[MHF203] TRANSFORMATION BY MACHINING PROCESSES

GENERAL INFORMATION

Studies	UNIVERSITY MASTER IN INDUSTRIAL ENGINEERING			**Subject**	?
Semester	2	**Course**	1	**Mention / Field of specialisation**	???
Character	OPTIONAL				
Plan	2022	**Modality**	Face-to-face	**Language**	CASTELLANO/EUSKARA
Credits	3	**Hours/week**	2.22	**Total hours**	40 class hours + 35 non-class hours = **75 total hours**

PROFESSORS

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REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	*(No previous knowledge required)*

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
MHMP01 - To project, calculate and design integrated manufacturing systems, optimizing the most suitable manufacturing processes for different industrial sectors, based on their material and design, identifying the machinery to be used, the parameters to control and establishing the designs of the tools to be used.		*x*		2,6
MHRA27 - To demonstrate the ability to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social, health and safety, environmental, economic and industrial implications and responsibilities		*x*		0,04
MHR125 - To possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context		*x*		0,08
MHR126 - To apply the knowledge acquired and your problem-solving skills in new, little-known or changing environments within broader (or multidisciplinary) contexts related to your area of ??study		*x*		0,2
MHR129 - To possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous		*x*		0,08
			Total:	3

KC: Knowledge or Content / SK: Skills / AB: Abilities

ENAEE LEARNING RESULTS	ECTS
ENA124 - Knowledge and comprehension: Deep knowledge and comprehension of the engineering disciplines of their speciality, at the level necessary to acquire the rest of the competencies of the degree.	0,3
ENA125 - Knowledge and comprehension: Critical Possession of avant-garde knowledge of their speciality.	0,36
ENA127 - Analysis in engineering: Ability to analyse new and complex engineering products, processes and systems within a broader multidisciplinary context; select and apply the most appropriate analysis, calculation and experimental methods already established, as well as innovative methods; and critically interpret the results of such analyses.	0,3
ENA128 - Analysis in engineering: Ability to conceive new products, processes, and systems.	0,3
ENA130 - Analysis in engineering: Ability to identify, formulate and solve engineering problems in emerging areas of their speciality.	0,3
ENA132 - Engineering projects: Ability to project while applying the knowledge and cutting-edge understanding of their engineering speciality.	0,48
ENA134 - Research and innovation: Ability to carry out bibliographic searches and consult and use databases and other information sources with discretion, in order to carry out simulations with the aim of conducting research on complex topics of their speciality.	0,18
ENA136 - Research and innovation: High-level capacity and ability to project and carry out experimental investigations, interpret data with criteria, and draw conclusions.	0,18
ENA140 - Practical application of engineering: Complete knowledge of application of materials, equipment and tools, engineering technology and processes, and their limitations.	0,3
ENA147 - Communication and Teamwork: Ability to operate effectively in domestic contexts as a member or leader of a team, which may be composed of people of different disciplines and levels, and who can use virtual communication tools.	0,3
Total:	3

SECONDARY LEARNING RESULTS

RMH136 **[!]** ***Conoce en profundidad los procesos de mecanizado por arranque de viruta y todos sus parámetros, ahondando en***

determinados aspectos como material de la pieza, comportamiento de las máquinas, modelos predictivos, simulaciones...

LEARNING ACTIVITIES	CH	NCH	TH
Computer simulation exercises, individually and/or in teams	4 h.	7 h.	11 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	4 h.	6 h.	10 h.
Carrying out exercises and solving problems individually and/or in teams	6 h.	5 h.	11 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and/or oral tests or individual coding/programming tests	100%	Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 14 h.
NCH - Non-class hours: 18 h.
TH - Total hours: 32 h.

RMH137 **[!]** ***Identifica aspectos sobre los cuales actuar para la mejora y optimización del proceso de mecanizado de la aplicación concreta.***

LEARNING ACTIVITIES	CH	NCH	TH
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning	4 h.	4 h.	8 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	10 h.	3 h.	13 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and/or oral tests or individual coding/programming tests	100%	Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 14 h.
NCH - Non-class hours: 7 h.
TH - Total hours: 21 h.

RMH138 **[!]** ***Conoce capacidades tanto cualitativas como cuantitativas de la modelización numérica y analítica***

LEARNING ACTIVITIES	CH	NCH	TH
Computer simulation exercises, individually and/or in teams	6 h.	5 h.	11 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	6 h.	5 h.	11 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and/or oral tests or individual coding/programming tests	100%	Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 12 h.
NCH - Non-class hours: 10 h.
TH - Total hours: 22 h.

CONTENTS

1. Introduction: presentation, objectives, program, generalities (1 hour)
2. Chip formation process (5 hours)
    1. Analytical, empirical, and numerical models.
    2. Sensitivity to different parameters: tool geometry, cutting conditions, piece and tool material.
    3. Experimental methodologies for the study of the cutting process.

3. Materials transformed in machining. Machinability (8 hours)
    1. Introduction: most significant materials
    2. Factors involved in machinability
    3. Machinability of steels and castings
    4. Machinability of Ti, Al, Cu, Ni alloys
    5. Easily machinable steels
    6. Machinability of composite materials and polymers
    7. Easily machinabile non-ferrous alloys.
    8. Part-tool material interaction, wear mechanisms
    9. Machinability characterization tests
4. Static and dynamic aspects of cutting studies (12 hours):
    1. Part
    2. Tool
    3. Clamping fixtures
    4. Forced vibrations and self-excited vibrations (chatter)
5. Stability maps. Reduction of vibration problems in machining
    1. Practical application: turning and milling
6. Simulation of the cutting process (15 hours)
    1. Basic description of the program
    2. Sensitivity to different parameters: cutting speed, feed, tool radius, rake angle.
    3. Operations: turning, milling, broaching
    4. Conclusions
7. New machining processes (5 hours)
    1. Hard turning
    2. Ecological machining: M.Q.L., dry...
    3. Assisted machining: LAM, Waterjet...
    4. Process integration: Grinding + hardening; Turning + tempering,...
    5. Micromachining-Nanomachining

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	Trent EM. Metal Cutting. Butterwoth-Heinemann; 1991.
Moodle Platform	MGEP. Jornadas de especialización en mecanizado. Mondragón; 2003.
Specific Master Software	Altintas Y. Manufacturing Automation. Cambridge University press; 2000.
Video projections	Shaw MC. Metal cutting principles. Oxford University Press, 2005.
Computer practical training	Tlusty J. Manufacturing processes and equipment. Prentice Hall; 1999.