Electromagnetism and 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: Jesús Liñares Beiras (suso.linares.beiras@usc.es)

UNIVERSITY WHERE THE LECTURER 1 IS: USC

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 equations in inhomogeneous and anisotropic optical media.

10.-Modal theory of propagation of light. Modal coupling. Guides and optical fibers.

11.-Linear and nonlinear spatial-temporal light propagation. Electro-optics and magneto-optics.

12.-Theory of radiation and diffraction. Electro-optics and magneto-optics.

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

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BIBLIOGRAPHY

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

J. M.Cabrera, F. Agulló, F. J. López, ÓPTICA Electromagnética Vol. I y II. AddisonWesley Iberoamericana, 1993 (Vol. I), 2000 (Vol. II)

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. NÉédélec, 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.

T. Poon and T. Kim, Engineering Optics with MATLAB, World Scientific, New Jersey, 2006

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.

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

WILL YOU BE USING ANY SPECIFIC SOFTWARE? No.

CRITERIA FOR THE 1ST ASSESSMENT OPPORTUNITY

For the assessment of the Electromagnetism part:

30 % of the grade: exercises and practices

70 % of the grade: final exam.

The total score will provide the 60 % of the final grade for the course.

For the assessment of the Optics part:

-Exercises and practices will be proposed and evaluated.

The total score calculated will provide the 40 % of the final grade for the course.

CRITERIA FOR THE 2ND ASSESSMENT OPPORTUNITY

The assessment of the **Electromagnetism** part will be the same as in the first assessment opportunity.

The assessment of the Optics part will be the same as in the first assessment opportunity.