Profile II

Second year

Common:

53001203	Machine Design
53001205	Thermal Engineering
53001212	Financial Management
53001215	Human Resources and work Organization
53001216	Integrated Project Management
53001217	Strategic and Innovation Management
53001218	Industrial Complexes
53001221	Installations Design
53001222	Transportation Engineering
53001223	Industrial Security and Quality
53001979	*Ingenia* Master´s Thesis

Depending on the access:

53001207	Thermal Machines and Heat Engines
53001208	Thermal Machines and Heat Engines II
53001213	Supply Chain Management
53001214	Supply Chain Management II

53001203 - MACHINE DESIGN

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	José Luis Muñoz Sanz
TYPE:	Common
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Planetary Gearing

MODULE 2. Deformable transmissions

MODULE 3. Mechanical springs and Pneumatic mechanisms

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):

• The modules develop skills and abilities to integrate the knowledge acquired in previous courses, comprising: Planetary gearing. Concept. Kinematic and dynamic calculation of planetary gears. Efficiency. Limitations to the number of teeth. Harmonic drive transmissions. Industrial applications. Deformable transmissions. Design and calculation of cable, belt and chain drives. Industrial applications. Mechanical springs. Types. Design and calculation of springs. Industrial applications. Testing.

STUDENT OUTCOMES

• ABET_1. An ability to identify,formulate,and solve complex engineering problems by applying principles of engineering,science,and mathematics

• ABET_2. An ability to apply engineering design to produce solutions that meet specified needs with consideration fo public health,safety,and welfare,as well as global,cultural,social,environmental,and economic factors

• ABET_3. An ability to communicate effectively with a range of audiences

• ABET_5. An ability to function effectively on a team whose members together provide leadership,create a collaborative and inclusive environment,establish goals,plan tasks,and meet objectives

• ABET_7. An ability to acquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

TEXT BOOKS

G.G. Baranov. Curso de la Teoría de Máquinas y Mecanismos. Ed. Mir, 1985.

Richard G. Budynas, J. Keith Nisbett. Diseño en ingeniería mecánica de Shigley. McGrawHill, 2008.

P. Lafont, J. Echávarri, E. Chacón. Presentation of Design and calculation of Machine Elements. Available in Aulaweb.

OTHER MATERIALS

P. Lafont, J. Echávarri, E. Chacón. Solved problems available in Aulaweb.

Drives chain Tsubaki catalog. Available on line: http://ptp.tsubakimoto.co.jp/contents/e_book/catarog/e_drive_chains/pageview/data/target.pdf

Roller chain products catalog. Timken. Available on line:
http://www.timken.com/en-us/products/Documents/Timken-Drives-Roller-Chain-Catalog.pdf

Belt drives reference guide. Emerson. Available on line:
http://www.emersonindustrial.com/en-US/documentcenter/PowerTransmissionSolutions/Catalog/Form_8932E.pdf

Belt drive & pulleys catalogue. Ashley Power. Available on line:
http://www.ashleypower.co.uk/pdf/Catalogues/Belt_Drives.pdf

Design guide for cable solutions. Carl Stahl. Available on line:
http://www.savacable.com/sava_cat.pdf

INDUSTRIALES
ETSII | UPM

53001205 - THERMAL ENGINEERING

CREDITS:	3 ECTS
DEPARTMENT:	Energy Engineering (ENE)
COURSE COORDINATOR:	José A Fernández Benítez
TYPE:	Common
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Introduction to thermal-fluid systems. Thermal loads

MODULE 2. Heat transfer fluids. Thermal and mechanical properties. Fluid transport

MODULE 3. Cooling generation

MODULE 4. Heating generation

MODULE 5. Heat storage and heat exchange. Heat recovery

MODULE 6. Ventilation systems

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Fundamentals of Fluid Mechanics. Fundamentals of Heat Transfer. Applied Thermodynamics

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_1. An ability to identify,formulate,and solve complex engineering problems by applying principles of engineering,science,and mathematics

• ABET_2. An ability to apply engineering design to produce solutions that meet specified needs with consideration to public health,safety,and welfare,as well as global,cultural,social,environmental,and economic factors

BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS

Moodle presentations
Software EES (Engineering Equation Solver)
Energy save and efficiency (IDAE practical guides)

53001212 - FINANTIAL MANAGEMENT

CREDITS:	3 ECTS
DEPARTMENT:	Organization Engineering, Business Administration and Statistics (MAS)
COURSE COORDINATOR:	Mercedes Grijalvo
TYPE:	Common
YEAR AND SEMESTER:	1st Year / Fall

LIST OF TOPICS

MODULE 1. Introduction to accounting

- 1) Financial accounting as a vehicle for economic information of the company: scope, laws and regulations, limitations.
- 2) International framework (IAS and IFRS).

MODULE 2. Statements and accounting techniques

- 3) The balance sheet and accounts.
- 4) Profit and loss statement
- 5) • The state treasury.
- 6) Statement of changes in equity.
- 7) Memory
- 8) Interaction between the various financial statements.
- 9) Preparation of the financial statements.
- 10) Consolidated statements.

MODULE 3. Economic analysis

- 11) Liquidity ratios, debt and profitability.
- 12) Equity ratios.
- 13) And comparative trend analysis.
- 14) The report financial analysis.

MODULE 4. Valuation of financial assets

- 15) Time value of money.
- 16) Capitalization and discount rates of simple interest, compound and continuous.
- 17) Rating annual and perpetual income.
- 18) Loans and leases.
- 19) Valuation of fixed income assets.
- 20) Stock valuation methods.

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_2. An ability to apply engineering design to produce solutions that meet specified needs with consideration fo public health,safety,and welfare,as well as global,cultural,social,environmental,and economic factors
- ABET_5. An ability to function effectively on a team whose members together provide leadership,create a collaborative and inclusive environment,establish goals,plan tasks,and meet objectives

BIBLIOGRAPHY

Finanzas para Directivos
Martinez Abascal
Ed McGraw Hill

Las claves del análisis económico-financiero de la empresa
Jaime Eslava, José de
Editorial ESIC

Contabilidad para Dirección
Pereira, Ballarín, Rosanas, Vázquez-Dodero.
Editorial Eunsa/ Manuales IESE

Principios de finanzas corporativas-
Brealey, Myers, Allen
McGraw Hill

OTHER MATERIALS

53001215 - HUMAN RESOURCES AND WORK ORGANIZATION

CREDITS:	3 ECTS
DEPARTMENT:	Industrial Management, Business Administration and Statistics (MAS)
COURSE COORDINATOR:	Ana Moreno Romero
TYPE:	Common
YEAR AND SEMESTER:	1st Year / Fall

LIST OF TOPICS

MODULE 1. The HR function

MODULE 2. Work Organization in the networked society

MODULE 3. The person in the organization: integration and development initiatives

MODULE 4. The leader role

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Organization of Production Systems

SPECIFIC OUTCOMES FOR THE COURSE

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

- Ability to identify, formulate and solve engineering problems of organization

STUDENT OUTCOMES

- ABET_1. An ability to identify,formulate,and solve complex engineering problems by applying principles of engineering,science,and mathematics
- ABET_3. An ability to communicate effectively with a range of audiences
- ABET_4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments,which must consider the impact of engineering solutions in global,economic,environmental,and societal contexts
- ABET_5. An ability to function effectively on a team whose members together provide leadership,create a collaborative and inclusive environment,establish goals,plan tasks,and meet objectives
- ABET_7. An ability to acquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS

RRHH y organización del trabajo ? McGrawHill

INDUSTRIALES
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53001216 - INTEGRATED PROJECT MANAGEMENT

CREDITS:	3 ECTS
DEPARTMENT:	Organization, Engineering, Business Administration and Statistics (MAS)
COURSE COORDINATOR:	Isabel Ortiz
TYPE:	Common
YEAR AND SEMESTER:	1st Year / Spring

LIST OF TOPICS

MODULE 1. Introduction to Project Management

• 1) What is meant by Project Management • Project Success • Portfolio Management and Program Management • The Project Management Office • Project Director • Project Stakeholders • Project Management Processes

MODULE 2. Stakeholders management

• 2) Identification of the stakeholders. • Plan stakeholders. • Manage expectations of stakeholders. • Monitor stakeholder involvement.

MODULE 3. Management integration project

• 3) Project Plan. • Implement the plan. • Track Changes: Updates •

MODULE 4. Scope management

• 4) Scoping • Breakdown Structure Project (EDP) • Validate the scope • range control

MODULE 5. Time Management

• 5) Defining activities • Dependencies • Estimating the duration of activities • Programming Techniques

MODULE 6. Cost management

• 6) Cost estimates • Estimation methods • Establishment of resources • Resource leveling • Project Budget

MODULE 7. Timing and costs Control

• 7) The earned value method • Monitoring indicators

MODULE 8. Risk Management

• 8) Planning Risk management • Risk identification • Qualitative analysis • Quantitative risk analysis • Plan risk response. • Control risk

MODULE 9. Human resources management

• 9) Develop human resources plan. • Acquiring the project team. • Develop the project team. • Lead the project team.

MODULE 10. Communications management

• 10) Planning communications • Manage communications • Distribute information. • Report on performance.

MODULE 11. Procurement management

• 11) Planning procurement. • Manage procurement. • Make acquisitions. • Close acquisitions.

RECOMMENDED COURSES OR KNOWLEDGE

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RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Engineering projects.
Management systems.

SPECIFIC OUTCOMES FOR THE COURSE

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

- Design a project management plan.
- Work in interdisciplinary teams.
- Tools to better manage projects with success: stakeholders, scope, time, cost, risk, communication, resources and procurements.
- Leading teams
- Communication skills

STUDENT OUTCOMES

- ABET_3. An ability to communicate effectively with a range of audiences
- ABET_4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments,which must consider the impact of engineering solutions in global,economic,environmental,and societal contexts
- ABET_5. An ability to function effectively on a team whose members together provide leadership,create a collaborative and inclusive environment,establish goals,plan tasks,and meet objectives
- ABET_7. An ability to acquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

TEXT BOOKS

Project management book of knowledge. 6ª ED 2017

OTHER MATERIALS

ISO 21500 Guidance on project management

Kerzner H. Project Management: A Systems Approach to Planning, Scheduling, and Controlling. 11ª Ed. Widley.

53001217 - STRATEGIC AND INNOVATION MANAGEMENT

CREDITS:	3 ECTS
DEPARTMENT:	Organization Engineering, Business Administration and Statistics(MAS)
COURSE COORDINATOR:	Rafael Ramos Díaz
TYPE:	Common
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Innovation and strategy

MODULE 2. Sources of innovation: open innovation

MODULE 3. Disruptive innovation

MODULE 4. Business model innovation

MODULE 5. Innovation in network markets

MODULE 6. The execution challenges

MODULE 7. Valuation and protection of innovation

MODULE 8. Selection of opportunities and innovation projects

MODULE 9. Technological lifecycles: The S curve

MODULE 10. Exponential technologies

MODULE 11. The role of government

MODULE 12. The future of innovation

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC: Economics, finance and human resources

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_3. An ability to communicate effectively with a range of audiences
- ABET_4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments,which must consider the impact of engineering solutions in global,economic,environmental,and societal contexts
- ABET_5. An ability to function effectively on a team whose members together provide leadership,create a collaborative and inclusive environment,establish goals,plan tasks,and meet objectives
- ABET_7. An ability to acquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

William, Chesbrough, Henry (2003). Open innovation: the new imperative for creating and profiting from technology. Harvard Business School Press

Christensen, Clayton M. (1997), The innovator's dilemma: when new technologies cause great firms to fail. Harvard Business School Press

Gans, Joshua (2016), The Disruption Dilemma. The MIT Press

Govindarajan, Vijay y Chris Trimble (2010), The Other Side of Innovation: Solving the Execution Challenge. Harvard Business Press

Gordon, Robert J (2012), Is U.S. Economic Growth Over? Faltering Innovation Confronts the Six Headwinds. NBER Working Paper

Brynjolfsson, Erik and McAfee, Andrew (January, 2014) The Second Machine Age: Work, Progress and Prosperity in a Time of Brilliant Technologies. W.W. Norton & Company

Mazzucato, M. (2011) , The Entrepreneurial State (US Edition), Public Affairs

TEXT BOOKS

OTHER MATERIALS

53001218 - INDUSTRIAL COMPLEXES

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Antonio Vizán Idoipe
TYPE:	Common
YEAR AND SEMESTER:	1st Year / Fall

LIST OF TOPICS

MODULE 1. The implementation of an industrial complex

1. Industrial urbanism
2. The industrial estate. Basic criteria for the design of industrial estates and parks
3. Basic concepts in carrying out an implantation
4. Industrialization and prefabrication
5. Precast structural components
6. Prefabricated components for the design and construction of enclosures

MODULE 2. Industrialized construction solutions

7. Typology and elements of industrial complexes
8. Implementation and start-up of an industrial complex
9. Equipment and systems of industrial complexes
10. Construction and assembly of industrial complexes
11. Control and supervision of industrial complexes
12. Introduction to cybersecurity in industrial plants

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

-

SPECIFIC OUTCOMES FOR THE COURSE

RA89 - Knowledge of industrial urbanism

RA87 - Know the different typologies used in the design and construction of industrial buildings

RA244 - Describe elements of control and supervision of industrial complexes

RA241 - Knowledge of the regulatory framework in the industrial construction sector

RA243 - Describe phases in the implementation of an industrial complex

RA242 - Describe elements of industrial complexes

STUDENT OUTCOMES

- ABET_1. An ability to identify,formulate,and solve complex engineering problems by applying principles of engineering,science,and mathematics
- ABET_2. An ability to apply engineering design to produce solutions that meet specified needs with consideration fo public health,safety,and welfare,as well as global,cultural,social,environmental,and economic factors
- ABET_3. An ability to communicate effectively with a range of audiences
- ABET_4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments,which must consider the impact of engineering solutions in global,economic,environmental,and societal contexts
- ABET_5. An ability to function effectively on a team whose members together provide leadership,create a collaborative and inclusive environment,establish goals,plan tasks,and meet objectives

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TEXT BOOKS

1.- Arquitectura Industrial. Principios y fundamentos, 1ª parte; Ramón Losada Rodríguez, Eduardo Rojí Chandrro. Ed. Universidad del País Vasco.
2.- Arquitectura Industrial. Principios y fundamentos, 2ª parte; Ramón Losada Rodríguez, Eduardo Rojí Chandrro. Ed. Universidad del País Vasco.

OTHER MATERIALS

Presentations used in the classroom

Complementary documentation

Technical specifications of

manufacturers Technical regulations

Conferences by experts in the field

53001221 - INSTALLATIONS DESIGN

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Antonio Carretero
TYPE:	Common
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Fire safety

MODULE 2. Fluid facilities

MODULE 3. Air Conditioning and Ventilation

MODULE 4. Electrical Installations

MODULE 5. Lighting

MODULE 6. Building management system

MODULE 7. Energy Saving and Efficiency. Integration

MODULE 8.

MODULE 9.

MODULE 10.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Maquinas Y Motores Termicos

Seguridad Y Calidad Industrial

Maquinas Hidraulicas Y Eolicas

Tecnologia Electrica

SPECIFIC OUTCOMES FOR THE COURSE

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

The student will increase their ability to design a system, component or process that meets the desired requirements taking into account realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturing and sustainability.

Identify, analyze, and interpret the data of the problem raised by the teacher.

The student is able to assess the positive and negative effects of the solution to an engineering problem that affect society, the economy and the environment.

Knowledge of the regulatory framework in the AEC sector.

Discussion and justification of the alternative solutions approach RA63 - Use technical standards.

Interpret a technical documentation.

The design of the component, process or system is carried out according to the given specifications.

STUDENT OUTCOMES

- ABET_1. An ability to identify, formulate, and solve complex engineering problems by applying principles ofengineering, science, and mathematics
- ABET_2. An ability to apply engineering design to produce solutions that meet specified needs with consideration for public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- ABET_4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- ABET_5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

BIBLIOGRAPHY

TEXT BOOKS

Nombre	Tipo	Observaciones
Números gordos en el proyecto de instalaciones	Bibliografía	Javier Vazquez Moreno; CINTER Divulgación Técnica, 2012; ISBN: 9788493930516
ABECE de las instalaciones	Bibliografía	Federico de Isidro Gordejuela y otros; Ed. Munilla-Leria

OTHER MATERIALS

Nombre	Tipo	Observaciones
Documentos CTE	Recurso web	En esta página se pueden descargar los documentos aprobados que configuran el marco regulatorio del CTE, así como los documentos de apoyo http://www.codigotecnico.org/index.php/menu-documentoscte
Agua Fría/ACS/Saneamiento	Recurso web	Documentos básicos CTE (HS y HE) http://www.codigotecnico.org/index.php/menu-salubridad
Documentación del Canal de IsabelII	Recurso web	https://www.canalgestion.es/es/pie/normativa /normativa/subapartados/documentacion_general/
Climatización: Guía aplicación del RITE	Recurso web	http://www.minetur.gob.es/energia/desarrollo/ EficienciaEnergetica/RITE/Reglamento/RDecreto-1027-2007-Consolidado-9092013.pdf

Climatización: Publicaciones del IDAE	Recurso web	http://www.idae.es/index.php/relcategoria.1030/id.430/relmenu.347/mod.pags/mem.detalle
Guía de aplicación del REBT	Recurso web	http://www.f2i2.net/LegislacionSeguridadIndustrial/rebt_guia.aspx
Manual Schneider	Recurso web	http://www.schneiderelectric.es/sites/spain/es/productos-servicios/distribucion-electrica/descarga/guia-diseno-instalaciones-electricas.page
Guía técnica del RSCIEI	Recursos web	http://www.f2i2.net/Documentos/LSI/InstProtInc/GUIA_TECNICA_RSCI.pdf
Publicaciones del IDAE	Recurso web	http://www.idae.es/index.php/idpag.17/relmenu.329/mod.pags/mem.detalle
Reglamento de instalaciones de protección contra incendios (BOE 12.06.17)	Recurso web	http://www.f2i2.net/documentos/lsi/dis_6083.pdf
Guía Técnica de Aplicación del R.D. 513/2017 RIPCI (Rev. 2)	Recurso web	http://www.f2i2.net/documentos/lsi/RIPCI/Guia_Tecnica_Aplicacion_RIPCI_Rev_2.pdf
Temas de interés en Calidad y Seguridad Industrial	Recurso web	http://www.f2i2.net/legislacionseguridadindustrial/SI_ambitoLista.aspx?TipoAmbito=Instalaciones+Industriales
MOODLE asignatura	Plataforma online de la asignatura	Curso: Diseño de instalaciones (upm.es) https://moodle.upm.es/titulaciones/oficiales/course/view.php?id=6766

53001222 - TRANSPORTATION ENGINEERING

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Jiménez Alonso, Felipe
TYPE:	Common
YEAR AND SEMESTER:	1st Year / Spring

LIST OF TOPICS

MODULE 1. Transport and modes.

- 1) Transport Evolution
- 2) Modes of transport

MODULE 2. Traffic flow

- 3) Traffic theory, models.

MODULE 3. transport demand

- 4) Travel demand models

MODULE 4. operational safety of the transport

- 5) Safety

MODULE 5. Energy demand and environmental impact of transport

- 6) Energy demand and environmental impact

MODULE 6. Intelligent transport systems

- 7) ITS

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_1. An ability to identify,formulate,and solve complex engineering problems by applying principles of engineering,science,and mathematics
- ABET_7. An ability to acquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

TEXT BOOKS

F. Aparicio, B. Arenas, A. Gómez, F. Jiménez, J. M. López, I. Martínez, F. J. Páez (2008). Ingeniería del Transporte. Editorial Dossat

OTHER MATERIALS

53001223 - INDUSTRIAL SECURITY AND QUALITY

CREDITS:	3 ECTS
DEPARTMENT:	Organization Engineering, Business Administration and Statistics (MAS)
COURSE COORDINATOR:	Ordieres Mere, Joaquin B.
TYPE:	Common
YEAR AND SEMESTER:	1st Year / Spring

LIST OF TOPICS

MODULE 1. Control and Verification

- 1) Verification and control of facilities and processes
- 2) Safety management systems for industrial facilities operating hazard materials. Risk analysis
- 3) Consequences and Vulnerabilities modelling
- 4) Industrial safety for mobile facilities
- 5) Auditing and reporting regarding safety of industrial facilities
- 6) Cybersecurity

MODULE 2. Industrial quality

- 7) Quality Infrastructure in Europe (RD2200 / 95)
- 8) Study: Construction Products Directive
- 9) Examples of audits and inspections
- 10) Examples of essays and reports

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Project Engineering

TOPIC: Labor Health and Safety

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):

- Understanding the Quality Infrastructure in Europe
- Understanding the Control and Verification process for Industrial facilities using hazardous materials

STUDENT OUTCOMES

- ABET_2. An ability to apply engineering design to produce solutions that meet specified needs with consideration fo public health,safety,and welfare,as well as global,cultural,social,environmental,and economic factors
- ABET_4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments,which must consider the impact of engineering solutions in global,economic,environmental,and societal contexts
- ABET_7. An ability to acquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

TEXT BOOKS

* Course Slides
* Félix Pedro Marín Andrés, "Seguridad industrial: manual para la formación de ingenieros", Universidad Rey Juan Carlos, Servicio de Publicaciones, 2006 ISBN 9788497729291, 196 páginas.
* José María Storch de Gracia, Tomás García Martín, "Seguridad industrial en plantas químicas y energéticas", Ediciones Díaz de Santos, 2008
ISBN 9788479788643, 968 páginas.
* Jos Luis Leyva, "Diccionario Especializado de Terminos Tecnicos: Seguridad Industrial: Terminologia de Seguridad Industrial/Comunicacion de Riesgos", Createspace Independent Pub, 2014, ISBN 9781502515322, 178 páginas.
* BOE (several laws)
* European Commission, "The "Blue Guide" on the implementation of EU product rules", 2014, 125 pp. doi: 102769/9091
* Antonio Blazquez Morales, Luis Vega Catalán, ed., "Marcado CE para productos de construcción. Código Técnico y marcas voluntarias", 2008, AMIET ISBN 84-931709-7-6

OTHER MATERIALS

Course Materials for Module I

53001979 – INGENIA subject

CREDITS: 12 ECTS

DEPARTMENT: Multi-department

COURSE COORDINATOR: Gregorio Romero

TYPE: Common

YEAR AND SEMESTER: 1stYear / Fall and Spring

LIST OF TOPICS

The subject INGENIA is a subject of 12 ECTS that corresponds to between 300 and 360 hours of student work. Of this work, 120 hours correspond to face-to-face work (in the presence of the teacher) and between 180 and 240 to the student's personal work.

Face-to-face part of the subject

The face-to-face part of the course is divided into three modules:

MODULE A: Face-to-face sessions for the approach and follow-up of the project (30 hours of class and 60 hours of labs or practices)

A1. 30 hours of face-to-face theory

The basic theoretical knowledge required by the students to carry out the proposed project in the various possible subjects must have been acquired beforehand (in undergraduate studies or other subjects in the curriculum) or, if necessary, the student must be provided with the means to learn them independently. For this reason, classroom sessions in the INGENIA subject should be aimed primarily at clarifying, reinforcing or concretizing theoretical concepts already covered in previous subjects, providing guidance and guidance to students on the practical aspects of the project to be carried out, planning, monitoring and supervising the work carried out by the students, and carrying out tests to assess the acquisition of competences (evaluating how the project works). teamwork, intermediate deliveries of work, etc.).

A2. 60 hours of face-to-face practical or laboratory work

In addition to the face-to-face sessions described above, 60 hours of practical work will be programmed for the student. In these sessions, the student must work on the practical aspects of the development of his project, although during this time he will be supervised by a teacher. The teacher's job in these sessions is to act as facilitator, support, answer questions, etc. , but not to give lectures.

MODULE B: Skills training seminars (approximately 15 hours of face-to-face training)

They provide theoretical training on personal skills that will be put into practice during the development of the project and which are also the skills required in a real working environment, such as teamwork, creative techniques and communication.

MODULE C: Sustainability of "engineering" (15 hours of face-to-face training)

All the work carried out will include an analysis of the environmental impact and the social, political, ethical, safety and health implications of the project or product developed, thus considering competences related to sustainability in its three dimensions: economic, environmental and social. Within the framework of these competences, all students must evaluate the contribution of their device, project or ingenuity to the seventeen objectives of the 2030 Agenda and this assessment is taken into account to refine or reorient the design. The SDGs addressed in each Ingenia are very varied and vary from year to year depending on the chosen topic. Based on the history of the topics addressed and the specific training on the 2030 Agenda that is given in the subject, it can be said that Engineering contributes to the seventeen SDGs, from SDG1 to SDG17.

To carry out this analysis, the subject will have face-to-face training on these aspects that will be taught by professors of the ETSI Industriales with fields of study related to these subjects, receiving specific training in the corresponding workshops and counting on the tutoring of specialized teachers. In addition, these teachers will be responsible for the assessment of the student's work in relation to this module C.

The face-to-face training of module C will consist of some general masterclass sessions for several INGENIA subjects. These sessions will be combined with more specific training on the specific subject of study of the project, or with tutorials to guide the student's work. In any case, the presence of the teacher will always be required for 15 working hours.

Personal work of the student in the subject

Most of the teaching load of the subject is the teamwork that students must perform to develop the project proposed in the subject. Students must spend between 180 and 240 hours of personal work without the teacher present.

The teachers responsible for the proposal of the subjects should try to ensure that the actual working time that the subject involves for the student is appropriate.

Existing themes in the subjects

In order to accommodate the different Departments and Laboratories of the School in order to teach the different competences of the subject Engineering from different prisms, different topics are offered, each of which has different needs in terms of quota and heterogeneity or not of the group with regard to the specialization of the students. Since each of these themes implies the existence of different activities and particularities due to different needs, each of them provides its own timetable and methodology to be followed.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

The curriculum of the Master's Degree in Industrial Engineering does not have defined prior subjects to be able to pass this subject, being sufficient subjects linked to the degrees that give access to the Master's Degree.

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

The curriculum of the Master's Degree in Industrial Engineering does not have defined prior knowledge or skills to be able to pass this subject, although communication skills and teamwork are recommended.

SPECIFIC OUTCOMES FOR THE COURSE

The curriculum of the Master's Degree in Industrial Engineering of the ETSI Industriales incorporates a type of compulsory subjects that have been generically called INGENIA. The basic guiding principle of these subjects is to develop in the student the ability to design and build systems and products that meet the needs of society. One could say, in a simple way, that these subjects are based on the fact that the engineer has to "engineer" them.

This type of subject has an important international reference within the CDIO initiative, to which a hundred educational institutions from all over the world are adhered and which has been promoted by MIT in the United States and by Chalmers University and other Swedish universities in Europe. The acronym CDIO refers to the starting point of this initiative, according to which engineers upon completion of their studies should be able to design, design, implement and operate engineering systems in modern, team-based work environments. To achieve these goals, students must master a complex and changing body of technical knowledge. Young engineers must also possess a broad set of personal skills that will enable them to work successfully in companies and organizations. To achieve this, the institutions participating in the CDIO initiative advocate the incorporation into their curricula of learning experiences that will lead to the development of the required personal and interpersonal skills, while developing their ability to conceive, design, implement and operate products or systems.

The INGENIA subject of the Master's Degree in Industrial Engineering has a concept that is very much in line with the approaches of CDIO.

General approach to the subject INGENIA

The principle that defines the subject INGENIA is that it is based on proposing to the student the realization of a project, system or product in the field of engineering, taking into account a series of restrictions or requirements previously defined and working and taking into account situations similar to those that may occur in a real professional environment.

It is, therefore, a subject in which the realization of projects or developments within the field of engineering is addressed from the initial conception and design phase to the final implementation and operation phase. Depending on the complexity of the proposal, in some areas it may be decided that the activity is limited to the design phase or that the implementation is reserved only for the best designs. This type of approach should facilitate the transition from theory, taught in other subjects of the curriculum, to practice. On the other hand, it is based on posing open-ended problems that deal with complex situations where there is no single predetermined correct answer.

To achieve the goal set for the subject, the student must work under conditions similar to those that, most likely, will develop in their future professional life, they must: work as a team, decide what information they need, how to find and manage it, how to organise the work, communicate the results they get and, above all, develop it by applying certain personal skills that allow them to handle the situation efficiently. On the other hand, the open nature of the problem to be solved constitutes an ideal environment for the development of creativity, which is understood as the capacity to face change, to adapt and to find original solutions.

STUDENT OUTCOMES

- ABET_1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- ABET_2. An ability to apply engineering design to produce solutions that meet specified needs with consideration for public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- ABET_3. An ability to communicate effectively with a range of audiences
- ABET_4.An ability to recognize ethical and professional responsibiities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- ABET_5.An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- ABET_6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions
- ABET_7. An ability to adquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

TEXT BOOKS

Each of the specific topics of the subject provides different bibliographic reference material.

OTHER MATERIALS

It also provides different laboratory material, needed to complete the design and manufacture of the different prototypes.

53001207 - THERMAL MACHINES AND HEAT ENGINES

CREDITS:	3 ECTS
DEPARTMENT:	Energy Engineering (ENE)
COURSE COORDINATOR:	José Manuel Burón Caballero
TYPE:	Common
YEAR AND SEMESTER:	1st Year / Fall

LIST OF TOPICS

MODULE 1. Fundamentals of Heat Engines

- 1) Difference between machine and the heat engine
- 2) Concept of thermal performance
- 3) Energy transformations
- 4) Scope of internal combustion engines
- 5) Polluting air emissions from combustion engines
- 6) Fundamentals of Heat Engines

MODULE 2. Fundamentals of Internal Combustion Engines

- 7) ICE classifications
- 8) Spark ignition engines (MEP) and compression ignition engines (diesel or MEC)
- 9) Four- and two-stroke engines. Indicator diagrams, distribution diagram and pressure-crank angle diagram
- 10) Water and air-cooled engines
- 11) Charge regulation
- 12) Differences between MEP and MEC
- 13) Fuel-air ratio
- 14) ICE pollutant emissions
- 15) Combustion
- 16) Fuels
- 17) Fundamentals of turbomachinery based Heat Engines
- 18) Naturally aspirated and turbocharged engines
- 19) Future trends in ICEs
- 20) Specific power
- 21) Fundamentals of ICEs

MODULE 3. Fundamentals of Heat Engines based in Turbomachinery

- 22) Steam turbines. Rankine Cycle
- 23) Thermodynamic Rankine cycle improvements
- 24) Cycle with intermediate reheating
- 25) Recuperative cycle
- 26) Special Cycles
- 27) Gas turbines. Brayton cycle
- 28) Cogeneration heat engines
- 29) Gas-steam combined cycle
- 30) Gas turbine cycle
- 31) Recuperative gas turbine
- 32) Compound gas turbine
- 33) Recuperative compound gas turbine
- 34) Closed cycle gas turbine

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

• Thermodynamics, Applied Thermal Engineering and Fluid Mechanics

SPECIFIC OUTCOMES FOR THE COURSE

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

• - Know how to apply and integrate their knowledge, understanding these, its scientific basis and problem-solving abilities in new and imprecisely defined environments, including multidisciplinary contexts both researchers and highly skilled professionals.

• - Know how to evaluate and select the appropriate scientific theory and methodology required their fields of study to make judgments based on incomplete or limited information, including, where necessary and appropriate, a reflection on the social and ethical responsibilities linked to the solution propose in each case.

• - Be able to take responsibility for their own professional development and specialization in one or more fields of study.

• - Have acquired advanced knowledge and demonstrated in the context of scientific and technological research and highly specialized, detailed and informed understanding of the theoretical and practical aspects and methodology of work in one or more fields of study.

• - Have developed enough to participate in research projects and scientific and technological collaboration within their subject area, in interdisciplinary contexts and, where appropriate, with a high component of knowledge transfer autonomy.

STUDENT OUTCOMES

• ABET_1. An ability to identify,formulate,and solve complex engineering problems by applying principles of engineering,science,and mathematics

BIBLIOGRAPHY

TEXT BOOKS

Máquinas y motores térmicos. Introducción a los motores alternativos y a las turbomáquinas térmicas. Editorial, UNED. ISBN: 9788436270075

OTHER MATERIALS

Subject slides

Lab engines and components

53001208 - THERMAL MACHINES AND HEAT ENGINES II

CREDITS:	3 ECTS
DEPARTMENT:	Energy Engineering (ENE)
COURSE COORDINATOR:	Jesús Casanova Kindelán
TYPE:	Common
YEAR AND SEMESTER:	1st Year / Fall

LIST OF TOPICS

MODULE 1. Fundamentals

- 1) Classification of thermal machines and heat engines. Definitions

MODULE 2. Reciprocating Internal Combustion Engines

- 2) Optimization of intake and exhaust processes. Supercharging
- 3) Optimization of combustion processes and tendencies
- 4) Pollutant emissions formation and reduction techniques
- 5) Fuels for internal combustion engines
- 6) Load control and performance characteristic curves

MODULE 3. Thermal Turbomachinery Engines

- 7) Design criteria, load control and construction of steam turbine plants
- 8) Design criteria, load control and construction of gas turbine plants
- 9) Design criteria of combined cycles
- 10) Jet engines: rockets and turbojets

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Internal combustion engines fundamentals
- Thermal Turbomachinery fundamentals
- Thermodynamic cycles calculations
- Fluid mechanics of compressible flow

SPECIFIC OUTCOMES FOR THE COURSE

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

- Calculation skills of performance and efficiency of Heat Engines
- Understanding of the principles of operation of reciprocating internal combustion engines, gas turbines and steam turbines
- Knowledge of the operation and regulation of internal combustion engines, gas turbines and steam turbines.
- Ability to understand the futures design trends of the different Heat Engines

STUDENT OUTCOMES

- ABET_1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering science, and mathematics
- ABET_3. An ability to communicate effectively with a range of audiences
- ABET_6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions
- ABET_7. An ability to acquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

TEXT BOOKS

Motores de combustión interna alternativos. Varios autores Editorial Reverte, 2011

Ingeniería Térmica. M. Muñoz y A. J. Rovira. UNED. 2006

OTHER MATERIALS

Power Point presentations in Moodle

Laboratory of heat Engines with test cells and test apparatus

53001213 - SUPPLY CHAIN MANAGEMENT

CREDITS:	3 ECTS
DEPARTMENT:	Organization Engineering, Business Administration and Statistics (MAS)
COURSE COORDINATOR:	Ruth Carrasco/Eva Ponce
TYPE:	Common
YEAR AND SEMESTER:	1st Year / Spring

LIST OF TOPICS

MODULE 1. Principles

- 1) Concept of Supply Network (RDS) and systems approach (2h)
- 2) Basics for RDS analysis: demand forecasting, inventory management (4h)

MODULE 2. Supply Network Strategy

- 3) RdS strategy: analysis of different strategies, frameworks (6h).
- 4) RdS design (3h)

MODULE 3. Supply management

- 5) Relations between members of a supply network (1h)
- 6) RdS productive activities: (5h) • Procurement • Production planning and scheduling• Physical distribution: storage subsystem (logistics plants, plant layout) and transport subsystem • Reverse logistics
- 7) Information systems and decision-making RdS: MRP and ERP (3h)

MODULE 4. New Approaches in Supply Chain Networks Management

- 8) Sustainable supply networks (2h)
- 9) Global supply networks (2h)

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):

- Identify supply chains networks in industrial environments for the delivery of goods and services, the infrastructure they require and the activities involved in supply chain design and operation. Understand the main factors to consider when designing supply chain networks and recognize some mathematical models supporting decision-making in supply chain networks design. Know the main operational and managerial activities that supply chain networks involve and the basic techniques and models required for developing them. Understand the importance of supply chain networks in society and the impacts (positive and negative) they have from a social and environmental standpoint.

STUDENT OUTCOMES

- ABET_1. An ability to identify,formulate,and solve complex engineering problems by applying principles of engineering,science,and mathematics
- ABET_2. An ability to apply engineering design to produce solutions that meet specified needs with consideration fo public health,safety,and welfare,as well as global,cultural,social,environmental,and economic factors
- ABET_3. An ability to communicate effectively with a range of audiences
- ABET_4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments,which must consider the impact of engineering solutions in global,economic,environmental,and societal contexts
- ABET_5. An ability to function effectively on a team whose members together provide leadership,create a collaborative and inclusive environment,establish goals,plan tasks,and meet objectives

BIBLIOGRAPHY

TEXT BOOKS

Chopra, S. and Meindl, P. (2012) “Supply Chain Management”. Prentice Hall; 5th edition

OTHER MATERIALS

See Moodle website of the course

53001214 - SUPPLY CHAIN MANAGEMENT II

CREDITS:	3 ECTS
DEPARTMENT:	Organization Engineering, Business Administration and Statistics (MAS)
COURSE COORDINATOR:	Carrasco Gallego, Ruth
TYPE:	Common
YEAR AND SEMESTER:	1st Year / Spring

LIST OF TOPICS

MODULE 1. Supply Network Strategy

- 1) RdS strategy: analysis of different strategies, frameworks
- 2) Case studies

MODULE 2. Network Design Supply

- 3) RdS design: relevant factors
- 4) RdS design: facility location-allocation models

MODULE 3. New Approaches to Supply Chain Networks Management

- 5) Sustainable supply networks (2h)
- 6) Global supply networks (2h)

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):

- Identify supply chains networks in industrial environments for the delivery of goods and services, the infrastructure they require and the activities involved in supply chain design and operation. Understand the main factors to consider when designing supply chain networks and recognize some mathematical models supporting decision-making in supply chain networks design. Know the main operational and managerial activities that supply chain networks involve and delve into advanced techniques and models required for developing them. Understand the importance of supply chain networks in society and the impacts (positive and negative) they have from a social and environmental standpoint.

STUDENT OUTCOMES

- ABET_1. An ability to identify,formulate,and solve complex engineering problems by applying principles of engineering,science,and mathematics
- ABET_2. An ability to apply engineering design to produce solutions that meet specified needs with consideration fo public health,safety,and welfare,as well as global,cultural,social,environmental,and economic factors
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OTHER MATERIALS

Case studies. See Moodle website.