Advanced manufacturing technologies

Academic Year: (2020 / 2021)   **Review date: 29-07-2020**

Department assigned to the subject: Mechanical Engineering Department

Coordinating teacher: DIAZ ALVAREZ, JOSE

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Students are expected to have passed:

- Production and Manufacturing Systems
- Mechanical technology

OBJECTIVES

-Students will develop skills and acquire the necessary knowledge for the correct definition and selection of the production systems and processes necessary to obtain especially critical components.
- Students will develop their communication skills to communicate the results and conclusions.
- They will increase their ability to analyze advanced problems related with new processes and production systems (analytically and numerically).
- They will improve their ability to lead, plan and supervise multidisciplinary teams.
- The student will receive the necessary knowledge to make optimal designs according to the process and the production system used for its manufacture.
- The student will have a global vision of the industrial transformation until the arrival of Industry 4.0.

DESCRIPTION OF CONTENTS: PROGRAMME

1/ Introduction to the machining proceses (milling, drilling, turning. Interest of high speed machining (good and bad points).

2/ Introduction to the modelization of machining (analytical, numerical and phenomenological). Advantages and limitations of each one.

3/ Determination of the cutting forces (orthogonal and oblique cutting) and chip contact length on the tool rake face.

4/ Description of the Merchand model. Hypothesis, critics and how to ameliorate it.

5/ The importance to have a good description of the behavior of the material in the numerical and analytical codes. Determination of the levels of strain and strain rate in the primary shear zone.

6/ Ley of behavior. Presentation of some leys and methodology to determine the Johnson-Cook parameters.

7/ Effect of the material behavior on the cutting process. Diferencies between metals and composites machining.

8/Termical problem in machining (induced damage, friction, wear, ...)

9/ Description of analytical model of Molinari (hypothesis and complete explanation of the equations).

10/ Fabrication in the motorsport industry

11/ Machining in mechanical industry

12/ No conventional machining.

13/ Cutting tools.

LEARNING ACTIVITIES AND METHODOLOGY
- Magistral lecture
- Problems lecture
- Homework prepared by student groups

ASSESSMENT SYSTEM
- Final Exam = 60 % (about all the knowledge given by the profesor on theory of machining, Merchand and Molinari analytical models)
- Group homework = 40 %

It is required that the grade of the exam is superior to 4/10 in order to pass

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

BASIC BIBLIOGRAPHY

- Amateau, M.F. Engineering Composite Materials, Engineering Mechanics, 2003

- Jamal Y. Sheikh-Ahmad. Machining of Polymer Composites, Springer, 2009

- Jones, R.M. Mechanics of Composite Materials, CRC Press, 1998

- Matthew J. Donachie. SUPERALLOYS: A Technical Guide, ASM International.

- Mazumdar, S.K. Composites Manufacturing: Materials, Product, and Process Engineering , CRC Press Book.

- Michael C.Y.Niu. Composite Airframe structures, Hong Kong Conmilit Press Ltd., 1992

- Steinar Westhrin Killi. Additive Manufacturing: Design, Methods, and Processes, CRC Press, 2017