



Universidad  
Politécnica  
de Cartagena



Centro  
Universitario  
de la Defensa

**General Air Force Academy**

# **Course unit description: Operations management**

**Degree/s: Industrial Organization Engineering**

## 1. Subject data

<b>Name</b>	OPERATIONS MANAGEMENT				
<b>Subject area</b>	Industrial Organization				
<b>Module</b>	Common material: Industrial Organization				
<b>Code</b>	511103001				
<b>Degree programme</b>	Industrial Organization Engineering Degree				
<b>Curriculum</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>Length of subject</b>	Annual course	<b>Semester</b>	both	<b>Course</b>	3 <sup>th</sup>
<b>Language</b>	Spanish/English				
<b>ECTS</b>	9	<b>Hours / ECTS</b>	25	<b>Total workload (hours)</b>	225

## 2. Lecturer data

<b>Lecturer in charge</b>	Juan Andrés Bernal Conesa		
<b>Department</b>	Department of Economics and Juridical Sciences		
<b>Knowledge area</b>	Economics - Business - Management		
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<b>Office hours</b>	to be determined		
<b>Location</b>	CUD, office 46		

<b>Qualification/Degree</b>	Business Management Ph.D
<b>Academic rank at CUD-UPCT</b>	Profesor ayudante-doctor
<b>Year of admission in CUD-UPCT</b>	2011
<b>Number of five-year periods (<i>quinquenios</i>) if applicable</b>	
<b>Research lines (if applicable)</b>	Management systems (quality, environment, occupational health and safety, production control), operations management and corporate social responsibility
<b>Number of six-year periods (<i>sexenios</i>) if applicable</b>	
<b>Professional experience (if applicable)</b>	Six years in the private sector as a consultant and advisor to companies an
<b>Other topics of interest</b>	Renewable energy and energy efficiency. Corporate Social Responsibility. Management Systems. Teaching Innovation

### 3. Subject description

#### 3.1. General description

The purpose of this course is to introduce concepts and models for effective and efficient operations management to the student. Its main objective is to analyze the role of production and operations management in the context of an organization, the relationship with other functional areas of the company and the analysis of different approaches to strategic and tactical decision making.

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

Production activity in companies is the rationale behind them. The company produces goods and / or services, putting on the market, and it must not only coordinate all elements that make up its operations but they interrelate with other activities such as finance, marketing ... The course addresses the knowledge of the functional area of production and operations at the company, providing students with the tools necessary for the management of production operations in the organization, considering two different but complementary aspects, strategic decisions and tactics.

Thus it is intended, therefore, to provide training on how major strategic and tactical decisions in the field of Operations Management and production management are established. Thus, the conclusion of this course, students should have acquired knowledge that will enable it to address the design and development of new products, processes and technologies; understand and develop production planning long, medium and short term; planning the production capacity of the company and its location; distribute space in relation to the set of resources owned by the company for its production activities, ie physical distribution; and, finally, to assimilate the quality and management philosophy.

#### 3.3. Relationship with other subjects in the programme

This course is related to the course "Economics and business administration" of 2<sup>nd</sup> year , which consists of a brief introduction to the production system. As well as Quantitative Methods 2<sup>nd</sup> year to apply optimization techniques for decision making. Moreover, it is relation with Quality Management of 4<sup>th</sup> year.

#### 3.4. Incompatibilities defined in the programme

There are not incompatibilities

#### 3.5. Recommendations to do the subject

There are not recommendations for this course.

#### 3.6. Special provisions

Special measures which combine studies of the subject with military training and aeronautics activities shall be adopted. In particular, groups of cooperative work/learning of students with limited availability will be made, promoting the monitoring of learning through programming of group and planning and delivery of exercises through the Virtual Class.

## 4. Competences and learning outcomes

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

KC1. Students must know and understand an area of study that has its basis in secondary education, for which advanced textbooks are used. In addition, students must also be acquainted with avant-garde knowledge of their area of study.

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

GC1. Ability to organize and manage companies and institutions, evaluating issues related to organizational behavior and resource management.

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

SC21. Identify concepts and models for effective and efficient management of operations.

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

CCC2. Teamwork

### 4.5. Subject learning outcomes

Students will acquire a set of conceptual, procedural skills and attitudes that will enable them to successfully develop and implement the various methods and management techniques of studied operations along the year, in the area of the productive system, being able: (1) to identify long and short term decisions in the area of operations of a company, (2) to identify sources of ideas for new products and to select the most suitable products, (3) to identify the basic characteristics of the different productive configurations and to select the most appropriate ones, according to economic and strategic criteria, (4) to design a production process, incorporating decision-making related to human and technical resources, plant distribution and capacity based on economic and strategic criteria, (5) project management, (6) select the location of the activity and (7) identify the problem of quality and the different alternatives for the design of its management system.

## 5. Contents

### 5.1. Curricular contents related to the subject

Capacity and location decisions. Lay-out. Product design. Short, medium and long term production planning. Project management

### 5.2. Theory syllabus (teaching modules and units)

#### **PART 1. STRATEGIC MANAGEMENT.**

- Unit 1. Introduction to operations management.
- Unit 2. Design and product development.
- Unit 3. Plant capacity and location.
- Unit 4. Processes and plant layout.
- Unit 5. Production systems. JIT and lean manufacturing.

#### **PART 2. TACTICAL AND OPERATIONAL MANAGEMENT**

- Unit 6. Production planning and scheduling.
- Unit 7. Project management.
- Unit 8. Inventory control and storage.
- Unit 9. Quality management.
- Unit 10. Maintenance.

### 5.3. Practice syllabus (name and description of every practical)

#### **PRACTICE 1: Balanced lines.**

The production or assembly lines (lines of Manufacture) are common configurations in production systems. In lines Manufacturing facilities are distributed in what is traditionally called product-oriented architecture, where jobs are organized by product or products to be manufactured, so that all products manufactured in the line remain largely the same sequence of operations. Therefore sometimes the distribution plant is organized by product through line balancing.

That is, the time it takes to perform a task on a machine must equal or be "balanced" with the time it takes to work in the following line machine manufacturing. Just as the time required for an employee of a workstation of the assembly line must be "balanced" with the time required for the employee that follows in the next workstation. Therefore practice is done relative to 21 tasks to manufacture a product and find its equilibrium.

#### **PRACTICE 2: Aggregate Planning.**

Aggregate planning refers to determine the capacity needs of both production quantity and production scheduling for an average period of 3-18 months calculate production ratios, employees, inventory and other controllable variables. Aggregate planning is connected with the planning of activities in the medium and long term. It is added in the sense that plans activities for homogeneous categories (product families) such as product volume or the number of customer service.

#### **PRACTICE 3: MRP**

The materials requirements planning (MRP) is a method to determine what, when and how many components and materials are required to meet a production plan and end

products on time.

#### PRACTICE 4: Inventory Management

The theory module and inventory systems (Inventory Theory and System) solves inventory control problems: problems of economic order quantity (EOQ), problems discount for order quantity, issues and problems periods simple probabilistic dynamic batch size ; and simulates and evaluates four inventory control systems: (s, Q), (s, S), (R, S) and (R, s, S).

The program is able to graphically display the cost analysis for the EOQ model and quantity discounts problems, develops and graphically shows the parametric analysis for the EOQ, quantity discount and problems of simple probabilistic periods.

Also graphically shows the profile of the EOQ, quantity discounts, lot size and four inventory control systems.

To become familiar with the program we will solve a problem EOQ.

#### PRACTICE 5: PROJECT MANAGEMENT (I). Critical Path Method (CPM).

The general idea of CPM method is to show the interdependence between project tasks in a graph and determine the critical path, understanding this as "the sequence of activities that determines the longest path through the network and determines the minimum time that the project can be concluded ".

#### PRACTICE 5: PROJECT MANAGEMENT (II). PERT.

The general idea of PERT method is to build a probabilistic model from CPM model that allows us to consider the variability inherent in this type of problems.

### **Risk prevention**

Promoting the continuous improvement of working and study conditions of the entire university community is one the basic principles and goals of the Universidad Politécnica de Cartagena.

Such commitment to prevention and the responsibilities arising from it concern all realms of the university: governing bodies, management team, teaching and research staff, administrative and service staff and students.

The UPCT Service of Occupational Hazards (*Servicio de Prevención de Riesgos Laborales de la UPCT*) has published a "Risk Prevention Manual for new students" (*Manual de acogida al estudiante en materia de prevención de riesgos*), which may be downloaded from the e-learning platform ("Aula Virtual"), with instructions and recommendations on how to act properly, from the point of view of prevention (safety, ergonomics, etc.), when developing any type of activity at the University. You will also find recommendations on how to proceed in an emergency or if an incident occurs.

Particularly when carrying out training practices in laboratories, workshops or field work, you must follow all your teacher's instructions, because he/she is the person responsible for your safety and health during practice performance. Feel free to ask any questions you may have and do not put your safety or that of your classmates at risk.

## **5.4. Theory syllabus in english (teaching modules and units)**

### **PART 1. STRATEGIC MANAGEMENT.**

Unit 1. Introduction to operations management.

- Unit 2. Design and product development.
- Unit 3. Plant capacity and location.
- Unit 4. Processes and plant layout.
- Unit 5. Production systems. JIT and lean manufacturing.

## **PART 2. TACTICAL AND OPERATIONAL MANAGEMENT**

- Unit 6. Production planning and scheduling.
- Unit 7. Project management.
- Unit 8. Inventory control and storage.
- Unit 9. Quality management.
- Unit 10. Maintenance.

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

### **SECTION 1. STRATEGIC MANAGEMENT..**

#### **Unit 1. Introduction to operations management.**

- a. Define operations management.
- b. Explain difference between goods and services
- c. Being able to identify the decisions in the area of operations of a company differentiating the long and short term based on their strategic or operational nature
- d. Explain difference between production and productivity
- e. Calculate productivity of a single factor and multiple factors.
- f. Identify critical variables to improve productivity

#### **Unit 2. Design and product development.**

- a. Define product life cycle
- b. Describe product development system
- c. Describe how products and services are defined
- d. Describe client participation in the design and production services.
- e. Describe system redesign and improvement of products.
- f. Identify sources of ideas for new products and selection of the most suitable products, based on economic criteria and strategic

#### **Unit 3. Capacity long term and plant location.**

- a. Define productive, theoretical, actual capacity utilization rate
- b. Define efficiency.
- c. Identify and explain the factors affecting the location.
- d. Complete an analysis of the equilibrium point of the location of graphically and mathematics
- e. Apply decision-making tools for installation location.
- f. Using the method of center of gravity.
- g. Using the method Electre
- h. Using the AHP method
- i. Selecting the location of the activity.

#### **Unit 4. Process and plant layout.**

- a. Analyze the most important aspects of plant layout.
- b. identify the basic characteristics of the different production configurations

- c. select the most appropriate based on economic criteria and strategic
- d. Knowing Systematic method Layout Planning (SLP)
- e. Make a distribution plan by the SLP method.
- f. Designing a production process, incorporating decision making related to resources (technical and human), plant layout and capacity.

**Unit 5. Productive systems. JIT and lean manufacturing.**

- a. Define oriented product distribution.
- b. Define workcell and requirements.
- c. Balance production lines.
- d. identify the basic characteristics of the various production settings and select the best one based on economic and strategic criteria.
- e. Define the concepts of "just in time" operations and "slim".
- f. Define the 7 types of waste which TPS and 5S
- g. Explain the principles of the Toyota Production System.
- h. Identify quality issues and alternatives for the design of its management system in the area of operations of a company

**BLOCK 2. TACTICAL AND OPERATIONAL MANAGEMENT.**

**Unit 6. planning and production scheduling.**

- a. Define the concept of aggregate planning.
- b. Identify alternative strategies to develop an aggregate plan.
- c. Prepare an aggregate plan
- d. Develop a product structure.
- e. Develop a plan for net requirements
- f. Determine the lot size
- g. Describe the MRP
- h. Describe an ERP
- i. Identify the basic characteristics of the different production settings and select the best one based on economic criteria and strategic

**Unit 7. Management projects.**

- a. Create a work breakdown structure.
- b. Activities draw networks nodes and arrows activities.
- c. Determining a critical path.
- d. Calculate the variance for activity times
- e. Being able to know the probability of completing a project on time.
- f. Design a process incorporating making decisions related to resources (technology and human factor)

**Unit 8. Inventory control and storage.**

- a. Perform an ABC analysis.
- b. Explain and use the EOQ model with independent demand inventory.
- c. Calculate the reorder point
- d. Explain the concept of inventory security
- e. Applying the model of economic quantity to be produced

- f. Explain and use the sample quantity discounts.
- g. Understanding the level of service models and probabilistic inventory.
- h. Identify quality issues and alternatives for the design of its management system in the area of operations of a company

**Unit 9. The quality management.**

- a. Defining quality and TQM
- b. Describe the international quality standards
- c. Meet quality systems defense ministry
- d. Meet the seven tools of total quality explain the purpose of a quality control chart
- e. Build charts and graphs x R.
- f. Build graphs p
- g. Identify quality issues and alternatives for the design of its management system in the area of operations of a company

**Unit 10. Maintenance.**

- a. To determine the reliability of a system
- b. Determining the MTBF described as the reliability of a system is improved.
- c. Distinguish between preventive maintenance and corrective. Describe how maintenance is improved.
- d. Compare costs of preventive versus corrective maintenance.
- e. Identify the basic characteristics of the different production settings and select the best one based on economic criteria and strategic

## 6. Teaching method

<b>6.1. Teaching method</b>			
<b>Teaching activity</b>	<b>Teaching techniques</b>	<b>Student workload</b>	<b>ECTS</b>
<b>Lectures</b>	Lectures using short-lived cooperative learning techniques. Solution of doubts raised by students. Issues of complexity and the most relevant aspects will be addressed.	<u>In-class</u> : Attendance and participation	<b>2</b>
		<u>Self-study</u> :: Study of the course.	<b>2,9</b>
<b>Class of problems. Troubleshooting type and case studies</b>	Problem solving and analysis of case studies guided by the teacher.	<u>In-class</u> : Active participation. Solving exercises. Doubts exposition.	<b>1,6</b>
		<u>Self-study</u> : Study of the course. Solving of exercises proposed by the teacher.	<b>0,63</b>
<b>Problems seminars and other activities of cooperative learning</b>	Activities of cooperative work in which students work in groups to solve a set of problems, questions, and clarify concepts.	<u>In-class</u> : Exposition to problems to the class or to groups. Explanation of the method of resolution to colleagues. Discussion of questions and sharing of the work done.	<b>1</b>
<b>Individual and group tutorials</b>	The tutorials will be individual or in group, in order to supervise individual or group learning. Review of problems by the groups and motivation for learning.	<u>In-class</u> : Troubleshooting group tutoring (10 students). Individual tutoring of query theory questions and problems.	<b>0,3</b>
		<u>Self-study</u> : Exposition of questions by e-mail	<b>0,27</b>
<b>Exams</b>	There will be a written exam.	<u>In-class</u> : Exam attendance	<b>0,3</b>
<b>TOTAL</b>			<b>9</b>



## 7. Assessment method

### 7.1 Assessment method

Assesment activity	Type		Assessment methods and criteria	Percentage (%)	Assessed learning outcomes (4.5)
	Summative	Formative			
<b>written examination (PEI) <sup>(1) (2)(4)</sup></b> <b>(70 % final note)</b>		*	<b>Theoretical-practical and/or theoretical questions:</b> individual learning of specif contents will be evaluated.	<b>±50 % exam</b>	<b>1,2,3,4,5,6,7</b>
		*	<b>Problems and/or case studies:</b> between 1 and 4 problems and/or practical cases. He is evaluated mainly the ability to apply knowledge in practice and the capacity for analysis.	<b>±50 % exam</b>	<b>1,2,3,4,5,6,7</b>
<b>Work, participation in class, exhibitions <sup>(3)(4)</sup></b> <b>(30 % final note)</b>	*	*	Evaluates participation in class, contribution to discussion topics, teamwork, presentations, capacity for innovation, critical evaluation of exposed presentations.	<b>30 % final note</b>	<b>3,4,5,6,7</b>

(1) It is necessary to obtain at least a score of 4 points of 10 in each of the written exams in order to add that marks to the rest. If the score is lower the student will fail the course and will have to take all exams again in the next call.

(2) The characteristics and conditions of the exam will be specified in the call for the exam.

(3) They must comply with the headings/criteria of quality. Attitude and behavior will be also taken into account. The completion of practical work is mandatory to pass the subject and must be delivered on the established date. The mark obtained in the practical exercises will be maintained until the next call for the exam.

(4) The irregular actions that can lead to significant variation in the rating of one or more students, shall constitute a fraudulent conduct an assessment act and behave a rating qualitative as fail and numerical 0 in the corresponding call to the students involved regardless of the disciplinary process that could instruct.

As set forth in article 5.4 of the *Reglamento de las pruebas de evaluación de los títulos oficiales de grado y de máster con atribuciones profesionales (UPCT)*, students in the special circumstances listed in the article 5.4 are entitled to a comprehensive assessment test, upon justified request which must be granted by the Department. This does not exempt them from carrying out compulsory tasks included in the teacher's guide of the subject (official syllabus).

### 7.2. Control and monitoring methods (optional)

Monitoring of learning will take place through any of the following mechanisms:

- A review to test the level of knowledge of the students on the course contents, as well as the presentations of practical cases by the students-questions in class and resolution of

problems.

- Participation in the analysis of news of interest discussed at class-level
- Involvement in team work presentations argumentation of group and individual assignments
- Argumentation in discussions forum

Supervision during of face-to-face teamwork session and review of the problems proposed to be done in group students attitude individual and group tutorials.

## 8. Bibliography and resources

### 8.1. Basic bibliography

Domínguez Machuca, J.A. et al. (1995): Dirección de Operaciones. Aspectos Estratégicos en la producción y en los servicios. Mcgraw-Hill, Madrid.

Domínguez Machuca, J.A. et al. (1995): Dirección de Operaciones. Aspectos tácticos y operativos en la producción y en los servicios. Mcgraw-Hill, Madrid.

Heizer, J. y Render, B. (2009): Principios de administración de operaciones. Prentice-Hall.

Heizer, J. y Render, B. (2008): Dirección de la producción y de operaciones. Decisiones tácticas. Prentice-Hall

Muther, R. (1968). Planificación y proyección de la empresa industrial (Método SLP). Editorial Técnicos Asociados S.A., Barcelona (España).

Muther, R. (1981). Distribución en planta. Segunda Edición. Editorial Hispano-Europea. Barcelona (España).

Slack, N. et al (2007) Operations Management. Prentice Hall. Harlow , England.

### 8.2. Supplementary bibliography

Cuatrecasas, L. (2011): Organización de la producción y dirección de operaciones. Editorial Díaz de Santos, Madrid

Chase, R.; Jacobs, F . y Aquilano, N. ( 2009) ADMINISTRACIÓN DE OPERACIONES. Producción y cadena de suministros. Duodécima edición. McGraw Hill Educación

Companys, R. y Corominas, A. (1998). Organización de la producción. Diseño de sistemas productivos. Ediciones UPC.

Palacios, T. M. (2005): Manual de dirección de operaciones. Ed. Thomson, Madrid.

Miranda González, F.J. *et al.* (2005). Manual de dirección de operaciones. Ed. Thomson, Madrid.

### 8.3. On-line resources and others

Aula virtual

Software POM for Windows 3.0