Course guide
295709 - POTAM - Optical, Thermal and Acoustic Properties of Materials

Last modified: 02/10/2025

Unit in charge: Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.

Degree: BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: Jimenez Piqué, Emilio

Others: Segon quadrimestre:
KIM ALBO SELMA - M11, M12
JOSÉ MANUEL GARCÍA TORRES - M11, M12
EMILIO JIMENEZ PIQUÉ - M11, M12

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEMT-20. Knowledge of the mechanical, electronic, chemical and biological behaviour of materials, and the ability to apply it in designing, calculating and modelling aspects of elements, components and equipment.

Transversal:
07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
04 COE N2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.

TEACHING METHODOLOGY

Lectures, demonstrations in class, problems and lab

LEARNING OBJECTIVES OF THE SUBJECT

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STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	50,0	33.33
Hours small group	10,0	6.67

Total learning time: 150 h

CONTENTS

UNIT I: Physics of light

Description:

Maxwell equations. Photons. Refractive index. Polarization. Reflectivity. Interference. Diffraction. Scattering. Incandescence.

Full-or-part-time: 50h
Theory classes: 12h
Practical classes: 8h
Self study : 30h

UNIT II: Color in Materials

Description:
Coloration in Metals. Color in dielectrics. Color in organic molecules. Color in Semiconductors. Optical Activity. Fluorescence Phosphorescence

Full-or-part-time: 50h
Theory classes: 12h
Practical classes: 8h
Self study : 30h

title english

Description:
content english
Sound waves. Interaction with materials. Reflection and Damping. Harmonics. Materials and Musical Instruments.

Full-or-part-time: 25h
Theory classes: 6h
Practical classes: 4h
Self study : 15h

UNIT IV: Thermal Properties of Materials

Description:

Phonons. Heat capacity. Thermal conductivity. Dilatation. Thermal shock.

Full-or-part-time: 25h
Theory classes: 6h
Practical classes: 4h
Self study : 15h

GRADING SYSTEM

49% Final Exam + 30% Partial Exam +6% Presentation +15% Laboratory

Reevaluation exam is programmed.

BIBLIOGRAPHY

Basic:
- Nassau, Kurt. The Physics and chemistry of color : the fifteen causes of color. 2nd ed. New York [etc.]: Wiley Interscience, cop. 2001. ISBN 0471391069.
- Simmons, Joseph H.; Potter, Kelly S. Optical materials. San Diego: Academic Press, cop. 2000. ISBN 0126441405.
- Pollock, D. D. Physical properties of materials for engineers. 2nd ed. 1993. ISBN 0849342376.
- Smith, F. Graham; King, T. A. Optics and photonics : an introduction. 2nd ed. Chichester [etc.]: John Wiley & Sons, cop. 2007. ISBN 0471489255.
- Turton, Richard. The Physics of solids. New York: Oxford University Press, 2000. ISBN 0198503520.