



PERSONA CIÈNCIA EMPRESA
UNIVERSITAT RAMON LLULL

COURSE: CERAMIC MATERIALS

SUBJECT: Metallic, polymeric and ceramic materials

MODULE: Specific knowledge module

PROGRAM: Master's degree in Materials Science and Engineering

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GENERAL CHARACTERISTICS*

Type: Basic formation, Compulsory, Optional

Master Thesis, External practices

Duration: Semester

Semester / s: 1

Number of ECTS credits: 4

Languages: Spanish, Catalan, English

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION

The course presents the different types of ceramic materials, from traditional ceramics to advanced ceramics. The relationship between the microstructure and composition of the materials and the macroscopic properties of the finished product is analyzed. The production methods are presented and the importance of each one of the steps involved (raw materials, powder preparation, shaping, sintering and finishing) is related to the final product properties.

COMPETENCES

- E1 - to know the different types of ceramic materials, their synthesis, processing, structure and properties, for their application in Materials Engineering, both industrial and research.
- E2 - Ability to propose the synthesis or processing method to obtain advanced ceramics, which allow solving problems in the industrial field and/or in the study of new materials
- CG2 - The ability to perform a responsible practice of the profession.
- CB6 - To have and understand the required knowledge that provides the basis or opportunity to be innovative in the development and/or application of ideas, often in a research context.
- CB7 - To apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study
- CB8 - To integrate knowledge and deal with the complexity of formulating judgments based on information, which, being incomplete or limited, includes reflections on social and ethical responsibilities related to the application of their knowledge and judgments.
- CB9 - To communicate conclusions and the reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way

PREREQUISITES*

The corresponding to access master studies

* These features should not be modified without the approval of the bodies responsible for academic higher-level structures (field, module and / or system).

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CONTENTS

1. Introduction, definition and classification.
2. Properties of ceramic materials
3. Glasses
4. Phase diagrams
5. Ceramics processing
6. Powder Characterization
7. Forming techniques
8. Debinding and sintering
9. Temperature, furnaces and refractories
10. Toughening
11. monocrystals
12. composites

METHODOLOGY

LEARNING ACTIVITIES *

Learning Activities	ECTS credits	Competences
Lectures	1.15	E1, E2, CG2, CB6, CB7, CB8, CB9
Seminars	0.07	E1, E2, CG2, CB6, CB7, CB8, CB9
Case and Problem-Solving Sessions	0.15	E1, E2, CG2
Personal study	2,33	E1, E2, CG2
Presentations	0.15	E1, E2, CG2
Assessment Tasks (Exams, Continuous Assessment...)	0.15	E1, E2, CG2
TOTAL	4	

TEACHING METHODOLOGY

The teaching methodology used in the course is based on lectures and case and problem-solving sessions. Seminars are also scheduled to solve doubts. The student is provided with the complete course documentation with theory and case documents for personal study.

The students prepare presentations in groups or individually on specific issues, which become part of the study material.

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ASSESSMENT

ASSESSMENT METHODS *

Assessment methods	Weight	competences
Final exam	50%	E1, E2, CB6, CB7, CB8
Reports and Presentations	20%	E1, E2, CG2, CB9
Follow-up activities	25%	E1, E2, CG2
Participation	5%	CG2

LEARNING OUTCOMES

- The student must demonstrate knowledge of the different types of ceramic materials, their synthesis, processing, structure and properties. (E1)
- The student should be able to propose a synthesis or processing method to obtain a ceramic with certain properties. (E2)
- The student must be able to establish the relationship between the structure of a ceramics and their properties. (E1, E2)
- The student should know the main applications of various ceramic materials. (E1)
- The student must demonstrate the knowledge of the properties of ceramic materials in relation to the implications arising from misuse. (CG2)

QUALIFICATION

The evaluation of the course will consider all aspects listed in the evaluation table with its corresponding weight. The main weight of the grade lies in the final examination (50%). The reports and Presentations include classroom presentations and specific monographs that students prepare (20%). Follow-up activities include midterm exams or other deliverables (15%). Participation (5%) includes attitude, attendance and initiative shown by the student in the subject

ASSESSMENT OF THE COMPETENCES (Define calculation expressions for each competency based assessment activities related.)

The grade of the final exam, reports and presentations and follow-up activities will be used as an indicator for the evaluation of E1 and E2 competences.

The grades of participation, reports and presentations and follow-up activities will be used as an indicator for the assessment of competence CG2.

The grade of the final exam will be used as an indicator for the assessment of CB6, CB7, CB8 competences

The grade of reports and presentations will be used for the evaluation of competencies CB9

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BIBLIOGRAPHY (Recommended and accessible to students.)

- Barry Carter, C., Grant Norton, M. "Ceramic Materials science and engineering". Springer, 2007
- Barsoum, MW "Fundamentals of Ceramics" IoP, 2003
- Rahaman, MN "Ceramic Processing and Sintering" M. Dekker Inc., 2003
- Boch, P. "Ceramic Materials. Processes, Properties and Applications" 2001 ISTE Ltd.

DOCUMENT HISTORY

PREVIOUS CHANGES

September 14, 2016, Manuel David Abad

CURRENT REVISION

February 26, 2019, Manuel David Abad