Universitat Autònoma de Barcelona

2023/2024

Antennas

Code: 102704
ECTS Credits: 6

Degree	Type	Year	Semester
2500898 Telecommunication Systems Engineering	OT	4	1

Contact

Name: Jose Parron Granados

Email: josep.parron@uab.cat

Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Prerequisites

It is recommended to have successfully taken the courses of Radiation and Guided Waves and Radio Communication Systems.

The contents of the course are closely related to the optional courses of Microwave Engineering and Design and Simulations Tools I, for that reason, it is also recommended, although not mandatory, taking all these courses simultaneously.

Objectives and Contextualisation

Antennas are a key component in many telecommunication systems since they act as transducers between guided waves and radiated waves. In this course we will develop the tools that relate the antenna shape and size to its behavior. In this way, the future engineer will be able to analyze and design antennas for different applications.

Once completed the course the student should be able to:

- Describe the radiation parameters of basic antennas
- Predict the behavior of radiating structures using simple approximations
- Design basic radiating structures that meet given specifications
- Use simulations tools for analyzing and designing antennas
- Convey the conclusions of their work in a proper technical language

Competences

- Communication

- Develop personal attitude.
- Develop thinking habits.
- Draft, develop and sign projects in the field of telecommunications engineering that, depending on the speciality, are aimed at the conception, development or exploitation of telecommunication and electronic networks, services and applications.
- Learn new methods and technologies, building on basic technological knowledge, to be able to adapt to new situations.
- Select and devise communication circuits, subsystems and systems that are guided or non-guided by electromagnetic, radiofrequency or optical means to fulfil certain specifications.

Learning Outcomes

1. Analyse and design radiofrequency, microwave, broadcasting, radio-link and radio-determination antennas, circuits, subsystems and systems.
2. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to non-expert audiences.
3. Design radio communication based applications, understood to be systems for receiving and transporting information.
4. Develop curiosity and creativity.
5. Develop systemic thinking.
6. Develop the capacity for analysis and synthesis.
7. Generate innovative and competitive proposals in professional activity.
8. Manage information by critically incorporating the innovations of one's professional field, and analysing future trends.
9. Use specific simulation tools to analyse and design radiofrequency telecommunication applications.

Content

1. Introduction
2. Fundamentals of radiation
3. Basic antennas
4. Aperture antennas
5. Antenna arrays

Methodology

Directed activities

- Lectures: explanation of theoretical contents
- Problem solving: application examples
- Practical work in laboratory: development of a planned activity using simulation tools

Supervised activities

- Personal study of the course contents
- Solving exercises, preparation of lab activities and reports

Supervised activities

- Tutoring: individual or small group meetings to clarify concepts, to advise on the development of the course or to attend other specific issues.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	26	1.04	1, 2, 5, 6, 4, 3, 7, 8
Practical work in laboratory	12	0.48	1, 2, 5, 6, 4, 3, 7, 8, 9
Problem solving	12	0.48	1, 2, 5, 6, 4, 3, 7, 8
Type: Supervised			
Tutoring	4	0.16	1, 2, 5, 6, 4, 3, 7, 8, 9
Type: Autonomous			
Personal study	32	1.28	1, 2, 5, 6, 4, 3, 7, 8
Problem solving	25	1	1, 2, 5, 6, 4, 3, 7, 8, 9

Assessment

This course does not provide a single assessment system.

a) Evaluation activities

- Final exam (ExF): 50%. Short questions and problems. It is compulsory to obtain ExF >= 4 to pass the course.
- Problem solving (EX): 10%. Short questions and problems will be proposed throughout the course.
- Deliverables (EpP): 20%. Solving problems and reading the lab document. All the deliverables have the same weight in EpP.
- Lab reports (InP): 20% Report (per lab group) on the activities developed in the lab. All the reports have the same weight in InP.

Any evaluation activity delivered after the deadline will be qualified with zero.

b) Evaluation activities schedule

- ExF: final exam dates will be public the first day of the course in the Campus Virtual and the web page of the Engineering School.
- EX, EpP and InP: schedule of lab sessions and deliverables will be made public in Campus Virtual.

The schedule can be modified due to unexpected events. Please, check Campus Virtual often since any modification will be published there.

c) Second chance procedure

- ExF: according to UAB regulations there will be one second chance exam for those students with FEx < 4 that have participated in, at least, 2/3 of the evaluation activities of the course. Taking the second chance exam implies that the student waives the grade of the previous exam.

- EX, EpP and InP: these evaluation activities do not have second chance procedure.

d) Grades revision procedure

For every evaluation activity it will be scheduled a place, date and time for reviewing the grade. The grade of the activity will not be modified after the scheduled date.

e) Final grade

- If ExF < 4, Final grade = ExF
- Si ExF>=4, Final grade =max(0.5*ExF + 0.1*EX + 0.2*EpP + 0.2*InP, 0.8*ExF +0.2*InP)
- It is mandatory a final grade >= 5 to pass the course
- Matricules d'honor (MH): the highest grade available can only be awarded by the coordinator of the course to those students with the top final grades. According to UAB regulations final grade should be >= 9 and the number of MH is restricted to the 5% of the students enrolled in the course.
- "Not evaluated" will be only granted with the student participates in less than 10% of the evaluation activities.

f) Irregularities by the student, copy and plagiarism

Without prejudice to other disciplinary measures considered appropriate, the irregularities committed by the student that can lead to a variation of the grade of an evaluation activity (such as copying plagiarizing, cheating …) will be qualified with zero.

g) Students repeating the course

There is no differential treatment for students repeating the course. No grades of the previous course will be kept.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Deliverables	20%	15	0.6	1, 2, 5, 6, 4, 3, 7, 8
Final exam	50%	3	0.12	1, 5, 6, 4, 3, 7, 8
Lab reports	20%	15	0.6	1, 2, 5, 6, 4, 3, 7, 8, 9
Problem solving	10%	6	0.24	1, 2, 5, 6, 4, 3, 7, 8

Bibliography

- Cardama et al., "Antenas" Edicions UPC, Barcelona, 2ª edición, 2002. https://upcommons.upc.edu/handle/2099.3/36797
- C.A. Balanis, "Antenna Theory, Analysis and Design", John Wiley & Sons, Inc., New Jersey, 3ª edició, 2005. (Other editions are also valid, this edition contains a CD with extra materials)
- T.A. Milligan, "Modern Antenna Design", John Wiley & Sons, Inc., New Jersey, 2ª edició, 2005. https://onlinelibrary.wiley.com/doi/book/10.1002/0471720615

Software

- FEKO EM solver from Altair. Student version. https://altairuniversity.com/feko-student-edition/

- Matlab from Mathworks.
  https://es.mathworks.com/academia/tah-portal/universitat-autonoma-de-barcelona-40811157.html