HUT
Department of Electrical and Communications Engineering
Communications Laboratory

S-72.3230 Radio Transmission and Network Access

Lectures autumn 2005

Sven-Gustav Häggman

Course status

Old degree structure

This course did not exist in the old degree structure.

Corresponding material included in several courses

New degree structure:

Compulsory course in the Master's degree program major subject in the option Radio Communication Systems of the major subject Radio Communications

Course targets

The course gives

- basic knowledge about the structure and functionalities of a radio transceiver
- knowledge about source and channel coding methods and their impact on transceiver performance
- knowledge about modulation methods used in the radio link, modulator/demodulator structures and optimum receiver performance in the AWGN-channel and in the multipath fading channel
- principles of channel equalization and diversity methods and their impact on transceiver performance
- characteristics of multiple access methods in both circuit switched and packet switched radio transmission

Prerequisites

The course S-72.2245 Transmission Methods in Telecommunication Systems or corresponding is assumed.

Teachers

- Professor Sven-Gustav Häggman is the responsible teacher and lecturer of this course.
- Mika Nupponen is the web-master
- Information about the course will be found on the web-address www.comlab.hut.fi/opetus/3230/.

Lectures and exercises

Lectured every academic year in Period II

Lectures starting on November 1 are held on

Tuesdays 12 – 14 in Auditorium SE111

Fridays 12 – 16 in Auditorium SE110.

Exercises (totally 10 h) starting on November 10 are held according to the lecture plan

There are 10 home-works, which will be checked and graded and they will give bonus to the final course grade.

Requirements

- The course is carried out with an exam and home assignments.
- The exam requirements consist of the material distributed to the students.
- The exam is an open-book exam with six tasks of which the five best answers are considered for the exam grade.
- The tasks will be available in English and Finnish.
- The first exam is on December 20, 2005.
- Information about the following exams will be shown on the Departments web-pages.
- Calculators are allowed and their use is highly recommendable. Otherwise the general exam rules in HUT are followed.

Final grade

The final course grade is the nearest integer to the exam grade + 0.2×assignment grade

Literature

- Lecture handouts distributed by Edita Oy. Following textbooks can provide background material:
- S. Haykin, M. Moher: Modern Wireless Communications, Prentice Hall 2004, 560p.
- A.B. Carlson, P.B. Crilly, J.C. Rutledge: Communications systems. An introduction to signals and noise in electrical communication. 4th ed. Mc Graw-Hill 2002, 850p.
- S. Haykin: Communication systems. 3rd ed. Wiley 1994, 872p.
- J.G. Proakis: Digital Communications, 4th ed. Mc Graw-Hill, 2001, 1002p.
- L. Ahlin, J. Zander: Principles of Wireless Communications. Lund 1997, Studentlitteratur, 527p.
- I.A. Glover, P.W. Grant: Digital Communications, Prentice Hall 1998, 734p.

- S. Benedetto, E. Biglieri: Principles of digital transmission with wireless applications,
  Kluwer Academic/Plenum Publishers 1999, 855p.
- Gordon L. Stüber: Principles of mobile communications. 2nd edition
  USA 2001, Kluwer, 752pp.

S-72.3230 Lecture plan autumn 2005

Tue.	1.11. 2005	12 – 14	Lecture 1&2	Introduction Radio link level functionalities
Thu.	3.11. 2005	12 – 14	Lecture 3&4	Optimum transceiver principles
Thu.	3.11. 2005	14 – 16	Lecture 5&6	Source coding principles Channel coding principles
Tue.	8.11. 2005	12 - 14	Lecture 7&8	Frame multiplexing principles Frequency conversion
Thu.	10.11. 2005	12 – 14	Lecture 9&10	Linear modulation methods Modulators, demodulators, performance
Thu.	10.11. 2005	14 – 16	Exercise 1&2	
Tue.	15.11. 2005	12 – 14	Lecture 11&12	Non-linear modulation methods Modulators, demodulators, performance
Thu.	17.11. 2005	12 - 14	Lecture 13&14	Spread spectrum methods
Thu.	17.11. 2005	14 - 16	Exercise 3&4	

Tue.	22.11. 2005	12 – 14	Lecture 15&16	Multicarrier modulation methods
Thu.	24.11. 2005	12 - 14	Lecture 17&18	Channel equalizer principles
Thu.	24.11. 2005	14 - 16	Exercise 5&6	
Tue.	29.11. 2005	12 – 14	Lecture 19&20	Diversity methods
Thu.	1.12. 2005	12 - 14	Lecture 21&22	Traffic modelling and multiple access methods in circuit switched system
Thu.	1.12. 2005	14 - 16	Exercise 7&8	
Tue.	6.12. 2005	10 – 12	No lectures	Independence day of Finland
Thu.	8.12. 2005	12 - 14	Lecture 23&24	Traffic modelling and multiple access methods in packet switched system
Thu.	8.12. 2005	14 - 16	Exercise 9&10	