4th Year

Elective Courses

1. 55000060 – Corporate and Professional Communication
2. 55000061 – Corporate Social Responsibility
3. 55000063 – Leadership
4. 55000064 – Discover your Creativity
5. 55000066 – Physical Systems Analysis using Octave
6. 55000067 – Tools for Data and Information Management
7. 55000068 – Dynamic Web Development
8. 55000069 – Application of Finite Element Analysis to Machine Design using Catia and NX
9. 55000070 – Computer Aided Design
10. 55000071 – Geographic Information Systems
11. 55000072 – Graphic Programming in Labview applied to Electrotechnics
12. 55000435 – Android Programming
Course Syllabi. Elective courses

55000060 - CORPORATE AND PROFESSIONAL COMMUNICATION

<table>
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<tr>
<td>COURSE COORDINATOR:</td>
<td>Mercedes Grijalvo</td>
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<td>Elective</td>
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<td>YEAR AND SEMESTER:</td>
<td>4th Year / Spring</td>
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</table>

LIST OF TOPICS

MODULE 1. Introduction to the communication process

MODULE 2. Working Sessions

- 1) Communicating in Writing: reports, memoranda, and e mail
- 2) Interpersonal communication and nonverbal communication.
- 3) Oral communication: Presentations, use of graphics and animation
- 4) Persuasive presentations, the elevator pitch
- 5) Communication in search of work: interviews, resumes and cover letters
- 6) Social networks, LinkedIn
- 7) Active Listening

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

SPECIFIC OUTCOMES FOR THE COURSE

At the end of the course, the student will be able to (or will have ability for):

• NO QUERY SPECIFIED

STUDENT OUTCOMES

• ABET_G. An ability to communicate effectively.

Student outcomes according to the Spanish official definition of the program: PO5

BIBLIOGRAPHY
**TEXT BOOKS**


**OTHER MATERIALS**

55000061 - CORPORATE SOCIAL RESPONSABILITY

CREDITS: 3 ECTS
DEPARTMENT: Industrial Management, Business Administration and Statistics (MAS)
COURSE COORDINATOR:
TYPE: Elective
YEAR AND SEMESTER: 4th Year / Spring

LIST OF TOPICS

MODULE 1. The view from society

• 1) Approaches to CSR, globalization and CSR, CSR, Public Administration and third sector, CSR and citizenship, the role of engineering in sustainability.

MODULE 2. The view from the company

• 2) Organizational analysis
• 3) Management Framework
• 4) An approach by sector (power, ICT, transport, distribution, construction ....)

MODULE 3. The vision of the professionals

• 5) Trends of professional knowledge. CSR culture as a motivator. The process of change and the role personas. Mi engineer

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:
TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

SPECIFIC OUTCOMES FOR THE COURSE

At the end of the course, the student will be able to (or will have ability for):

STUDENT OUTCOMES

• ABET_F. An understanding of professional and ethical responsibility.
• ABET_H. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
• ABET_J. A knowledge of contemporary issues.

Student outcomes according to the Spanish official definition of the program: PO3, PO4, PO5

BIBLIOGRAPHY

Course Syllabi. Elective courses
TEXT BOOKS

OTHER MATERIALS

55000063 - LEADERSHIP

CREDITS: 3 ECTS
DEPARTMENT: Industrial Management, Business Administration and Statistics (MAS)
COURSE COORDINATOR: 
TYPE: Elective
YEAR AND SEMESTER: 4th Year / Spring

LIST OF TOPICS

MODULE 1. Bases Leadership
- 1) What is a leader? Can you be trained to be a leader?
- 2) Basic characteristics of a leader
- 3) Leadership and management

MODULE 2. Classical Theories of Leadership
- 4) Trait Theory
- 5) Behavioral Theories

MODULE 3. Contingency theories
- 6) Fiedler model
- 7) Theory Situational Leadership Hersey and Blanchard
- 8) Theories: Road-Meta; LMX and Decisional Participation

MODULE 4. Inspirational Leadership
- 9) Transformational Leadership
- 10) Transactional leadership
- 11) Visionary and charismatic leadership

MODULE 5. Teamwork
- 12) Work environment
- 13) Oral communication
- 14) Leadership Team

MODULE 6. Other aspects
- 15) Causes of failure of leadership
- 16) Effective leader

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:
COURSE: 
TOPIC: Basic knowledge of Business Administration

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

SPECIFIC OUTCOMES FOR THE COURSE
At the end of the course, the student will be able to (or will have ability for):

**STUDENT OUTCOMES**

- ABET_D. An ability to function on multidisciplinary teams.
- ABET_E. An ability to identify, formulate, and solve engineering problems.
- ABET_F. An understanding of professional and ethical responsibility.
- ABET_G. An ability to communicate effectively.
- ABET_H. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- ABET_I. A recognition of the need for, and an ability to engage in life-long learning.
- ABET_J. A knowledge of contemporary issues.
- ETSII_8. The ability to work in a bilingual context (English-Spanish).
- ETSII_9. Organization and planning in a company context and in the context of other institutions, project organisations and human resources.
- ETSII_10. The capacity to generate new ideas (creativity).

Student outcomes according to the Spanish official definition of the program: PO3, PO4, PO5, PO6

**BIBLIOGRAPHY**

**TEXT BOOKS**

Liderazgo. La Esencia
**Tom Peters** Editorial Pearson Educación, 2005

La experiencia del liderazgo
**DAFT, R. L.** Editorial Cengage Learning Editores, 2006

Total Leadership: Be a Better Leader, Have a Richer Life
**Stewart D. Friedman** Editorial Harvard Business Press, 2008

Liderazgo basado en resultados
**ULRICH, D., ZENGER, J. Y SMALLWOOD, N** Editorial Gestión, 2000

Management (Administración)
**Stephen P. Robbins & Mary K. Coultier** Editorial Prentice-Hall, 2008

**OTHER MATERIALS**

- Artículos de revistas especializadas y diarios
- Biblioteca
- Transparencias con el contenido de la asignatura
- Internet
- Videos
**55000064 - DISCOVER YOUR CREATIVITY**

**CREDITS:** 3 ECTS  
**DEPARTMENT:** Industrial Management, Business Administration and Statistics (MAS)  
**COURSE COORDINATOR:**  
**TYPE:** Elective  
**YEAR AND SEMESTER:** 4th Year /

**LIST OF TOPICS**

**MODULE 1. Understands creativity**
- 1) The innovation machine  
- 2) Importance of active observation  
- 3) Reframing Problems  
- 4) Connect and combine  
- 5) Challenging assumptions

**MODULE 2. Understands creativity**
- 6) Creative Intelligence  
- 7) The creative class  
- 8) Creativity and competition  
- 9) The approach of the right brain

**MODULE 3. Analysis of creativity**
- 10) Case studies  
- 11) Support Tools  
- 12) Integration of emotions

**MODULE 4. Internalization of creativity**
- 13) Individual creative profile  
- 14) Skills for creativity  
- 15) Action Plan

**RECOMMENDED COURSES OR KNOWLEDGE**

**RECOMMENDED PREVIOUS COURSES:**

**COURSE:**  
**TOPIC:**

**RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:**

**SPECIFIC OUTCOMES FOR THE COURSE**

At the end of the course, the student will be able to (or will have ability for):

**STUDENT OUTCOMES**
• ABET_E. An ability to identify, formulate, and solve engineering problems.
• ETSII_10. The capacity to generate new ideas (creativity).

Student outcomes according to the Spanish official definition of the program:

BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS
### 55000066 - PHYSICAL SYSTEMS ANALYSIS USING OCTAVE

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### LIST OF TOPICS

**MODULE 1. Introduction to Octave**
- 1) Installation and Introduction to Octave and Matlab
- 2) Basics of programming in Octave and Matlab: Language M
- 3) Graphics Octave / Matlab and input / output

**MODULE 2. Linear static Mechanical Systems**
- 4) Lagrangian Mechanics Basics
- 5) Static models of simple mechanical elements in two and three dimensions
- 6) Connectivity and graphical representation: complex mechanical models
- 7) Linear static mechanical systems: equations, resolution Octave / Matlab and graphical representation
- 8) Equilibrium analysis

**MODULE 3. Linear Dynamic Mechanical Systems**
- 9) Dynamic models of simple mechanical elements in two and three dimensions
- 10) Linear dynamics of mechanical systems: equations, solving in Octave / Matlab and graphical representation
- 11) Application to a specific mechanical system

### RECOMMENDED COURSES OR KNOWLEDGE

#### RECOMMENDED PREVIOUS COURSES:

- COURSE:  
- TOPIC:  

#### RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

### SPECIFIC OUTCOMES FOR THE COURSE

At the end of the course, the student will be able to (or will have ability for):
- Ability to use the techniques, skills and modern engineering tools necessary for engineering practice

### STUDENT OUTCOMES

---

Course Syllabi. Elective courses
• ABET_A. An ability to apply knowledge of mathematics, science, and engineering.
• ABET_B. An ability to design and conduct experiments, as well as to analyze and interpret data.
• ABET_D. An ability to function on multidisciplinary teams.
• ABET_E. An ability to identify, formulate, and solve engineering problems.
• ABET_I. A recognition of the need for, and an ability to engage in life-long learning.
• ABET_K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
• ETSII_10. The capacity to generate new ideas (creativity).

Student outcomes according to the Spanish official definition of the program: PO1, PO2, PO3, PO5, PO6, PO7

BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS
55000067 - TOOLS FOR DATA AND INFORMATION MANAGEMENT

CREDITS: 3 ECTS
DEPARTMENT: Industrial Management, Business Administration and Statistics (MAS)
COURSE COORDINATOR:
TYPE: Elective
YEAR AND SEMESTER: 4th Year

LIST OF TOPICS

MODULE 1. Spreadsheets
MODULE 2. Task automation. VBA
MODULE 3. Data bases

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:
TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

SPECIFIC OUTCOMES FOR THE COURSE

At the end of the course, the student will be able to (or will have ability for):

• Learn a work methodology in Excel and VBA
• Automate operations in spreadsheets via VBA macros
• Learn Structured Query Language (SQL)
• Know the basics of databases

STUDENT OUTCOMES

• ABET_K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
• ETSII_8. The ability to work in a bilingual context (English-Spanish).

Student outcomes according to the Spanish official definition of the program: PO7

BIBLIOGRAPHY

Course Syllabi. Elective courses
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55000068 - DYNAMIC WEB DEVELOPMENT

CREDITS: 3 ECTS

DEPARTMENT: Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AEE)

COURSE COORDINATOR: Raquel Martínez Fernández

TYPE: Elective

YEAR AND SEMESTER: 4th Year /

LIST OF TOPICS

MODULE 1. Active client pages

1) HTML 5 language.
2) Cascade Style Sheets (CSS3).
3) JavaScript programming.
4) jQuery Library - AJAX Technology.

MODULE 2. Active server pages

5) Installation and use of development tools: Apache web server, PHP interpreter, phpMyAdmin.
6) PHP language: treatment of forms and files.
7) Data bases: MySQL. Using MySQL from PHP.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Programming on C

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

SPECIFIC OUTCOMES FOR THE COURSE

At the end of the course, the student will be able to (or will have ability for):

STUDENT OUTCOMES

• ABET_D. An ability to function on multidisciplinary teams.
• ABET_E. An ability to identify, formulate, and solve engineering problems.
• ABET_K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
• ETSII_8. The ability to work in a bilingual context (English-Spanish).
• ETSII_10. The capacity to generate new ideas (creativity).

Student outcomes according to the Spanish official definition of the program: PO3, PO7

BIBLIOGRAPHY

Course Syllabi. Elective courses
**TEXT BOOKS**

**OTHER MATERIALS**
# 55000069 - APPLICATION OF FINITE ELEMENT ANALYSIS TO MACHINE DESIGN USING CATIA AND NX

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## LIST OF TOPICS

### MODULE 1. Modeling and assembly
- 1) Introduction to solid design with CATIA
- 2) Introduction to solid design with NX
- 3) Introduction to CATIA assembly
- 4) Introduction to the assembly with NX

### MODULE 2. Simulation of Mechanisms
- 5) CATIA simulation mechanisms
- 6) NX simulation mechanisms

### MODULE 3. Structural Analysis and Design
- 7) Structural analysis using CATIA
- 8) Structural analysis using NX
- 9) Dynamic analysis using CATIA
- 10) Dynamic analysis using NX

### MODULE 4. Thermal Analysis and Fluidic
- 11) Thermal analysis: steady with NX
- 12) Thermal Analysis: Transitional arrangements with NX
- 13) Thermomechanical analysis with NX and CATIA
- 14) Fluidic analysis: Fundamentals with NX

## RECOMMENDED COURSES OR KNOWLEDGE

### RECOMMENDED PREVIOUS COURSES:
- COURSE:
- TOPIC:

### RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

## SPECIFIC OUTCOMES FOR THE COURSE

At the end of the course, the student will be able to (or will have ability for):

## STUDENT OUTCOMES
Student outcomes according to the Spanish official definition of the program: PO5, PO6, PO7

BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS
55000070 - COMPUTED AIDED DESIGN

CREDITS: 3 ECTS
DEPARTMENT: Mechanical Engineering (MEC)
COURSE COORDINATOR:
TYPE: Elective
YEAR AND SEMESTER: 4th Year /

LIST OF TOPICS

MODULE 1. Part Modeling
• 1) Traditional CAD systems / Systems Parametric CAD
• 2) Applications of CAD systems
• 3) Use with other programs
• 4) Part Modeling: operations and restrictions
• 5) Finishing realistic

MODULE 2. Making plans
• 6) Creating Drawings
• 7) Dimensioning

MODULE 3. Assembling parts
• 8) Sets restrictions
• 9) Assembly drawings
• 10) BOM and drawings reviews

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:
COURSE:
TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:
• Industrial Drawing
• Space Vision
• Computers

SPECIFIC OUTCOMES FOR THE COURSE

At the end of the course, the student will be able to (or will have ability for):

STUDENT OUTCOMES

Student outcomes according to the Spanish official definition of the program: PO7
BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS
# 55000071 - GEOGRAPHIC INFORMATION SYSTEMS

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## LIST OF TOPICS

### MODULE 1. Introduction to GIS.
- 1) Geographical Information
- 2) Components of a GIS
- 3) GIS functions
- 4) Data Structures
- 5) Data sources

### MODULE 2. Data analysis and visualization
- 6) Data Visualization
- 7) Map Design
- 8) Alphanumeric Analysis: Queries attribute and location

### MODULE 3. Integration and data processing
- 9) Data management
- 10) Format changes
- 11) Reference systems
- 12) Topology
- 13) Georeferencing
- 14) Digitizing and editing

### MODULE 4. Spatial analysis
- 15) Vector Analysis
- 16) Raster analysis
- 17) Network analysis

## RECOMMENDED COURSES OR KNOWLEDGE

**RECOMMENDED PREVIOUS COURSES:**

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**RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:**

- Ability to formulate and solve problems
- Spatial thinking skills
- Communication skills

## SPECIFIC OUTCOMES FOR THE COURSE

At the end of the course, the student will be able to (or will have ability for):
• CG1. Understanding the features, usability, applicability and complementarity of different Geographic Information Technologies.
• EC1. Engaged in the harvesting, storage, management, analysis and presentation of geographic information in the environment of Geographic Information Systems, in vector or raster format.
• CE2. Design, develop, use and interpret simple maps.
• EC4. Understand, manage and interpret the applications of Geographic Information Technologies.
• CG2. Use a program in the field of Geographic Information Technologies, and specifically a Geographic Information System.
• CE3. Understand, manage, interpret and analyze satellite images and aerial photographs.

**STUDENT OUTCOMES**

• ABET_E. An ability to identify, formulate, and solve engineering problems.
• ABET_G. An ability to communicate effectively.
• ABET_K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Student outcomes according to the Spanish official definition of the program: PO5, PO7

**BIBLIOGRAPHY**

**TEXT BOOKS**

Sistemas de Información Geográfica
**SANTOS PRECIADO, J.M.** Editorial UNED, 2004

Geographic Information systems and Science

Sistemas de información geográfica

**OTHER MATERIALS**

https://moodle.upm.es/titulaciones/oficiales/course/view.php?id=5352
55000072 - GRAPHIC PROGRAMMING IN LABVIEW APPLIED TO ELECTROTECHNICS

CREDITS: 3 ECTS
DEPARTMENT: Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AEE)

LIST OF TOPICS

MODULE 1. LabVIEW graphical programming
• 1) 1. Graphical Programming Basics
• 2) 2. Virtual Instruments
• 3) 3. Structures
• 4) 4. Arrays and clusters
• 5) 5. Graphical representation of data

MODULE 2. Applications in Electrical Engineering
• 6) 6. AC single-phase circuits
• 7) 7. Power measurement and power factor correction
• 8) 8. Voltage and current in three-phase circuits
• 9) 9. Data acquisition and processing systems

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

SPECIFIC OUTCOMES FOR THE COURSE

At the end of the course, the student will be able to (or will have ability for):

STUDENT OUTCOMES

• ABET_K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Student outcomes according to the Spanish official definition of the program: PO7

BIBLIOGRAPHY
TEXT BOOKS

OTHER MATERIALS

Laboratorio informático de Electrotecnia
**55000435 - ANDROID PROGRAMMING**

**CREDITS:** 3 ECTS  
**DEPARTMENT:** Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AEE)  
**COURSE COORDINATOR:** Angel García Beltrán  
**TYPE:** Elective  
**YEAR AND SEMESTER:** 4th Year /

**LIST OF TOPICS**

**MODULE 1. Introduction**
- 1) Android operating system
- 2) Android Development Tools

**MODULE 2. Android basics**
- 3) Write a basic application
- 4) Activities and their lifecycle
- 5) Development for different devices
- 6) Architecture GUI

**MODULE 3. Technologies and tools for Android**
- 7) Access sensors
- 8) Access to geographic location
- 9) Tools for persistence of information: archives, databases and iCloud
- 10) Drawing and management of multimedia resources
- 11) Tools and protocols ubiquitous computing: Internet access and services

**MODULE 4. Tools for quality assurance and software distribution**
- 12) Enforcement Testing
- 13) Security & Privacy
- 14) Application distribution.

**RECOMMENDED COURSES OR KNOWLEDGE**

**RECOMMENDED PREVIOUS COURSES:**

**COURSE:** Programming Fundamentals or Programming in C or Java

**RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:**

**SPECIFIC OUTCOMES FOR THE COURSE**

At the end of the course, the student will be able to (or will have ability for):

**STUDENT OUTCOMES**
• ETSII_8. The ability to work in a bilingual context (English-Spanish).
• ETSII_10. The capacity to generate new ideas (creativity).

Student outcomes according to the Spanish official definition of the program: PO3, PO7

**BIBLIOGRAPHY**

**TEXT BOOKS**

Apuntes de Programación en Android
*Santiago Tapia y Angel Garcia-Beltran* Editorial Autopublicacion, 2014

Programación con Java 7
*A. García-Beltrán* Editorial Vision Libros, 2012

**OTHER MATERIALS**

The official site for Android developers. Provides the Android SDK and documentation for app developers and designers: