Course Syllabus:

Computer Engineering MA, Wireless Communication, 6 credits

General data

Code	DT061A
Subject/Main field	Computer Engineering
Cycle	Second cycle
Orientation (name)	
Credits	6.0
Progressive specialisation	A1N , Second cycle, has only first-cycle course/s as entry requirements
Answerable institution	Information Systems and Technology
Adapted	2019-04-01
Established	2019-04-29
Date of change	2020-06-01
Valid from	2020-07-01

Aim

The course provides basic knowledge about problems and methods for construction of radio communication systems. The main emphasis is on digital radio systems. In particular it is illustrated how different forms of signal processing is used for the construction of efficient radio communication systems.

Course objectives

After completion of the course, students should
- Perform link budget calculations in connection to the design of wireless communication links.
- Identify and describe various physical and statistical fading channel models.
- Present modulation techniques for wireless communication and their spectral properties as well as evaluate their performance over fading channels.
- Give an account for coding techniques, which can be used for improvement of the transmission reliability.
- Describe and solve problems about direct sequence and frequency hopping band spreading techniques.
- Analyse and describe properties for various diversity methods,
- Present and use the basic principles for design and analysis of wireless cellular systems.
- Give an account and solve problems about ARQ and some basic multiple access techniques.

Content

- Basics about radio communication systems: utilization of the frequency spectrum, various radio systems.
- System oriented antenna and wave propagation theory: propagation in free space, in the troposphere, in the ionosphere, basic antenna theory, link budget.
- Probabilistic channel models: fading models, time and frequency dispersive channels, and digital channel models.
- Modulation methods for the radio channel: bit-error analysis in fading channels, spectral properties, spectral efficient modulation, OFDM.
- Diversity methods: principles, weighting, performance.
- Coding for radio channels: methods for burst error correction, coding gain.
- Spread spectrum techniques: frequency hopping, direct sequence systems.
- Wireless packet transmission: ARQ, multiple access techniques, reuse capacity calculations.
- Wireless cellular systems: basic concepts, frequency reuse, capacity calculations
- Practical examples: 3G, 4G, 5G and WLAN.

Entry requirements

Computer engineering, 40 credits, including programming 10 credits and a course in probability and random processes or signal theory. Mathematics, 25 credits, including statistics, linear algebra, and advanced calculus.

Selection rules and procedures

The selection process is in accordance with the Higher Education Ordinance and the local order of admission.

Teaching form

Teaching consists of lectures, exercise sessions, and labs.

The course can also be given as a self-study course.

Examination form

L101:   Laboration , 1,0 hp

Grading: Fail (U) or Pass (G)

T101:   Written exam , 5,0 hp

Grading: Seven-grade scale, A, B, C, D, E, Fx and F. Fx and F represent fail levels.

Grading criteria for the subject can be found at www.miun.se/gradingcriteria.

The examiner has the right to offer alternative examination arrangements to students who have been granted the right to special support by Mid Sweden University's disabilities adviser.

If examination on campus cannot be conducted according to decision by the vice-chancellor, or whom he delegated the right to, the following applies: Written Exam T101, will be replaced with two parts, online examination and follow-up. Within three weeks of the online examination, a selection of students will be contacted and asked questions regarding the examination. The follow-up consists of questions concerning the execution of the on-line exam and the answers that the student have submitted.

Grading system

Seven-grade scale, A, B, C, D, E, Fx and F. Fx and F represent fail levels.

Course reading