The University Of Sheffield.

EEE6431 BROADBAND WIRELESS TECHNIQUES

Credits: 15

Course Description including Aims

This module will give an understanding of the most up to date communication techniques used in the design and operation of broadband wireless systems based on OFDM technology such as WiFi, WiMAX and LTE. The module will explore the physical (PHY) layer, medium access control (MAC) and radio resource management functionalities of broadband wireless systems. The outline syllabus will include an introduction to broadband wireless systems; the principles of OFDM, OFDMA and TDD/FDD multiple access; bit interleaved convolutional and turbo channel coding/decoding for OFDM systems; adaptive coding and modulation; frequency selective fading, channel estimation and equalisation; MIMO techniques; and network architectures.

Outline Syllabus

1. Broadband wireless systems concepts;
2. OFDM, OFDMA and TDD/FDD multiple access;
3. FEC coding, modulation and rate adaptation in OFDM/A;
4. Frequency selective fading, channel estimation and equalisation;
5. MIMO techniques;
6. Broadband wireless network standards (LTE or WiFi).

Learning Outcomes

By the end of the module, a student will be able to demonstrate the ability to:

1. Appreciate how broadband wireless systems operate (US1, US1m, US2, US2m, US3, US3m, E1, E1m, E2, E3m, E4);
2. Understand how OFDM techniques are used in broadband wireless systems (US1, US1m, US2, US2m, US3, US3m, E1, E1m, E2, E2m, E3, E3m, E4);
3. Analyze how frequency selective fading due to multipath propagation impairs system performance (US1, US1m, US2, US2m, US3, US3m, E1, E1m, E2, E2m, E3, E3m, E4);
4. Design FEC coding and channel equalisation schemes to mitigate frequency selective fading (US1, US1m, US2, US2m, US3, US3m, E1, E1m, E2, E2m, E3, E3m, E4);
5. Understand how spectrally efficient wireless transmission is achieved using high order modulation and MIMO techniques (US1, US1m, US2, US2m, US3, US3m, E1, E1m, E2, E2m, E3, E3m, E4);
6. Appreciate current broadband wireless systems, standards and deployment practices (US1, US1m, US2, US2m, US3, US3m, E1, E1m, E2, E2m, E3, E3m, E4, D1, S1, P6)

Time Allocation

24 lectures, 6 problem solving classes and 38 hours of coursework exercises.

Recommended Previous Knowledge

UG level 3 (or equivalent) understanding of basic electronic and electrical engineering, digital communications theory, signal processing, MATLAB programming and/or applied mathematics.

Recommended Books

Title: Wireless Communications
Author: Andrea Goldsmith
Edition: 1
Publisher: Cambridge University Press

Assessment

Two hour examination.
Essay/Coursework.