IK2560 Mobile Networks and Services 7.5 credits
Mobila nätverk och tjänster

Course syllabus for IK2560 valid from Spring 18, edition 2.

Intended learning outcomes

Upon completion of the course, the student should be able to:

- Explain the basic functionality of mobile networks and be able to do performance calculations.
- Discuss the effect of the availability of affordable mobile services and IoT in a global society.
- Be able to explain the architecture of existing mobile and wireless networks and compare and contrast one network architecture with another.
- Describe the core network protocols and applications in the current generations of mobile networks.
- Explain, in a broad sense, the environmental and sustainability challenges of the ICT-industry (including issues of electromagnetic radiation, energy, limited natural resources, environmentally harmful effects, economic effects (of both infrastructures and devices), economic and social effects on society)).
- Demonstrate knowledge of this area both orally and in writing.
- Be able to follow the current literature, i.e. white papers, conference papers, and journal papers in the area.

Course main content
Transmission fundamentals, Signal encoding, Overview of Wireless Communications.
Architecture of Wireless LAN, PAN, and BAN.
Architecture of current generations of Mobile Networks.
Mobile applications, Internet of Things (IoT), and device to device communication.
Sustainability and ICT.

Eligibility
IK1203 Networks and Communications, or equivalent course.

Literature
C. Beard and W. Stallings. Wireless Communication Networks and Systems. Pearson Education, 2016
Selected papers.

Examination
PRO1 - Project, 3.5 credits, grading scale: A, B, C, D, E, FX, F
TEN1 - Exam, 4.0 credits, grading scale: P, F
Make up exams may be given as oral examinations

Course Information

Teaching Methods of the Course

The course consists of lectures, recitations, seminars, and a project. The lectures presents an overview of the material in the course and the recitations gives more time for questions and problem solving. However, certain parts of the course must be studied on your own. The seminars are for discussions of interesting scientific papers in the area. The project work is designed to integrate the knowledge and skills gained, and to foster the ability to follow the literature in the subject.

The project should consist of an assigned paper requiring roughly 50h of work by each student along with an oral presentation.

Requirement for the written report:
- The length of the final report should be a maximum of 20 pages total (roughly 10,000 words) for the group (the style should be that of a conference paper);
- Papers should focus on system and services of wireless networks.
- If there are multiple students in a project group, the report may be in the form of a collection of papers, with each paper suitable for submission to a conference or journal.
- The contributions by each member of the group must be clear (in the case where the report is a collection of papers - the role of each member of the group can be explain in the overall introduction to the papers.
- The report should clearly describe: (1) what you have done; (2) who did what; if you have done some implementation and measurements you should describe the methods and tools used, along with the test or implementation results, and your analysis.
- Oral presentations: Each group should present their results for at most 20 minutes (note that this is the upper limit on time - not a lower limit, thus an individual doing a project might plan on 8-10 minutes), followed by some discussion.

Grading Criteria

The course consists of two requirements: an exam of 4 credits and a project of 3.5 credits. If the exam is passed, then the grade for the whole course is determined by the grade on the project.

Exam

For date and time see: http://www.kth.se/student/schema

Teacher, Course responsible and examiner

Fredrik Kilander	08/790 40 82	fki@kth.se, teacher
Gerald Maguire		maguire@kth.se, Examiner and teacher.
Marina Petrova	08/790 42 44	petrovam@kth.se, teacher
Ben Slimane	08/790 93 53	slimane@kth.se , teacher
Konrad Tollmar	08/790 43 03	konrad@kth.se, teacher
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Sara Khosravi		sarakhos@kth.se, assistant

Course Information on the Web

Current information URL: http://www.kth.se/student/program-kurser/kurshemsidor

Detailed Course Planning

The course consists of 13 lectures (L), 6 recitations (R), and 4 seminars (S) of two hours each. Every teaching hour is 45 minutes.

Activity	Description	Readings	Teacher
L1	**Introduction and overview of the course**	Beard C. and W. Stallings: Chapter 1	Gerald Maguire
L2	**Wireless Networks**	Beard C. and W. Stallings: Chapter 11.1-3, 13.1	Marina Petrova
L3	**Mobile Services**	Beard C. and W. Stallings: Chapter 15	Konrad Tollmar
L4	**Internet of Things**	Beard C. and W. Stallings: Chapter 12.1-12.2	Fredrik Kilander
L5	**Telecom Markets and Mobile operators**		Jan Markendahl
L6	**Transmission Fundamentals I**	Beard C. and W. Stallings: Chapter 2.1-2+offprint	Anders Västberg
R1	**Transmission Fundamentals I**	Problems: 2.1, 2.2, 2.4, 2.5, 2.6, 2.7, 2.15, 2.16, 2.17, Offprint	
L7	**Transmission Fundamentals II**	Beard C. and W. Stallings: Chapter 2.3-2.5, Appendix 2A	Anders Västberg
R2	**Transmission Fundamentals II**	Problems: 2.9, 2.10, 2.11, 2.12, 2.13, Offprint	
L8	**The Wireless Channel**	Beard C. and W. Stallings: Chapter 6	Anders Västberg
R3	**The Wireless Channel**	Problems: 6.1, 6.3, 6.6, 6.7, 6.8, 6.9, 6.13, 6.14, Offprint	
L9	**Signal Encoding Techniques**	Beard C. and W. Stallings: Chapter 7	Ben Slimane
R4	**Signal Encoding Techniques**	Problems 7.5, 7.6, 7.8, 7.13, 7.16, 7.18, 7.19	
L10	**OFDM and Spread Spectrum**	Beard C. and W. Stallings: Chapter 8, 9	Ben Slimane
R5	**OFDM and Spread Spectrum**	Problems 8.1, 8.3, 8.4, 8.5, 8.6, 9.1, 9.3, 9.4	
L11	**Coding and Error Control**	Beard C. and W. Stallings: Chapter 10	Ben Slimane
R6	**Coding and Error Control**	Problems 10.2, 10.3, 10.6, 10.9, 10.11, 10.20, 10.21	
L12	**Bluetooth and IEEE 802.15**	Beard C. and W. Stallings: Chapter 12	Gerald Maguire
S1	**Seminar 1**	(selected papers on WLAN, WPAN, LPWAN, …)[*]	
L13	**Cellular Networks**	Beard C. and W. Stallings: Chapter 14	Marina Petrova
S2	**Seminar 2**	(selected papers on cellular networks)	
	Written Exam	**Digital online exam**	
S3	**Seminar 3**	(selected papers)	
S4	**Seminar 4**	(selected papers)	
	Submission of project report		
	Project Presentation		

Recitations (R1..R6) and Seminars (S1..S4) will provide formative feedback, while the written examination, project report, and project presentation will involve summative feedback. The project

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[*] The papers selected for the seminars will vary from year to year and may even differ between different sections of the course (if there are enough students to merit splitting the course into sections; for example, to ensure that there is adequate time for all students to participate in the seminars).

report and project presentation are evaluated together for the project grade.

Acronyms and abbreviations

LPWAN   Low power wide-area network

WLAN   Wireless local area network

WPAN   Wireless personal area network