OFDM/OFDMA and SC-FDMA • Application of before-mentioned techniques to modern radio standards i. e. LTE, WLAN and broadcast systems • System simulations investigating the mobile radio channel • Lab projects dealing with advanced SDR-based experimentation of i. e. high-order-QAM-, OFDM- or MIMO-transmission • Projects dealing with theoretical research of detailed aspects of cutting-edge radio standards as i. e. LTE-A and 5G
Reading list	Cox: Introduction to LTE, Wiley Dahlman: 4G LTE / LTE-Advanced for Mobile Broadband, Academic Press Kammeyer: Nachrichtenübertragung, Vieweg Nuszkowski: Digitale Signalübertragung im Mobilfunk
Further information	Language employed in the module: English
Required Room type	Ü-Sem, Ü-Lab