Powder Technology

Academic Year: (2022 / 2023) **Review date: 07-07-2021**

Department assigned to the subject: Materials Science and Engineering and Chemical Engineering Department

Coordinating teacher: CAMPOS GOMEZ, MONICA

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Materials Science and Engineering
Materials technology

OBJECTIVES

LEARNING OUTCOMES
Successful completion of this subject ensures that students are able to:
-To know and master the techniques and processes for the manufacture of sintered materials.
-To understand the advantages and limitations of the different variants of powder technology.
-To evaluate the effect of porosity in sintered materials and propose strategies to control it according to the requirements of the application.
-To know the main families of sintered metals.
- To know the latest techniques in the sector: additive technology, total densification processes, etc.
Knowing the environmental implications (energy consumption, raw material consumption, generation of by-products, and waste) of the different variants of powder technology.

Basic Competences
-To possess and understand the knowledge that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context.
- Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
- Students should be able to communicate their conclusions and the knowledge and rationale behind them to specialist and non-specialist audiences in a clear and unambiguous manner.
General competences
- Students acquire the learning skills that will enable them to continue studying in a largely self-directed or autonomous way.
-To understand the issues involved in Materials Science and Engineering in an industrial and research context.
- To be familiar with the appropriate disciplines for working in a materials laboratory and to optimize the obtaining of results.
-To develop teamwork skills in a research context.
- To develop the ability to apply the knowledge acquired to the research and development of new materials or in technologies for their processing in strategic sectors.
-To combine the interest in innovating and making processes profitable with the need to do so in an environmentally friendly way.
- To acquire the necessary skills to defend a research project and its results.
-To develop creative and decision-making strategies when faced with problems related to materials, their design, manufacture, and behavior.
SPECIFIC COMPETENCES
-To know the most current trends in the world of materials in terms of their formulation and to identify the potential advantages they can offer compared to more traditional materials.
-To acquire the ability to contribute to the optimization of processing technology for specific applications and problems.
- To interpret, discuss and draw conclusions from experimental data obtained using complex characterization techniques, that are common in the world of Materials Science and Engineering.
- To know and understand the environmental impact of materials in service during their life cycle, being able to tackle the development of new materials and processing technologies based on sustainability criteria.

DESCRIPTION OF CONTENTS: PROGRAMME

- PM Global Concept. PM as an alternative
- Powder Manufacturing & Characterization
- Shaping Technologies
- Sintering fundamentals
- PM low alloyed steels. Liquid Phase Sintering
- Special PM steels
-Hardmaterials & cermets
- PM Light Alloys
- Porous Materials
- Advances Methods in PM

LEARNING ACTIVITIES AND METHODOLOGY

RAINING ACTIVITIES
-Theoretical-practical courses
-Laboratory
- Tutorials
- Group work
-Individual students work

TEACHING METHODOLOGIES
- Class lectures by the teaching staff with the support of computer and audiovisual media, in which the main concepts of the subject are developed and examples of the resolution of exercises or practical cases are given. Interaction with interaction tools (Kahoot/Wooclap).
- Resolution by the students (individually or in groups) of practical cases, problems, or exercises set by the teacher.
-Presentation and discussion in class, under the moderation of the lecturer, of topics related to the content of the subject.
- Obtaining experimental results in the laboratory, using research equipment and techniques, under the guidance of the teaching staff.
-Gamification dynamics in the classroom.
- Preparation of work and reports individually or in groups.

ASSESSMENT SYSTEM

Collaborative works: 30%
Lab practice, reports, and experimental work 30%

Final examination: 40%

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

BASIC BIBLIOGRAPHY

- Collective ASM Handbook vol. 7.. Powder Metal Technologies and Applications.., ASM, , 1998.
- M. Rhodes Principles of Powder Metallurgy., Wiley, 1997
- R.M. German.. Sintering Theory and Practice.., Wiley, , 1996
- W. Schatt & K.P. Wieters Powder Metallurgy, processing and materials., EPMA, 1997.

ADDITIONAL BIBLIOGRAPHY

- Fernand D. S. Marquis Powder Materials: Book 3 : Current Research and Industrial Practices, The Minerals, Metals & Materials Society , 2010
- Martin Rhodes Introduction to Particle Technology , wiley.
- R. German Sintering Theory and Practice , Wiley.
- Randall M. German, Pavan Suri, Seong Jin Park Review: liquid phase sintering, DOI: 10.1007/s10853-008-3008-0, 2008