Electromagnetism & optics

ECTS: 6 ECTS

COORDINATOR: Alfredo Bermúdez de Castro (alfredo.bermudez@usc.es)

UNIVERSITY WHERE THE COORDINATOR IS: USC

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? Yes

LECTURER 1: Edita de Lorenzo Rodríguez (edita.delorenzo@uvigo.es).

UNIVERSITY WHERE THE LECTURER 1 IS: UVigo

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? Yes

SUBJECT CONTENTS

1.-Mathematical requirements: field theory, distributions and functional spaces.

2.-General concepts about waves. Examples.

3.-Maxwell's equations in vacuum.

4.-Maxwell equations in material regions.

5 –Electrostatics.

6.-Continuous electrical current.

7.-Magnetostatics.

8.-Quasi-static approximation. Harmonic regime. Electromagnetic induction. Eddy currents.

9.- Wave equation in free space and radiated field.

10. Radiation diagram and antenna parameters

11.- Introduction to linear and aperture antennas.

METHODOLOGY

1.-Planning for the contents of each class.

2.-Delivery of teaching materials in pdf

3.-Explanation on electronic blackboard (lecture).

4.-Solving exercises

5.-Use of telematic resources for supplementary activities

LANGUAGE USED IN CLASS: Spanish, Galician, English

IS IT COMPULSORY TO ATTEND CLASS? Students can attend via conference system

BIBLIOGRAPHY

- Bossavit, Computational Electromagnetism. Variational Formulations.Complementarity, Edge Elements. Academic Press. San Diego, CA, 1998.

- M. Cessenat, Mathematical Methods in Electromagnetism. World Scientific. 1996.

- C. T. A. Johnk, Engineering Electromagnetic Fields and Waves, Springer, 2001.

- P. Monk, Finite Element Methods for Maxwell's Equations, Clarendon Press. Oxford. 2003.

- J. C. Nédélec, Acoustic and Electromagnetic Equations, Springer, 2001.

- B. D. Popovic, Introductory Engineering Electromagnetics. Addison Wesley, 1971.

- A. B. Reece and T. W. Preston, Finite Elements Methods in Electrical Power Engineering, Oxford University Press, Oxford, 2000.

- P. P. Silvester and R. L. Ferrari, Finite Elements for Electrical Engineers, Cambridge University Press, Cambridge, 1996.

- C.A. Balanis, *Antenna Theory: Analysis and Design*, John Wiley and Sons, 4ª ed., 2016.

- W. L. Stutzman, G. A. Thiele, *Antenna Theory and Design*, John Wiley and Sons, 3ª ed. 2013.

SKILLS

Basic:

CG1: To have knowledge that provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context, knowing how to translate industrial needs in terms of R & D in the field of mathematics Industrial.

CG2: To be able to apply the acquired knowledge and abilities to solve problems in new or unfamiliar environments within broader contexts, including the ability to integrate multidisciplinary R & D in the business environment.

CG4: To have the ability to communicate the findings to specialist and non-specialist audiences in a clear and unambiguous way.

CG5: To have the appropriate learning skills to enable them to continue studying in a way that will be largely self-directed or autonomous, and also to be able to successfully undertake doctoral studies.

Specific:

CE1: To acquire a basic knowledge in an area of Engineering / Applied Science, as a starting point for an adequate mathematical modelling, using well-established contexts or in new or unfamiliar environments within broader and multidisciplinary contexts.

CE2: To model specific ingredients and make appropriate simplifications in the model to facilitate their numerical treatment, maintaining the degree of accuracy, according to previous requirements.

CE5: To be able to validate and interpret the results, comparing them with visualizations, experimental measurements and functional requirements of the physical engineering system.

Modelling specialization:

CM1: To be able to extract, using different analytical techniques, both qualitative and quantitative models.

Teaching methodology	Related skills		
Theory classes	CG1-CG2-CG3-CG4-CG5	CE1-CE2-CE3	CM1
Problem-solving exercises	CG1-CG2-CG3-CG4-CG5	CE1-CE2-CE3	CM1

WILL YOU BE USING A VIRTUAL PLATFORM? Yes. Moodle (USC)

WILL YOU BE USING ANY SPECIFIC SOFTWARE? No.

CRITERIA FOR THE 1ST ASSESSMENT OPPORTUNITY

30 % of the grade: exercises and practices

70 % of the grade: final exam.

Activities to evaluate	Related skills		
Problem-solving exercises	CG1-CG2-CG3-CG4-CG5	CE1-CE2-CE3	CM1
Exam	CG1-CG2-CG3-CG4-CG5	CE1-CE2-CE3	CM1

CRITERIA FOR THE 2ND ASSESSMENT OPPORTUNITY

The assessment will be the same as in the first assessment opportunity.