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

**Last modified:** 11/07/2025

**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.