



## IDENTIFYING DATA

### Fundamentals of manufacturing systems and technologies

Subject	Fundamentals of manufacturing systems and technologies			
Code	V12G380V01305			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Diéguez Quintas, José Luís			
Lecturers	Areal Alonso, Juan José Ares Gómez, José Enrique Diéguez Quintas, José Luís Fenollera Bolívar, María Inmaculada Peláez Lourido, Gustavo Carlos Pérez García, José Antonio Prado Cerqueira, María Teresa			
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**General description** The educational aims of Foundations of Systems and Technologies of Manufacture, in his fundamental and descriptive appearances, centre in the study and the application of scientific knowledges and technicians related with the processes of manufacture of components and conjoint whose functional purpose is mechanical, as well as the evaluation of his dimensional precision and the one of the products to obtain, with a determinate quality. All this including from the phases of preparation until the ones of utilisation of the instruments, the tools, toolings, teams, machines tool and necessary systems for his realisation, in accordance with the norms and specifications established, and applying criteria of optimisation.

To reach the aims mentioned will give the following thematic educational:

- Foundations of dimensional metrology. Measure of length, angles, forms and elements of machines.
- Study, analysis and evaluation of the dimensional tolerances. Chain of tolerances. Optimisation of the tolerances. Systems of adjust and tolerances.
- Processes of conformed of materials by means of start of material, operations, scheme, teams and tooling
- Processes of conformed by means of plastic deformation, operations, scheme, teams and tooling
- Processes of conformed by \*moldeo, operations, scheme, teams and tooling
- Processes of conformed no conventional, operations, scheme, teams and tooling.
- Conformed of polymers, and other no metallic materials, operations, scheme, teams and tooling
- Processes of union and assembling, operations, scheme, teams and tooling
- Foundations of the programming of scheme with \*CNC, used in the mechanical manufacture.

## Skills

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
C15	CE15 Basic knowledge of production systems and manufacturing.
D2	CT2 Problems resolution.
D8	CT8 Decision making.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.
D17	CT17 Working as a team.
D20	CT20 Ability to communicate with people not expert in the field.

**Learning outcomes**

Expected results from this subject	Training and Learning Results	
(*)	C15	D2 D9 D10 D20
New	B3	C15 D2 D10
New		C15 D2 D8 D17
New	B3	C15 D2 D8 D9 D17 D20

**Contents**

Topic	
DIDACTIC UNIT 1. INTRODUCTION To THE TECHNOLOGIES And SYSTEMS OF MANUFACTURE.	Lesson 1. INTRODUCTION To THE ENGINEERING OF *FABRICACION. The productive cycle. Classification of industries. Technologies of manufacture.
DIDACTIC UNIT 2. *METROTECNIA.	Lesson 2. PRINCIPLES OF DIMENSIONAL METROLOGY. Introduction. Definitions and concepts. The International System of Units. Physical magnitudes that covers the Dimensional Metrology. Elements that take part in the measurement. Classifications of the methods of measure. Patterns. The chain of *trazabilidad. *Calibración. Uncertainty. Chain of *calibración and transmission of the uncertainty. Relation between tolerance and uncertainty. Expression of the uncertainty of measure in *calibración.  Lesson 3. INSTRUMENTS And METHODS OF MEASURE. Introduction. Patterns. Instruments of verification. Patterns *interferométricos. Principles of *interferometría. Instruments of direct measure. Methods and instruments of indirect measure.  Lesson 4. MEASUREMENT BY COORDINATES. MEASUREMENT BY IMAGE. SUPERFICIAL QUALITY. Machines of measurement by coordinates. Concept. Principles of the MMC. Classification of the machines. Main components of the MMC. Process to be followed for the development of a measure. Systems of measurement by image. Superficial quality. Methods of measure of the *rugosidad. Parameters of *rugosidad.

DIDACTIC UNIT 3.  
PROCESSES OF CONFORMED BY START OF  
MATERIAL

Lesson 5. INTRODUCTION To THE CONFORMED BY START OF MATERIAL.  
Introduction. Movements in the process of start of material. Factors to take into account in the election of the tool. Geometry of tool. Materials of tool. Mechanism of training of the shaving. Types of shavings. Power and strengths of court. Wear of tool. Criteria of wear of tool. Determination of the life of the tool. Flowed of court.

Lesson 6. TURNING: OPERATIONS, SCHEME And TOOLING.  
Introduction. Main operations in lathe. The machine-tool: the lathe. Main parts of the lathe. Setting or subjection of pieces. Typical tools of the lathe. Special lathes.

Lesson 7. MILLED: OPERATIONS, MACHINES And TOOLING.  
Introduction. Description and classification of the operations of milled. Parts and main types of \*fresadoras. Types of strawberries. Setting of the tool. Subjection of pieces. Different configurations of \*fresadoras.  
\*Fresadoras Special.

Lesson 8. MECHANISED OF HOLES And WITH RECTILINEAR MAIN MOVEMENT: OPERATIONS, MACHINES And TOOLING.  
Introduction to the operations of mechanised of holes. Punches.  
\*Mandrinadoras. General characteristics of the processes of mechanised with rectilinear main movement. \*Limadora. \*Mortajadora. \*Cepilladora.  
\*Brochadora. Saws.

Lesson 9. CONFORMED WITH ABRASIVE: OPERATIONS, MACHINES And TOOLING.  
Introduction to the operations of mechanised of holes. You grind abrasive. Operation of rectified. Types of \*rectificadoras. \*Honeado. \*Lapeado. Polishing. Burnished. \*Superacabado

Lesson 10. PROCESSES OF MECHANISED NO CONVENTIONAL.  
Introduction. The mechanised by electroerosion or \*electro-download. Mechanised electrochemical. Mechanised by laser. Mechanised by \*chorro of water. Court by arch of plasma. Mechanised by ultrasounds. Milled chemist.

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DIDACTIC UNIT 4.  
AUTOMATION And MANAGEMENT OF THE  
PROCESSES OF MANUFACTURE.

Lesson 11. NUMERICAL CONTROL OF MACHINES TOOL.  
Introduction. Advantages of the application of the \*CN in the machines tool. Necessary information for the creation of a program of \*CN. Manual programming of \*MHCN. Types of language of \*CN. Structure of a program in code ISO. Characters employed. Preparatory functions (G\_). Auxiliary functions (M\_). Interpretation of the main functions. Examples. Automatic programming in numerical control.

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DIDACTIC UNIT 5.  
PROCESSES OF CONFORMED OF MATERIALS IN  
LIQUID STATE And GRANULATE.

Lesson 12. GENERAL APPEARANCES OF THE CONFORMED BY FOUNDRY OF METALS.

Introduction. Stages in the conformed by foundry. Nomenclature of the main parts of the mould. Materials employed in the conformed by foundry. Flow of the fluid in the system of feeding. Solidification of the metals. Contraction of the metals. The \*rechupe. Procedure of calculation of the system distribution of \*colada. Considerations on design and defects in pieces melted.

Lesson 13. PROCESSES OF MANUFACTURE BY FOUNDRY.

Classification of the processes of foundry. \*Moldeo In sand. \*Moldeo In shell. \*Moldeo In plaster. \*Moldeo In ceramics. \*Moldeo To the CO<sub>2</sub>. \*Moldeo To the stray wax  
Foundry in full mould. \*Moldeo \*Mergast. \*Moldeo In permanent mould. Foundry injected. Foundry \*centrifugada. Ovens employed in foundry.

Lesson 14. METALLURGY OF DUSTS (\*PULVIMETALURGIA).

Introduction. Manufacture of the metallic dusts. Characteristics and properties of the metallic dusts. Dosage and mix of metallic dusts. \*Compactación. \*Sinterizado. Ovens of sintering. \*Sinterizado By download \*disruptiva. \*Presinterizado. Back operations. Considerations of design. Products \*obtenibles by sintering.

Lesson 15. CONFORMED OF PLASTICS.

Introduction. Polymeric material classification. Physical properties of polymers. Classification of the processes. \*Moldeo By extrusion. \*Moldeo By injection. \*Moldeo By compression. \*Moldeo By transfer. \*Moldeo Rotational. \*Termoconformado.

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DIDACTIC UNIT 6.  
PROCESSES OF CONFORMED BY UNION.

Lesson 16. PROCESSES OF WELDING.

Introduction to the processes of welding. Welding with electrical arch. Welding by resistance. Welding with oxygen and gas fuel. Welding with temperature of fusion of metal of lower contribution that the one of the metals to join.

Lesson 17. PROCESSES OF UNION And SETTING WITHOUT WELDING.

Processes of union by means of adhesive. Resistance to the adhesion. Conditions for the hit. Design of unions Types of adhesive according to origin and composition. Processes of mechanical union. Removable mechanical unions and permanent.

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DIDACTIC UNIT 7.  
PROCESSES OF CONFORMED BY PLASTIC  
DEFORMATION OF METALS.

Lesson 18. GENERAL APPEARANCES OF THE CONFORMED BY PLASTIC DEFORMATION.

Introduction. Curves of effort-deformation. Expressions of the deformation. Proof of the volume. Approximate models of the curve encourage real-natural deformation. State of flat deformation. Primary and secondary processes. Processes of work in hot and in cold. Conditions and control of the process.

Lesson 19. PROCESSES OF \*LAMINACIÓN And FORGES.

\*Laminación: Foundations; temperature of \*laminación; teams for the \*laminación in hot; characteristics, quality and tolerances of the products \*laminados in hot; \*laminación in cold. It forges: free; in matrix of impression; in press; by \*recalcado; header in cold; by \*laminación; in cold.

Lesson 20. EXTRUSION, \*EMBUTICIÓN And AFFINE.

Extrusion. Pulled of bars and tubes. \*Trefilado. Reduction of section. \*Embutición. \*Repujado In lathe. Attainable pieces by \*repujado: considerations of design. Forming by pulled. Forming with pads of rubber and with liquid to pressure. Forming to big power.

Lesson 21. CONFORMED OF METALLIC SHEET.

\*Curvado Or bent of sheets. \*Curvado With rollers. Conformed with rollers. \*Enderezado. \*Engatillado. Operations of cut of sheet.

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PROGRAM OF PRACTICES

Practice 1.- Utilisation of the conventional devices of metrology. Measurement of pieces using foot of normal king and of depths and micrometer of outsides and inner. Employment of clock comparator. \*Comprobación Of flat surfaces. Use of calibrate raise/does not happen, rules, squares and \*calas pattern. Measurement and \*comprobación of threads. Realisation of metric measurements and in English units.

Practice 2.-Indirect measurements. \*Comprobación Of a cone using rollers and a foot of king, measurement of a tail of \*milano using rollers, measurement of the angles of a double tail of \*milano and measurements using a rule of breasts. Direct measurements with goniometer.

Practice 3.- Machine of measurement by coordinates. Establish a system of coordinates. Check measures in piece, using a machine to measure by coordinates. Verify tolerances forms and position.

Practice 4.- Manufacture with machines conventional tools. Manufacture of a piece employing the lathe, the \*fresadora and the \*taladro conventional, defining the basic operations and realising them on the machine.

Practice 5.- Selection of conditions of computer-aided court. Realisation of leaves of process of three pieces using program of planning of Practical computer-aided processes 6, 7 and 8.- Initiation to the numerical control applied to the lathe and to the \*fresadora. Realisation of a program in \*CNC using a simulator, with the main orders and simpler; realising at the end diverse pieces so much in the lathe as in the \*fresadora of the classroom workshop.

Practice 9.- Welding. Knowledge of different teams of electrical welding. \*Soldeo Of different materials employed the technicians of electrode \*revestido, \*TIG and \*MIG.

**Planning**

	Class hours	Hours outside the classroom	Total hours
Lecturing	32.5	0	32.5
Laboratory practical	18	0	18
Objective questions exam	0	2	2
Laboratory practice	0	50	50

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

**Methodologies**

	Description
Lecturing	The theoretical classes will realise combining the explanations of blackboard with the employment of videos and presentations of computer. The purpose of these is to complement the content of aim them, interpreting the concepts in these exposed by means of the sample of examples and the realisation of exercises.
Laboratory practical	The practical classes of laboratory will realise in 9 sessions of 2 hours, except the students of the course bridge that will realise the practices in the 6 sessions that contemplates his particular schedule, in groups of 20 maximum students, and employing the available resources of instruments and machines, combining with the simulations by computer.

**Personalized assistance**

Methodologies	Description
Lecturing	
Laboratory practical	
Tests	Description
Objective questions exam	
Laboratory practice	

**Assessment**

Description	Qualification	Training and Learning Results

Objective questions exam	Type A test (for all students -75% final grade-) The character of this test is written and face-to-face, it is compulsory for all students, with or without continuous evaluation. It will be composed of 25 multiple choice questions on the theoretical and practical content. The evaluation of the multiple choice test will be carried out on a scale of 7.5 points, which represents 75% of the total mark, being necessary to obtain at least 2.5 points, so that together with the practical tests it is possible to obtain the minus 5 points and pass the subject. The grade for this test will be obtained by adding 0.3 points for each question answered correctly and 0.1 points will be deducted if the question is answered incorrectly. Blank questions do not score.	75	B3 C15 D8 D9 D10
Laboratory practice	Type B test (continuous assessment -15% final grade-): A test to be carried out in the practical class schedule consisting of carrying out a numerical control program that mechanizes the piece that is presented to you.  Type C test (continuous assessment -10% final grade-): A written test or work to be proposed by the teacher throughout the semester. This test will be valued with a maximum of 1 point, 10% of the final grade. The notes of tests A, B and C will be added, in order to obtain at least 5 points and pass the subject.  Type D test (waiver of continuous assessment, 25% final grade): Resolution of various practical problems, whose value will be 25% of the final grade, that is, a maximum of 2.5 points. It is necessary to obtain a minimum of 1 point in this test so that the qualification can be added to that of the type A test and to be able to obtain at least 5 points to pass the subject. This type D test will be carried out exclusively by students who have been granted the waiver of continuous assessment, and it will be carried out on the same day that the compulsory type A test is carried out, after it has finished.	25	C15 D2 D8 D9 D10 D17 D20

### Other comments on the Evaluation

#### PASSED

Qualified students through continuous evaluation:

To pass this subject it is necessary to obtain at least 5 points by adding the score of the tests types 'A', 'B' and 'C', in the conditions previously exposed.

Qualified Students Granted Waiver of Continuous Assessment:

To pass this subject it is necessary to obtain at least 5 points by adding the score of the 'A' and 'D' tests, under the conditions set forth in their respective sections.

#### ATTENDANCE TO THEORETICAL AND PRACTICAL CLASSES

Attendance at theoretical and practical classes is not mandatory, but what is taught in them will always be subject to examination.

#### PERFORMANCE OF CONTINUOUS ASSESSMENT TESTS

Carrying out these type 'B' and 'C' tests is not mandatory, but if they are not carried out, up to 2.5 points will be lost, which is the total value of these tests.

If these tests are carried out and the subject is not approved, its value is not saved from one course to another.

#### EXTRAORDINARY CALL (Minutes of 2nd edition / July)

Qualified students through continuous evaluation:

This second call will be graded as follows:

- By completing the mandatory type 'A' test.
- The qualifications of the type 'B' test are kept in this 2nd opportunity, but it will be possible, if desired, to improve this qualification, by carrying out a new machine tool programming test, which will be a test type, at the end of the type 'A' test.
- The score achieved in the type 'C' test will be maintained, but this mark can be improved if desired by means of a new written test or work, which will be similar, to be delivered on the date that is published, before the day of the call of this second edition.

To pass this subject it is necessary to obtain at least 5 points by adding the three previous tests and meeting the same minimum requirements as in the 1st edition.

The marks of the continuous evaluation tests, corresponding to 25% of the final grade, will not be kept from one course to another.

Qualified Students Granted Waiver of Continuous Assessment:

Students who do not carry out continuous assessment, because the center has accepted their resignation, must always take the type 'A' test and the type 'D' test, in the terms specified in the previous sections.

To pass this subject it is necessary to obtain at least 5 points by adding the two previous tests.

EXTRAORDINARY END-OF-CAREER CALL:

This test will be the same for all students and will consist of a type 'A' test and a type 'D' test, in the terms specified in the previous sections.

To pass this subject it is necessary to obtain at least 5 points by adding the two previous tests, fulfilling the same minimum requirements as in the ordinary calls.

ETHICAL COMMITMENT:

The student is expected to present an appropriate ethical behavior, free from fraud. In case of detecting unethical behavior (copying, plagiarism, use of unauthorized electronic devices...) it will be considered that the student does not meet the necessary requirements to pass the subject. In this case, the overall grade in the current academic year will be a fail (0.0).

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## Sources of information

### Basic Bibliography

### Complementary Bibliography

Dieguez, J.L.; Pereira, A.; Ares, J.E., **Fundamentos de fabricación mecánica,**

Alting, L., **Procesos para ingeniería de manufactura,**

De Garmo; Black; Kohser, **Materiales y procesos de fabricación,**

Kalpakjian, Serape, **Manufactura, ingeniería y tecnología,**

Lasheras, J.M., **Tecnología mecánica y metrotecnica,**

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## Recommendations

### Subjects that are recommended to be taken simultaneously

Materials science and technology/V12G350V01305

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## Other comments

Requirements: To enrol of this matter is necessary to have surpassed or be enrolled of all the matters of the inferior courses to the course to the that is \*emplazada this matter.

In case of discrepancies, will prevail the version in Spanish of this guide.