



## 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	Diéguez Quintas, José Luís Fenollera Bolívar, María Inmaculada Fernández Ulloa, Antonio Hernández Martín, Primo Queimaño Piñeiro, David			
E-mail	jdieguez@uvigo.es			
Web	http://moovi.uvigo.es			

**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.

## Training and Learning Results

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.

## Expected results from this subject

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 \*MHCHN. 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.

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.

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.

## 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 raisin/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	<p>It TESTS TYPE To (for all the students -60% final note-)</p> <p>The character of this proof is written and face-to-face, is compulsory for all the students, with or without continuous evaluation.</p> <p>It will be composed this proof by 20 ask type test on the theoretical and practical contents.</p> <p>The assessment of tests it type test will realise in a scale of 6 points, what represents 60% of the total note, being necessary to obtain at least 2 points, so that together with the practical proofs can obtain at least 5 points and surpass the matter The note of this test will obtain adding 0,3 points by each properly answered question and will subtract 0,1 points if the question is resolved of wrong form. The questions in white do not mark.</p>	39	B3 C15 D8 D9 D10
Laboratory practice	<p>It TESTS TYPE *B (continuous evaluation -30% final note-):</p> <p>Two test type test to realise in the schedule of class, consistent in 5 questions on the matter given until the moment, each correct question will cost 0,3 points and the wrong will subtract 0,1 points. The questions in white do not mark. Each proof will be therefore 15% of the final note.</p> <p>It TESTS TYPE C (continuous evaluation -10% final note-):</p> <p>A proof written or work to propose by the professor along the *cuatrimestre. This proof will value with a maximum of 1 point, 10% of the final note. These notes will add to the qualification of tests it type test, to be able to obtain at least 5 points and surpass the matter.</p> <p>It TESTS TYPE (renunciation to the continuous evaluation -40% final note-):</p> <p>Resolution of several practical problems, whose value will be 40% of the final note, or was at most 4 points, being necessary to obtain a minimum of 1 point in this second proof so that the qualification can add to the one of tests it type test, and if it equalises or surpasses 5 points, approve the matter.</p> <p>This tests type D, will realise it the students to which have conceded them the renunciation to the continuous evaluation, and will realise the same day that realise tests it compulsory test, after this have finalised.</p>	61	C15 D2 D8 D9 D10 D17 D20

#### Other comments on the Evaluation

<\*/p>APPROVED<\*/p><\*/p>Students described by means of continuous evaluation:<\*/p><\*/p>To surpass this matter is necessary at least obtain 5 points adding the punctuation of test them types □To□, □\*B□ and □C□. <\*/p><\*/p>All the students in principle will have to follow the procedure of continuous evaluation, except those that on purpose renounce in the term and form that mark the school. <\*/p><\*/p>&nbsp;Students described with renunciation conceded to the continuous evaluation:<\*/p><\*/p>To surpass this matter is necessary at least obtain 5 points adding the punctuation of test them types □To□ and □D□.<\*/p><\*/p>ASSISTANCE To PRACTICAL CLASSES<\*/p><\*/p>The assistance to practical classes is not compulsory, but will be always matter of examination the in them given.<\*/p><\*/p>ANNOUNCEMENT OF 2ª EDITION<\*/p><\*/p>Students with continuous evaluation, qualification in the announcement of 2ª edition:<\*/p><\*/p>&nbsp;This second edition of the ordinary announcement will describe as the following way: <\*/p><\*/p>- By means of the realisation of the compulsory proof type □To□ <\*/p><\*/p>- conserve the qualifications of the two test type □\*B□ in this 2ª opportunity, but will be able to , if it wishes , improve this qualification, by means of the repetition of these test type □\*B□ when finalising tests it type □To□.<\*/p><\*/p>- Will keep the punctuation reached in tests it type □C□ by maximum value of 1 point, but will be able to improve this note if it wishes by means of a proof written or work to propose by the professor, to deliver before the day of the announcement of this second edition.<\*/p><\*/p>To surpass this matter is necessary at least obtain 5 points adding the three previous proofs. <\*/p><\*/p>The notes of the proofs of continuous evaluation, corresponding to 40% of the final qualification, will not conserve of a course for another. <\*/p><\*/p>Students without continuous evaluation, qualification in the announcement of 2ª edition: <\*/p><\*/p>The students that do not realise continuous evaluation, due to the fact that the centre has accepted them the renunciation, always will have to realise in all the announcements tests it type □To□ (by value of 6 points) and tests it type □D□ (by value of 4 points), in the terms specified in the previous sections. <\*/p><\*/p>To surpass this matter is necessary at least obtain 5 points adding the two previous proofs. <\*/p><\*/p>EXTRAORDINARY ANNOUNCEMENT: <\*/p><\*/p>This proof will be equal for all the students and will consist in one tests it type □To□ (by value of 6 points) and tests it type □D□ (by value of 4 points), in the terms specified in the previous sections. <\*/p><\*/p>To surpass this matter is necessary at least obtain 5 points adding the two previous proofs. <\*/p><\*/p>ETHICAL COMMITMENT:<\*/p><\*/p>expects that the present student a suitable ethical behaviour, free of fraud. In case to detect a no ethical behaviour (copy, plagiarism, utilisation of unauthorised electronic devices, for example) will consider that the student does not gather the necessary requirements to surpass the matter. In this case the global qualification in the present academic course will be of suspense (0.0).<\*/p>

#### 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, Serope, **Manufactura, ingeniería y tecnología**,  
Lasheras, J.M., **Tecnología mecánica y metrotecnica**,

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### **Recommendations**

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#### **Subjects that are recommended to be taken simultaneously**

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Materials science and technology/V12G350V01305

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#### **Other comments**

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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.

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