Syllabus

Subject

Name	22380 - Advanced Wireless Networks
Credits	2.4 in-class (60 hours) 3.6 distance (90 hours) 6 total (150 hours).
Group	Group 4, 2S (Campus Extens)
Period	Second semester
Language	Catalan

Lecturers

Lecturers	Office hours for students					
	Starting time	Finishing time	Day	Start date	End date	Office
Guillem Femenias Nadal guillem.femenias@uib.es	09:00	13:00	Monday	01/09/2017	31/07/2018	Anselm Turmeda - Despatx D109
	18:00	19:00	Thursday	01/09/2017	31/07/2018	desp. 109 - 1er pis Anselm Turmeda
Felipe Riera Palou felip.riera@uib.es	15:30	16:30	Monday	01/09/2017	31/07/2018	desp. 109 - 1er pis Anselm Turmeda

Context

Advanced Wireless Networks is an optional module addressed to students on the 4th year of the degree Grau en Enginyeria Telemàtica and whose objective is to provide an overview of the technologies and standards supporting modern wireless networks. Contents developed in this module should allow the student to understand the evolution and underpinning principles of the latest generation of wireless local area networks (IEEE 802.11n/ac/ah), cellular standards (LTE/LTE-Advanced), WiMAX (IEEE 802.16e) and personal area networks (WiMedia). Within the degree's conceptual map (eps.uib.es/mapa), this module belongs to the Communication Systems block.

Requirements

Recommended

To take full advantage of this course, it is essential that students have the knowledge corresponding to the blocks of Telecommunications and Telematic Networks, detailed below:

* Xarxes d'Àrea Local i Intranets
* Xarxes d'Operadora

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* Transmissió de Dades

Skills

Specific

*   * CC1: Capacity to autonomously acquire new skills and knowledge related to the design, development or exploitation of telecommunication systems and services..
*   * CC3: Capacity to use search engines related to bibliographic resources related to telecommunications and electronics.
*   * CC4: Capacity to analyze and specify the main parameters of a communication system.
*   * CC12: Ability to use concepts related to network architecture, protocols and internetworking..

Generic

*   * CG6: Oral expression: clarity and fluency to convey information related to results, products or services, to either specialized or non-specialized audiences..
*   * CG12: Ability for future autonomous study (lifelong learning).

Basic

*   * You may consult the basic competencies students will have to achieve by the end of the degree at the following address: http://www.uib.eu/study/grau/Basic-Competences-In-Bachelors-Degree-Studies/

Content

Theme content

A. Core concepts and enabling technologies

A.1. The wireless channel

Large-scale fading

Small-scale fading

A.2. Digital modulation over wireless channels

Fading, outage probability and error probability

Adaptive modulation and coding

A.3. Multiple antenna systems

SISO capacity expression
MIMO capacity expression
Antenna selection
Spatial multiplexing
Space-time block coding (Alamouti)
Cyclic delay diversity

A.4. Multicarrier modulation techniques

Principles of multicarrier transmission

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OFDM

Multicarrier practicalities

Multicarrier related techniques

B. Modern wireless communication standards

B.1. IEEE 802.11n/ac/ax/ad/ah
802.11x PHY layer
802.11x MAC layer
Extensions for IEEE 802.11ac/ad/ax/ah

B.2. 3GPP-LTE and LTE-A
OFDMA architecture within LTE (downlink and uplink)
Transmitter/Receiver processing chain for uplink and downlink
Channel organization in LTE
Radio resource management within LTE
Advanced techniques in LTE-A.

B.3. Other wireless standards
IEEE 802.16e (WiMAX)
IEEE 802.15.3 (WPANs)

C. 5G Visions

C.1. Students' presentation on 5G topics
Students will need to prepare and present a report on any of the topic that are currently being
discussed within the context of 5G communications. Examples include:
cognitive radio, multi-tier architectures, BS cooperation, millimeter wave communications,
filterbank-based multicarrier, 3D beamforming

Teaching methodology

In-class work activities

Modality	Name	Typ. Grp.	Description	Hours
Theory classes	Lectures	Large group (G)	To develop the contents of the module. Material will be made available through Campus Extens. CC1, CC4, CC12 and CG12.	36
Assessment	Lab sessions	Large group (G)	To consolidate through computer experiments (Matlab) the material introduced in the theory lectures. CC1, CC3, CC4, CC12 and CG6.	16
Assessment	Report-presentation	Large group (G)	Students will develop a survey report and presentation related to a topic concerning 5G communications and they will have to present it in class. Skills CC3, CG6 and CG12 will be assessed.	4
Assessment	Task sheets	Small group (P)	Students must solve the task sheets assigned to each Unit for the material comprising blocks A and B .	4

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Modality	Name	Typ. Grp.	Description	Hours
			CC1, CC4 and CC12 skills will be assessed.	

At the beginning of the semester a schedule of the subject will be made available to students through the UIBdigital platform. The schedule shall at least include the dates when the continuing assessment tests will be conducted and the hand-in dates for the assignments. In addition, the lecturer shall inform students as to whether the subject work plan will be carried out through the schedule or through another way included in the Campus Extens platform.

Distance education work activities

Modality	Name	Description	Hours
Group or individual self-study	Classroom activities study	Students will consolidate the contents introduced in class.	90

Specific risks and protective measures

The learning activities of this course do not entail specific health or safety risks for the students and therefore no special protective measures are needed.

Student learning assessment

Lectures

Modality	Theory classes
Technique	Attitude scales **(non-retrievable)**
Description	To develop the contents of the module. Material will be made available through Campus Extens. CC1, CC4, CC12 and CG12.
Assessment criteria	- Degree of participation of students in class, quality and soundness of their reasonings and precision and accuracy in their answers.

Final grade percentage: 5% for the training plan A with minimum grade 0
Final grade percentage: 0% for the training plan B with minimum grade 0

Lab sessions

Modality	Assessment
Technique	Student internship dissertation **(retrievable)**
Description	To consolidate through computer experiments (Matlab) the material introduced in the theory lectures. CC1, CC3, CC4, CC12 and CG6.
Assessment criteria	- Quality and soundness of the development of the report.

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- Precision, conciseness, clarity, consistency and spelling and grammatical correctness of the document.

Final grade percentage: 30% for the training plan A with minimum grade 5
Final grade percentage: 30% for the training plan B with minimum grade 5

Report-presentation

Modality	Assessment
Technique	Papers and projects **(retrievable)**
Description	Students will develop a survey report and presentation related to a topic concerning 5G communications and they will have to present it in class. Skills CC3, CG6 and CG12 will be assessed.
Assessment criteria	- Quality and soundness of the development of the project.
	- Precision, conciseness, clarity, consistency and spelling and grammatical correctness of the document.

Final grade percentage: 15% for the training plan A with minimum grade 5
Final grade percentage: 15% for the training plan B with minimum grade 5

Task sheets

Modality	Assessment
Technique	Objective tests **(retrievable)**
Description	Students must solve the task sheets assigned to each Unit for the material comprising blocks A and B . CC1, CC4 and CC12 skills will be assessed.
Assessment criteria	- Quality and soundness of reasoning in:
	proposed solutions to problems
	answers to questions
	- Precision and accuracy of the results.
	- Clarity, intelligibility and spelling and grammatical correctness in answers.

Final grade percentage: 50% for the training plan A with minimum grade 5
Final grade percentage: 55% for the training plan B with minimum grade 5

Resources, bibliography and additional documentation

Basic bibliography

- Emerging Technologies in Wireless LANs: Theory, Design, and Deployment, Benny Bing, Cambridge University Press, 2007
- 4G, LTE/LTE-Advanced for Mobile Broadband, Erik Dahlman, Stefan Parkvall, Johan Sköld, Academic Press, 2011

Complementary bibliography

- Wireless Communications, Andrea Goldsmith, Cambridge University Press, 2005

Other resources

- All the information, slides and working material will be available at the web page in Campus Extens.

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- Scholar and IEEEexplore.

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