



Universidad  
Politécnica  
de Cartagena



Centro  
Universitario  
de la Defensa

## Course Unit Description:

# PROJECTS OF INDUSTRIAL ENGINEERING

**Degree: Grado en Ingeniería de Organización Industrial**

**Course: 4º**

## 1. Subject Information:

<b>Name:</b>	PROJECTS OF INDUSTRIAL ENGINEERING				
<b>Course Field*</b>	INDUSTRIAL ENGINEERING PROJECT MANAGEMENT				
<b>Degree programme</b>	COMMON SUBJECTS				
<b>Code:</b>	511104001				
<b>Degree</b>	Grado en Ingeniería de Organización Industrial				
<b>Programme</b>	2009 (Decreto 269/2009 de 31 de julio)				
<b>Centre</b>	Centro Universitario de la Defensa en la Academia General del Aire				
<b>Type</b>	Compulsory				
<b>Duration</b>	Four month course	<b>Term</b>	1º	<b>Course</b>	4º
<b>Language</b>	English				
<b>ECTS</b>	4,5	<b>Horas / ECTS</b>	25	<b>Total Workload (hours)</b>	112,5

## 2. Teaching Staff contact details

Lecturer	José Luis Roca González		
Departament	Engineering and Applied Technologies		
Area of expertise	720 Engineering Projects		
Office location	Box nº16 CUD		
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URL / WEB	UPCT virtual class (www.upct.es)		
Office hours (for supervisions)	Tuesday & Thursday start at 10:00 to 14:00 and at 19:00 to 20:00. Other Schedule is possible by a appointment request through the virtual classroom web or e-mail.		
Office hours location (for supervisions)	Box nº16 at CUD Building		

<b>Academic and Research Profile</b>	Dual Use Technologies
<b>Teaching experience</b>	University Centre of Defence at the Spanish Air Force Academy Polytechnic University of Cartagena. Mancomunidad de Canales del Taibilla (The Ministry of Agriculture,

	Food and Environment ) Risk and labour Hazards Prevention.
<b>Research interests</b>	Double Use Technologies. Offset Projects, Industrial Engineering Projects, R&D+i Programmes. CAD-Simulation, Human Resources Analysis, Environmental Science.
<b>Professional experience</b>	Senior Electrical Project Designer. Explosive Atmosphere Designer Certificated by Ineris® Electrical Hospital Engineering. Heavy Machinery Manufacture Management. Risk and Hazard Prevention Engineer
<b>Additional Work frame</b>	Innovation Analysis, Product developer, Design Improvement, Simulation by software, 3d-print.

### 3. Subject Description

#### 3.1. General description

Project in Industrial Engineering is a course which main scope is to provide the theoretical and practical knowledge that are required by the industrial activity in order to achieve all the engineer competences in relationship with Industrial Engineering procedures and project management standards.

#### 3.2. How the subject contributes to the professional career

This course will developed the first professional skills of the students as future industrial engineers in relationship with the degree "Grado de Ingeniería de Organización Industrial". These skill involve to dominate the design, planning, control and supervision phases and the tasks and activities which are aimed to accomplished efficiently the project goals.

The requirements of management limited resources, cost, timing and Knowledge, R&D+i are the foundations of the Competitive Organization Improvement integration as today main survival frontier to enforce the industrial activity which is one of the future graduates mission and objective.

#### 3.3. Relationship with other subjects

This Subject belongs to a group that is built with other Industrial Engineering Subjects from technical science, scientific sciences, common subjects of this degree and under a multidisciplinary framework that answer the industrial needs where all the course knowledge is applied to reach the maximum productivity and efficiency range.

The Subject is interrelated with side by side and up to bottom subjects to guarantee the success of the full learning processes but it does no require any specific subject to be

passed before as a previous requirement.

#### **3.4. Incompatibilities defined in the programme**

Not Defined.

#### **3.5. Recommendations**

Follow the schedule provide by the professor at any time.

#### **3.6. Special Foreseen Measures**

It is highly recommend to attend to all the workshops and seminars which were summoned by the teacher in charge.

## 4. Competences and Learning Outcomes

### 4.1. Basic curricular competences related to the subject

### 4.2. General curricular competences related to the subject.

#### INSTRUMENTAL COMPETENCES

- ☒ T1.1 Analysis and synthesis skill
- ☒ T1.2 Skill for planning and decision making
- ☒ T1.3 Spoken and written communication in the native language
- ☐ T1.4 Knowledge of a foreign language
- ☒ T1.5 Basic Computational Abilities
- ☒ T1.6 Knowledge and data Management Capability.
- ☒ T1.7 Problem Solving
- ☒ T1.8 Decisions making.

#### PERSONAL COMPETENCES

- ☐ T2.1 Critical and self-critical ability
- ☒ T2.2 Team work
- ☒ T2.3 Interpersonal skills
- ☒ T2.4 Multidisciplinary Team Work Ability
- ☐ T2.5 Ability to communicate with experts in other field of knowledge.
- ☐ T2.6 Ability to deal with diversity and multiculturalism
- ☐ T2.7 Sensibility to Natural Environment Care
- ☒ T2.8 Ethic achievement

#### SYSTEMIC COMPETENCES

- ☒ T3.1 Ability to apply theory to practice
- ☒ T3.2 Learning ability
- ☒ T3.3 Ability to adapt to new situations
- ☒ T3.4 Ability to develop new Ideas
- ☐ T3.5 Leadership
- ☐ T3.6 Other cultures and other customs knowledge.
- ☒ T3.7 Ability to carry out the work by their own.
- ☐ T3.8 Initiative and entrepreneurial skill.
- ☐ T3.9 Concern about Quality assurance.
- ☐ T3.10 Achievement Motivation.

### 4.3. Specific curricular competences related to the subject

#### SPECIFIC ACADEMIC COMPETENCES

- ☒ E1.2k Applied Knowledge of Business Management.
- ☒ E1.3b Knowledge of work study, methods, planning, production management and project report.

#### PROFESSIONAL COMPETENCES.

- ☒ E2.1 Ability to develop Industrial Engineering projects and technical report.
- ☒ E2.2 Ability to lead and manage activities related with industrial engineering

framework.

- ☒ E2.3 Ability to solve problems, promote solutions, conclude decision taking processes, design thinking, critic reasoning and communication performance to transfer knowledge, abilities and other skills.
- ☒ E2.5 Ability to handle regulations, technical standards and other compulsory requirements
- ☒ E2.6 Ability to carry out high responsibility on the Organizations Chart and lead Management of Functional Business Areas as production, Budget Administration, Human Resources et al

#### 4.4. Transversal curricular competences related to the subject

See 4.2

#### 4.5. Subject learning outcomes\*\*

Once the course is finished, it is expected that the student achieve the next outcomes:

- 1) Earn the theoretical and practical knowledge needed to attend the industrial needs in relationship with industrial engineering and project management.
- 2) Own an academy methodology suitable to the professional planning, control and supervision reality.
- 3) Strengthen the ability to interact within multidisciplinary environments by putting together several knowledge domains to achieve the expected goals in terms of efficiency and competitive improvement of the professional labour.
- 4) Lead and promote the creativity into their professional environment.
- 5) Improve the analysis and summarize ability.
- 6) Have a good command on technical communications between several areas to achieve a common goal assuming for this purpose the responsibility defined at any time for the professional future development.

See other outcomes at point 4.2.

**\*\* see also the ANECA guideline to take into practices the learning evaluations processes.**

[http://www.aneca.es/content/download/12765/158329/file/learningoutcomes\\_v02.pdf](http://www.aneca.es/content/download/12765/158329/file/learningoutcomes_v02.pdf)

## 5. Contents

### 5.1. Contents according to the Degree Programme

All contents in relationship with Project Typologies, Industrial Guidelines, Regulations & Standards, Management, Viability Analysis, Project Execution, Industrial Labour Safety Practices, Project Management and Professional ethics have been group together under the next two main sections of the subject:

#### **SECTION I: INDUSTRIAL ENGINEERING PROJECTS.**

##### **BLOC I: BASIS AND PROJECT TYPOLOGIES.**

This Bloc follows to teach in detail the knowledge needed to develop any industrial project, from its first definition through the several typologies and up to the industrial engineering applications analysis.

##### **BLOC: R&D+i PROJECT (UNE 166002)**

Under this bloc are all the lectures units that describe the Research and Development plus innovations processes which are nowadays best tools to carry out the Organization Competitive improvement and the processes that support continuous improvement cycles.

##### **BLOC III: DEFENCE PROGRAMS AND PROJECTS.**

The Defence Block include the lectures that explain how the Ministry of Defence and all the stakeholder interact to develop defence programs and how they affect the Security and Defence Industry.

#### **SECTION II: PROJECT MANAGEMENT AND NEW PROJECT TOOLS**

##### **BLOC IV: "THEORETICAL PROJECT MANAGEMENT FRAMEWORK".**

This bloc includes all the lectures which explains the Kernez© focus on Project Management and the Project Management Institute Handbook and as a contrasts the lectures that explain the International Project Management Association guidelines.

##### **BLOC V: PROJECT MANAGEMENT TOOLS.**

The lectures under this bloc explains the most common software applications that gives support to nowadays PM Techniques.

##### **BLOC VI: 3D PRINTERS APPLIED TO DEFENCE PROGRAMMES DEVELOPMENT.**

The emerging 3D techniques are an interesting new opportunity to develop new knowledge for Defence Industry and therefore the main scope of the lectures at this bloc.

### 5.2. Theoretical Programme.

#### **SECTION I: INDUSTRIAL ENGINEERING PROJECTS.**

##### **BLOC I: BASIS AND PROJECT TYPOLOGIES.**

- 1) Typologies and definitions. Life cycle of the projects and initial considerations.
- 2) Technical Industrial Projects (Regulations, Guidelines, Best Practices, Formal Report).
- 3) Basic Project and Execution Projects.
- 4) Viabilities Analysis Projects.
- 5) Industrial Safety and other Project developemet in Hazards Preventions Projects.
- 6) Contracts and Projects Auditing.
- 7) Professional ethics

## **BLOC II: R&D+i PROJECT (UNE 166002)**

- 8) Innovation Management. UNE 166000 Standards.
- 9) General Documentations and Requirements of R&D+i development.
- 10) R&D+i Management Guidelines.
- 11) Resources Management for R&D+i.
- 12) R&D+i activities for R&D+i.

## **BLOC III: DEFENCE PROGRAMS AND PROJECTS.**

- 13) Singularities of the Defence Project Development Programms.
- 14) Acquisition Processes.
- 15) Offset Projects.

## **SECTION II: PROJECT MANAGEMENT AND NEW PROJECT TOOLS**

## **BLOC IV: "THEORETICAL PROJECT MANAGEMENT FRAMEWORK".**

- 16) The Project Manager under PMI & IPMA Scopes.
- 17) Project Integration.
- 18) Scope Statement, Human Resources, Timing and Cost Management.
- 19) Risk Project Control and Quality assurance.
- 20) Acquisitions management.
- 21) Communication Management.
- 22) Corporative Social responsibility.

## **BLOC V: PROJECT MANAGEMENT TOOLS.**

- 23) Changes Control on Project Chart to close projects.
- 24) Resources Management trough Software tools.

## **BLOC VI: 3D PRINTERS APPLIED TO DEFENCE PROGRAMMES DEVELOPMENT.**

- 25) 3d Printer systems
- 26) Modelling Software
- 27) Trends in 3d Print for Defence Applications.

## **5.3. Practical Programme**

### **SECTION I: INDUSTRIAL ENGINEERING PROJECTS.**

#### **BLOC I: BASIS AND PROJECT TYPOLOGIES.**

PR01: Preliminary Budgets Report. From a Case of study provide by the teacher, the student should be able to redact a budget report, for that purpose the student will use the online applications and the teacher guideline.

#### **BLOC II: R&D+i PROJECT (UNE 166002)**

PR02: R&D+i Report. The student will redact a professional report based on a case of study.

#### **BLOC III: DEFENCE PROGRAMS AND PROJECTS.**

PR03: Professional Report on UNE-ISO 21500 regulation. The student will have to analyze this regulation in relationship with Defence interest.



## **SECTION II: PROJECT MANAGEMENT AND NEW PROJECT TOOLS**

### **BLOC IV: "THEORETICAL PROJECT MANAGEMENT FRAMEWORK".**

### **BLOC V: PROJECT MANAGEMENT TOOLS.**

PR04: MSPROJECT. Follow the teacher msproject walkthrough for a case of study.

### **BLOC VI: 3D PRINTERS APPLIED TO DEFENCE PROGRAMMES DEVELOPMENT.**

PR05: 3D CAD. Workshop on 3d Printers and CAD design concepts changes.

## **5.4. Syllabus in English**

**UNIT I: BASICS AND TYPOLOGIES ANALYSIS ABOUT INDUSTRIAL ENGINEERING**

**UNIT II: RESEARCH AND INNOVATION PROJECTS (UNE 166002)**

**UNIT III: OFFSET PROGRAMS AND DEFENCE PROJECTS.**

**UNIT IV: "PROJECT MANAGEMENT.**

**UNIT V: PROJECT MANAGEMENT TOOLS.**

**UNIT VI: 3D PRINT TOOLS FOR DEFENCE APPLICATIONS**

## **5.5. Detailed description of learning goals for every teaching module**

Learning Goals:

- 1) To reach the theoretical and practice knowledge to attend any need of the industrial activity.
- 2) Develop an academy methodology suitable for the incoming future industry in terms of planning, control and supervision.
- 3) Acquire the ability to interact under multidisciplinary environments interacting different fields of knowledge to reach the goals defined previously.
- 4) Lead and promote the industrial creativity.
- 5) Improve the analysis and synthesis ability.
- 6) To be fluent in the use of technical language as a communication tool to reach the desire goals tanking the charge of the leader responsibility in relationship with the professional future development.

## 6. Teaching Methodology

6.1. Teaching Methodology *			
Activity *	Teaching techniques	Student workload	HOURS
Theoretical Classes	Expositive lesson.	<u>Attendance</u> : Active attendance is a must.	1,2
	Some lesson will use technical english language in order to approach the students to a real future framework.	<u>Non-attendance</u> : Individual Subject Study..	1,08
Practical Classes	Review of the Cases of study used by the teacher. Workshop and other seminars in relationship with the subject..	<u>Attendance</u> : Follow the practical schedule.	0,92
		<u>Non-attendance</u> : Write the report of each unit.	0,16
Individual Tutorials	Student's clearing up of doubts and queries upon request	<u>Attendance</u> : clearance of individual doubts and queries	0,2
		<u>Non-attendance</u> : Question answered through email..	
Final Course Report	Each student must work in a teamwork to achieve a goal defined by the teacher. Each student will be responsible of one section of the final report.	<u>Attendance</u> :. Oral exposition about the report results.	
		<u>Non-attendance</u> : Write the report and prepare all the graphical information requested.	0,9
Individual Assessment	written assessment	<u>Attendance</u> : Exam	0,04
			4,50

## 6.2. Learning Outcomes (4.5) / Learning Activities (6.1)

Learning Activities (6.1)	Learning Outcomes (4.5)									
	1	2	3	4	5	6	7	8	9	10
Expositive Lecturer	X	X				X				
Practical lesson and workshops	X	X				X				
Tutorials			X	X	X					
Final Report Exposition	X		X	X	X	X				
Exams.	X		X	X	X					
1) To reach the theoretical and practice knowledge to attend any need of the industrial activity. 2) Develop an academy methodology suitable for the incoming future industry in terms of planning, control and supervision. 3) Acquire the ability to interact under multidisciplinary environments interacting different fields of knowledge to reach the goals defined previously. 4) Lead and promote the industrial creativity. 5) Improve the analysis and synthesis ability. 6) To be fluent in the use of technical language as a communication tool to reach the desire goals tanking the charge of the leader responsibility in relationship with the professional future development.										

## 7. Metodología de evaluación

### 7.1. Assessment Criteria\*

Activity	Type		Assessment methods and criteria	Weight (%)	Assessed Learning Outcomes evaluated (4.5)
	Sumative *	Formative *			
<b>Partial Written Exam (optional)</b>	X		According to the time schedule, if the teachers considered appropriate for students, an optional partial exam will take place. To pass this probe the student may reach 5 points of 10 in order to validate this grade in relationship with the final exam.	24%	1,3,4,5 y T1.1, T1.2, T1.3, T1.6, T3.2
<b>Final Written Exam</b>		X	FINAL Global Exam. If the partial exam did not take place or if the student did not reach at least 5 points or if the student wants to improve his/her score, the he/she ought to pass a final global exam about all the subject programme. In this case the weighting will be 60% The final global exam, may include short	36% o el 60%*	1,2,6 y T1.1, T1.2, T1.3, T1.6, T3.2

			<p>type question, test with different options, short calculations, and any other options that will be mentioned on the final exam call.</p> <p>FINAL Exam.</p> <p>When the partial exam were offered and the student passed with a minimum of 5 points over 10 and he/she does not want to attend to the final global exam, a Final Exam about the rest of the subject will be call.</p> <p>In this case the final exam weighting is 36%</p>		
<b>Practical Handbook.</b>		X	<p>The students must write a report at each practical exercise at the teacher handbook . Any unauthorized copy will be a direct fail on the subject.</p> <p>The teacher handbook may be considered as optional when the teacher considered appropriate for the student learning, in this case the weighting will be assigned to the final report.</p>	15%	1,2,6 y T1.1, T1.5, T1.7, T1.8, T2.2, T2.3, T2.8, T3.2
<b>Final Course Report</b>		X	<p>Each student will write an individual section of the final course report and work with the rest of the team group to deliver a final course report.</p> <p>This report and its oral presentation in a interview with the teacher must take place before the final exam call.</p> <p>Any non authorized reference will be considered as a plagiarism and the student will fail the subject.</p>	25%	1,3,4,5,6 y T2.4, T2.8, T3.1, T3.2, T3.4, T3.5, T3.7

## 7.2. Control and Monitoring Methods

The Academy activity fill be followed by the teacher through individual interviews, called when necessary or while individual tutorial takes places. Some other techniques like virtual activity monitoring will be use through the "Virtual Classroom Application"

## 8 Resources and Bibliography

### 8.1. Basic Suggested Bibliography\*

- Teacher notes at the virtual classroom application. .
- Guide to the Project Management Body of Knowledge. Project Managment Institute. 5th edition. ISBN- 978-1-935589-67-9
- Fundamentos de la dirección y gestión de proyectos. Gómez-Senent Martínez, Eliseo González Cruz, Mari Carmen Poveda Bautista, Rocio Nº Edición: 1 / 20-06-2007 ISBN: 978-84-8363-128-7
- Guía práctica de aplicación del Código Técnico de la Edificación (CTE) Antonio Rubinos Fuentes, Jesús Manuel Rubio Alonso. AENOR (Asociación Española de Normalización y Certificación), 2009 ISBN: 978-84-8143-607-5

### 8.2. Supplementary Bibliography\*

- See the Virtual Classroom application.

### 8.3. Web and Other Resources

- Last year Notes.
- Código Técnico de la Edificación.
- Reglamentos de Instalaciones Industriales.
- Tramitación y legislación.
- Generador de Precios online.
- INSHT .Guías de Seguridad Establecimientos industriales.