PERSONA CIÈNCIA EMPRESA
Universitat Ramon Llull

TITLE OF COURSE: TECHNOLOGY OF MACHINE MANUFACTURING

MATTER: Mechanical Engineering
MODULE: Specific Technology
PROGRAM TITLE: Degree on Industrial Technologies Engineering

GENERAL CHARACTERISTICS*

Type: ☐ Basic training, ☑ Compulsory elective, ☐ Optional
☐ Final degree project, ☐ Practicum

Duration: Semiannual **Semester/s**: 7
Number of credits ECTS: 6
Language/s: Spanish, Catalan, English

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION (the meaning of the course in relation to the studies. Between 100 and 200 words.)

The Manufacturing Technology course is intended for students to acquire knowledge of current manufacturing processes. Emphasis on manufacturing automation, management and computer control and system integration. This gives access to current technologies for reverse engineering, metrology and quality control. Teaches additive manufacturing and its difference from traditional manufacturing technologies.
The course builds on the knowledge gained in Applied Mechanics, Strength of Materials, Theory of Machines, Materials Science Foundations, Calculating Machine Elements and Manufacturing Processes to integrate knowledge and apply to the manufacture of products.

COMPETENCES (of the course made in relation to preassigned competences in this area.)

• Ability to understand and apply the basic skills such as, among others: computer graphic expression, mechanics and materials, necessary for the practice of engineering. (E2)
• Knowledge of materials science and technology to enable them to learn new methods and theories, and to equip them with the versatility to adapt to new situations. (E3)
• Ability to communicate effectively, both orally and in writing, to transmit knowledge, skills and abilities in the field of industrial engineering. (T1)
• Ability to use English as a foreign language. (T2)
• Ability to understand the importance of working in a professional environment ethically responsible. (T7)
• Ability to develop learning skills necessary to undertake further studies and to recognize the need for ongoing training for appropriate professional development. (T8)
• Applied knowledge of systems and manufacturing processes, metrology and quality control. (TE11)

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PREREQUISITES* (modules, matters, courses and knowledge needed to follow the course. Can be stated that courses must have been completed.)
Competences of the earlier educational stages.

CONTENTS (as a relationship of the chapters that constitute the contents, or topics covered, of the course to a second level detail.)

1. Technologies and methodologies to automate the manufacture
2. Computer-aided manufacturing (CAM)
3. Flexible manufacturing
4. Computer Integrated Manufacturing (CIM)
5. Automated management of manufacturing
6. Advanced techniques of metrology. Reverse engineering
7. additive manufacturing
8. Control and Quality Management

METHODOLOGY

TRAINNING ACTIVITIES* (Complete the table relating activities, workload in ECTS credits, and competences.)

Training activities	ECTS Credits	Competences
Sessions presentation of concepts (A1)	1.2	E2, E3, T2, T7, TE11
Sessions for resolution of exercises, problems and cases (A2)	0.7	T1, TE11
Seminars (A3)	0.1	
Personal mandatory activities professor-student (A4)	0.05	E2
Practical work / laboratory (A5)	1.1	E2, TE11
Oral and writing presentations (A6)	0.05	T1, T2, TE11
Personal study activities by students (A7)	2.4	E2, E3, TE11
Evaluation activities (exams, tests,…) (A8)	0.2	E2, E3, TE11
Jobs (A9)	0.1	T1, TE11
Visits to companies (A10)	0.1	T8, TE11
TOTAL	**6**	

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EXPLANATION OF THE TEACHING METHODOLOGY (justifying the teaching methods used in relation to the competences and course contents. Between 100 and 200 words.)

The teaching methods used in the course is based on theoretical classes and practical problem solving combined with practice. Due to the technological profile of this course will be coordinated visits to manufacturing companies. The lectures and problem solving classes are linked with dynamic explanatory (presentation of content), dynamic demonstration (teacher solves a problem) and active dynamic (the student solves the problem). At the end of each class the student poses the problem to solve for a future class so as to promote the work outside the classroom.
Practical work is a guide written by the teacher where the student is oriented. The information in the guide is complete with literature search. Students must follow the guide information, practical activities involving do-preferably-group work and generates a report. The company visits the teacher coordinates with the company the purpose of the visit. Students have to make a report of the visit.
For the student's personal study provides the complete course with theory, problems, practices. It is also recommended additional exercises of the literature of the course.

EVALUATION

EVALUATION METHODS* (Fill in the table relating evaluation methods, competences and weight in the qualification of the subject.)

Evaluation Methods	Weight	Competences
Final Exam (A)	40%	E2, E3, TE11
Examination / s Partial / s / control / s scheduled / s (B)	15%	T1, E2, TE11
Activities done in class (C)	2%	E2, TE11
Exercises outside of class (D)	3%	E3, T1, TE11
Reports realizats work (E)	9%	T1, T7, T8, TE11
Presentations and / or oral examinations (F)	7,5%	E2, T1, T2, TE11
Modeling, Proposed, etc.. (G)	0%	
Laboratory reports (H)	5%	E2, T1, TE11
Practical work / lab (I)	15%	E2, TE11
Work in other centers (Practicum) (J)	0%	
Participations (K)	2%	T1

LEARNING OUTCOMES (Explanation of the achievements of students that allow competences evaluation, relating to competences and evaluation methods.)
• The student must demonstrate knowledge of the application of the automated management of manufacturing processes, knowledge of flexible manufacturing and computer integrated manufacturing. Demonstrate learn techniques for automated metrology and reverse

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engineering. See also demonstrate additive manufacturing and its difference from the traditional manufacturing techniques. (E2, E3, T1, T8, TE11) [A, B, C, E, F, G, H, I].
• The student must demonstrate the ability to program CNC machines to manufacture complex geometries and is able to understand the difference in design for additive manufacturing parts about designing for traditional manufacturing. (E2, E3, T1, T2, TE11) [A, B, C, E, F, G, H, I].
• The student must demonstrate knowledge of management techniques and quality management in manufacturing. (E2, E3, T1, T7) [A, B, C, E, F, G, H, I].

QUALIFICATION (Explanation of the calculation system of qualifying the course.)
The evaluation of the course will consider all aspects that appear in the evaluation grid with its corresponding weight. The brunt of the note falls on the Final Exam (A) 40%. Also included in the final results of the scheduled (B) 15%, activities in class (C) 2%, reports of work performed (E) 9%, Presentations and / or oral examinations (F) 7, 5%, laboratory reports (H) 5% and practical work / lab (I) 15% Participation (K) 2%. To pass the course you must have a minimum grade of four in all evaluations.

EVALUATION OF COMPETENCES (Defining expressions of calculation for each competence based on corresponding evaluations activities.)

For the evaluation of competencies (E2, E3, T1, TE11) in each of the evaluation activities a part of the note reflected the skills acquired. The ability to understand and apply the basic computer skills, graphic expression, mechanical and materials (E2) was evaluated in developing CNC programs using CAD / CAM software. E3 Competition is titrated with specific aspects of the final exam questions. Competition is measured T1 delimiting the ability to present and defend the work reports. T2 Competition submissions will be assessed in English language to demonstrate the ability to communicate in that language. T7 and T8 competencies will be assessed in reports of visits to companies and literature searches on topics. The competition will be measured TE11 specific sections of the final examination of the scheduled appointments, project, practices and presentations measuring knowledge of Manufacturing Technology. Each evaluation activity will have a maximum score of ten points will be divided into amounts to quantify the degree of acquisition of skills by the student.

TEXTBOOKS (recommended and accessible to students.)

1. Groover, M. P. “Fundamentos de manufactura moderna”. Ed.: Prentice Hall. 1997
2. Boothroyd, G. “Fundamentals of machining and machine tools”. 2ª edición. Ed.: Marcel Dekker. 1989
3. Gerling, H. “Alrededor de las máquinas herramientas”. 3ª edición. Ed.:Reverté. 2000
4. Lasheras, J. M. “Tecnología Mecánica y Metrotécnia”. Ed. :Donostiarra. 1997

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5. Peláez Vara, J. “Máquinas herramientas auxiliares” Colección La máquina herramienta. Centro E.N.CEDEL. 1993
6. Molera Solá, P. “Electromecanizado: Electroerosión y mecanizado electroquímico”. Barcelona. Ed.: Marcombo. 1989
7. LAMPRECHT, J. L. “ISO 9000 en la Pequeña y Mediana Empresa”. Ed.:AENOR. Madrid, 1996.
8. WALDNER, J. B. “CIM. Principles of Computer-Integrated Manufacturing”. Ed.: J. Wiley & Sons.
9. Shigley, J. E. “Diseño en Ingeniería Mecánica”. Ed.: McGraw-Hill. 2002

HISTORICAL DOCUMENT

EARLIER CHANGES
June 20, 2011, Dr. Guillermo Reyes Pozo

LAST REVISION

September 3, 2012, Dr. Guillermo Reyes Pozo