Profile I

Second year

Common

53001203	Machine Design
53001205	Thermal Engineering
53001217	Strategic and Innovation Management
53001221	Installations Design
	Master´s Thesis

Track 1: Automatic Control and Electronics

53001234	Communications
53001235	Systems Modeling and Simulation
53001236	Electronic Instrumentation
53001237	Software Engineering
53001238	Nonlinear Systems

Elective Track 1

53001239	Automated Production Processes
53001240	Microelectronics
53001241	Power Electronics Applications
53001242	Digital Systems Architecture
53001243	Digital Signal Processing

Track 2: Electrical Engineering

53001244	Electric Installations
53001245	Electric Power Systems
53001246	Conventional Electric Generation and Renewable Energies

Track 3: Construction Engineering

53001247	Acoustic Engineering
53001248	Design of Steel Structures
53001249	Design of Reinforced concrete Structures
53001250	Soil Mechanics

Track 4: Mechanical Engineering

Select five subjects of the following:

53001247	Acoustic Engineering
53001251	Elasticity, Plasticity, and Fracture
53001252	Vibrations
53001254	Design and Manufacturing with Polymers
53001255	Industrial Safety and Maintenance
53001256	Automobiles
53001257	Materials Handling
53001258	Equipment and Installations in Railways
53001259	Hybrid Vehicles
53001260	Design of Electromechanical Systems
53001263	Productive Maintenance

Track 5: Materials

53001264	Siderurgy
53001265	Structural Materials Design
53001266	Functional Materials and Nanomaterials
53001267	Biomaterials
53001268	Behaviour of Materials in Service

Track 6: Industrial Management

53001269	Logistics
53001270	Information Systems
53001271	Economics
53001272	Introduction to Capital Markets

Track 7: Chemical Engineering

53001273	Industrial Chemistry
53001274	Experimentation in Chemical Engineering
53001275	Process and Product Engineering
53001276	Chemical Process Control

Track 8: Energy Techniques

53001277	Radiation Protection
53001278	Thermal Power Stations
53001279	Electric Power Plants
53001280	Fluids Engineering
53001281	Radiation Technologies
53001283	Nuclear Safety

Elective for all tracks:

53001227	Complements of Electromagnetism
53001289	Negotiation
53001290	Competitive Intelligence & Technology Surveillance
53001294	Knowledge Management for Technological Industries
53001295	History of Engineering
53001296	Organization, Development and Participation
53001980	Communication and outreach of science and technology

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)

53001217 - STRATEGIC AND INNOVATION MANAGEMENT

CREDITS:	3 ECTS
DEPARTMENT:	Organization Engineering, Business Admnistration 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

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

53001234 - COMMUNICATIONS

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AEE)
COURSE COORDINATOR:	Eduardo de la Torre
TYPE:	Elective - Track Automatic Controls and Electronics
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. General concepts of communications

1. Generic communications concepts /Conceptos generales de comunicaciones
2. The OSI layer model /Modelo de capas OSI

MODULE 2. Data Networks

3. Ethernet Networks / Redes Ethernet
4. TCP/IP
5. Network services / Servicios de red

MODULE 3. Wireless technologies

6. Mobile and cellular networks / Redes móviles y celulares
7. Wireless networks / Redes inalámbricas

MODULE 4. Control networks

8. Control Networks: Introduction, requirements, CAN as an example

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):

This subject has been designed so that the student is able to know and evaluate different communication systems, with deeper knowledge on the OSIlayered model. In addition to this, the practical approach of some parts of the subject allows the student to really follow the information flow throughout all layers and from generation, transmission and reception. So, the student will be able to see how information flows through physical transmission media, how it is addressed at LAN level, the way packets are routed through a series of networks, identify session protocls and diagnose them, and see how higher layers operate, also.
The first couple of lessons address general concepts such as multiplexing techniques, swithcing techniques, modulation, transmission types, the concept of encapsulation, etc.
After this, several lessons revise in more detail the layers, classified in: a) Ethernet (physical and link layer levels), b) TCP/IP (network and transport), and c) Applications (session, presentation and application itself).
After this travel throughout allthe layers, other networks are revisited. For instance, wireless networks are covered by two topics: cellular

networks (with emphasis on GSM), Wireless LANs (Wifi) and lower power lower rate ones such as Bluetooth and Zignee, are seen. Another lesson addresses the specific problems of control networks. The CAN protocol is analysed in detail as a widely used control network example.

STUDENT OUTCOMES

- 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

- Some specialized books are recommended for further reading, such as wireless communication technologies books, books on controller networks, or similar. However, for the daily issues with the subject, students are referred to the freely available material shown next

OTHER MATERIALS

- Class Slides, available via Moodle
- IEEE Standards, Accessible form University computers only
- RFC Documents, Public domain documents

53001235 - SYSTEMS MODELING AND SIMULATION

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AEE)
COURSE COORDINATOR:	Agustín Jiménez
TYPE:	Elective - Track Automatic Controls and Electronics
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Introduction

MODULE 2. Simulation of continuous systems

MODULE 3. System simulation events

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Dinámica de Sistemas and Fundamentos de Automática

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):

- It trains to carry out practical work on systems simulation

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_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

Agustín Jiménez, Manuel Castro y José Manuel Gómez, “Simulación de Procesos y Aplicaciones”, Segunda Edición, Sección de Publicaciones, ETSII-UPM, 2005

A. Creus. "Simulación y Control de Procesos por Ordenador". Ed. Marcombo, Barcelona, 1987

A. Guasch. Modelado y Simulación: Aplicaciones a Procesos Logísticos de Fabricación y Servicios. Edicions UPC, 2003

OTHER MATERIALS

53001236 - ELECTRONIC INSTRUMENTATION

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Pedro Alou Cervera
TYPE:	Elective - Track Automatic Controls and Electronics
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Design of RC networks (transfer fuctions)

MODULE 2. Analog Filters

MODULE 3. Analog signal processing. Amplifications and typical circutis

MODULE 4. Sensors, Transducers. Measurement circuits.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Diseño de Sistemas Electrónicos (MII)

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Analog electronics

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 fo public health,safety,and welfare,as well as global,cultural,social,environmental,and economic factors
- 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

INSTRUMENTACIÓN ELECTRÓNICA (THOMSON). PARTE 1
M.A. Perez et al.

OTHER MATERIALS

Slides with the content of the subject and exercises

Lab Instrumentation for tests of circuits

53001237 - SOFTWARE ENGINEERING

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Daniel Galán
TYPE:	Elective - Track Automatic Controls and Electronics
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Foundations of Software Engineering

MODULE 2. Aspects of Software Engineering

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):

- Complete a whole life cycle for a software system project. Specify requirements, design, implement, test, deploy and document a software system. Understand concepts and be able to use professional software engineering tools to perform this work.

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

Software Engineering 9th Ed.. Ian Sommerville. Pearson, 2011.
Distributed Systems 5th Ed. George F. Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair. Addison-Wesley, 2011.

OTHER MATERIALS

53001238 - NONLINEAR SYSTEMS

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Sergio Domínguez
TYPE:	Elective - Track Automatic Control and Electronics 2nd
YEAR AND SEMESTER:	Year / Fall

LIST OF TOPICS

MODULE 1. Analysis of nonlinear systems

MODULE 2. Control Strategies for nonlinear systems

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Frequency response of linear systems: Open and closed loop. Ordinary differential equations. Linear control systems

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

BIBLIOGRAPHY

TEXT BOOKS

- **Nonlinear Dynamics and Chaos** Steven Strogatz, Westview Press, 2015
- **Nonlinear Systems, 3rd Edition** Hasan Khalil, Prentice Hall, 2002
- **Applied Nonlinear Control** Jean-Jacques Slotine & Weiping Li, Prentice Hall, 1991
- **Nonlinear Control Systems. An Introduction** Alberto Isidori, Springer-Verlag, 1985
- **Nonlinear Systems Analysis** Mathukumalli Vidyasagar, Prentice Hall, 1993
- **Nonlinear Process Control** Michael Henson & Dale Seborg, Prentice Hall, 1996
- **Nonlinear Systems** Shankar Sastry, Springer Verlag, 1999

OTHER MATERIALS

Class slides. SW Technical Reference

53001239 - AUTOMATED PRODUCTION PROCESSES

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AEE)
COURSE COORDINATOR:	Antonio Barrientos
TYPE:	Elective - Track Automatic Controls and Electronics
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Introduction

MODULE 2. Actuators

MODULE 3. Sensors for automation

MODULE 4. PLC programming

MODULE 5. Sequential modeling systems

MODULE 6. Storage and transport systems

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_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_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

OTHER MATERIALS

Course Syllabi. Elective (Profile I)

53001240 - MICROELECTRONICS

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Eduardo de la Torre
TYPE:	Elective - Track Automatic Controls and Electronics
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Microelectronic design philosophies and tools

1. Introduction
    - 1.1. Subject presentation
    - 1.2. History of microelectronics
    - 1.3. Technology evolution
    - 1.4. Main challenges of microelectronic design

MODULE 2. Design of digital integrated circuits

2. Microelectronic technology
    - 2.1. CMOS Technologiy
    - 2.2. Design of logic circuits with CMOS technology
    - 2.3. Manufacturing process
    - 2.4. Physical design (layou)
    - 2.5. Digital systems testing
3. Design Techniques
    - 3.1. Implementación / Implementation alternatives
    - 3.2. Metodologías de diseño / Design Methods
    - 3.3. Arquitecturas de procesamiento de datos / Data processing Architectures

MODULE 4. Reconfigurable circuits

4. Reconfigurable systems
    - 4.1. Introduction to reconfiguration technologies
    - 4.2. FPGA Internal Architecture and Reconfiguration methods
    - 4.3. Architectures and Tools for reconfiguration
    - 4.4. Design of reconfigurable systems with commercial flows
5. Reconfigurable computing applications
    - 5.1.Adaptive and evolvable HW
    - 5.2. Reconfigurable computing and HW acceleration
    - 5.3. Other applications of reconfigurable systems

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Course Syllabi. Elective (Profile I)

SPECIFIC OUTCOMES FOR THE COURSE

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

- Addressing microelectronic and technological issues, including microelectronic design techniques.
- It also addresses the field of reconfigurable systems, ranging from basic techniques based on FPGA technology to complex ones that address self-adaptive self-repairing selfaware systems that make use of reconfiguration technques as the underlying technology for adaptation in the context of adaptive intelligent cyber physical systems

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_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS

- Digital Integrated Circuits, by Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic
- Slide materials
- Selected IEEE & ACM Journals

1.

OTHER MATERIALS

53001241 - POWER ELECTRONICS APPLICATIONS

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AEE)
COURSE COORDINATOR:	Pedro Alou Cervera
TYPE:	Elective - Track Automatic Controls and Electronics
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Continuous Power Distribution

MODULE 2. Electrical energy storage

MODULE 3. Industrial applications

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC: Fundamentals of Power Electronics

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_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

OTHER MATERIALS

53001242 - DIGITAL SYSTEMS ARCHITECTURE

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Yago Torroja
TYPE:	Elective - Track Automatic Controls and Electronics
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Introduction. Cost vs Performance

MODULE 2. Design and analysis of microprocessor architectures.

MODULE 3. Implementation techniques. Segmentation. Memory Hierarchy.

MODULE 4. Theoretical fundamentals of target application (Digital Sound Synthesis)

MODULE 5. Design of a target application: Modular Digital Synthesizers

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

- Microprocessor Systems
- Digital Electronics
- Analog Electronics

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Design of digital systems based on HDLs (VHDL)

SPECIFIC OUTCOMES FOR THE COURSE

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

- Evaluate different architectural approaches to design a digital system with respect cost vs performance
- Design complex digital systems
- Use designing tools and methods to simulate complex digital systems

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_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

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BIBLIOGRAPHY

TEXT BOOKS

Computer Architecture, Fifth Edition: A Quantitative Approach, Patterson &Hennessy

Digital Design and Computer Architecture, Harris & Harris

OTHER MATERIALS

53001243 - DIGITAL SIGNAL PROCESSING

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Eduardo de la Torre
TYPE:	Elective - Track Automatic Controls and Electronics
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Basic Concepts

1. Introduction.Signals / Introducción. Señales
2. Fundamentals. Temporal and frequency domains /Fundamentos. Dominios temporal y en frecuencia
3. Spectral analysis technqieues / Técnicas de análisis espectral
4. Oversampled systems / Sistemas sobremuestreados

MODULE 2. filtering

5. Digital filters / Filtros digitales
6. Filter realization / Implementación de filtros

MODULE 4. OTHER APPLICATIONS

7. Cyphering / Encriptación
8. Data compression / Compresión de datos

MODULE 3. DSP processors

9. DSP processor architectures / Arquitecturas de procesadores DSP

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Previous knowledge about synchronous dgitial design (registers, arithmetic operators, and timing analysis) are expected. Also, skills on using Simulink and its basic blocks is also expected.

SPECIFIC OUTCOMES FOR THE COURSE

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

- To acquire knowledge on the applied aspects in the field of digital signal processing
  - Techniques
  - Applications
  - Implementations → this is NOT just a DSP microprocessor programming course
- To be able to compare and to acquire selection criteria to choose a solution for a given problem
- Mixed practical and theoretical approach
- Experiments, demos, use cases, real work, are included

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_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS

- The scientist?s and engineer?s guide to Digital Signal Processing, Steven Smith
- Andreas Antoniou, Mc-GrawHill, Digital Signal Processing with Field Programmable FPGAs
- U. Meyer-Baese, Springer Discretetime Signal Processing, Alan Oppenheim, Ronald Schafer, Pearson

OTHER MATERIALS

Copy of the slides are provided via Moodle.

53001244 - ELECTRIC INSTALLATIONS

CREDITS:	6 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AEE)
COURSE COORDINATOR:	Rosa Mª de Castro
TYPE:	Elective - Track Electrical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Electric Power Subestations

- I) Elements
- 2) Types

MODULE 2. Earthing Installations

- 3) Potential distributions
- 4) Earthing current determination
- 5) Design of an Earthing Installation

MODULE 3. High Voltage Switchgear

- 6) General considerations
- 7) Breaking switchgear
- 5) Fuses
- 7) Capacitors and reactances
- 8) Overvoltage switchgear

MODULE 4. Power System Relaying

- 9) General considerations
- 7) Voltage and current transformers
- 5) Types

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: 1º Electric Technology

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Analysis of Electric Circuits
- Steady State Power System Analysis
- Transient Power System Analysis
- Shortcircuit in Power Systems
-

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 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
- 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

- Reglamento de Instalaciones Eléctricas de Alta Tensión y sus fundamentos teóricos
  F. Garnacho et al.
  Ed. Garceta
- Electrical Transients in Power Systems
  Allan Greenwood
  John Wiley&Sons, Ltd
- Sobretensiones en las redes de alta tensión
  Francisco Crespo
  ASINEL
- Power system relaying
  S. H. Horowitz and A. G. Phadke
  John Wiley&Sons, Ltd
- Network Protection and Automation Alstom. Protective Relaying, Principles and Applications
  J.L. Blackburn
  Marcel Dekker Inc.
- The Art and Science of Relaying
  C. R. Mason
- Protecciones en las instalaciones eléctricas
  Paulino Montané
  Ed. Marcombo
- Protección de Instalaciones y redes eléctricas
  Suarez Creo
  Ed. Andavira

OTHER MATERIALS

- International Electrotechnical Commission. www.iec.ch
- Technical Brochures of Schneider Electric

53001245 - ELECTRIC POWER SYSTEMS

CREDITS:	6 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Sergio Martínez
TYPE:	Elective - Track Electrical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. State estimation

MODULE 2. Frequency and voltage control

MODULE 3. Transmission system operation

MODULE 4. Fault analysis

MODULE 5. Stability

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Technology and design of Electric Grids

TOPIC: Fundamentals of Power Systems

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Those corresponding to the courses of the specialty in Electrical Engineering of the Degree in Engineering in Industrial Technologies

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 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_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

Power System Analysis
J.J. Grainger, W.D. Stevenson, G.W. Chang. Ed. McGraw-Hill, 2021

Power Generation, Operation and Control
A.J. Wood, B.F. Wollenberg, G.B. Sheble. Ed. Wiley, 2013.

Power System Analysis and Design
D. Glover, M. Sarma, T. Overbye. Ed. Thomson, 2016

Análisis y operación de sistemas de energía eléctrica
A. Gómez Expósito. Ed. McGraw-Hill, 2002

OTHER MATERIALS

AulaWeb
Web repository with different resources: Power System Analysis software, additional course documentation, tasks, exams, etc.

53001246 - CONVENTIONAL ELECTRIC GENERATION AND WITH RENEWABLE ENERGIES

CREDITS:	6 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Carlos Platero / Carlos Veganzones
TYPE:	Elective - Track Electrical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Conventional Power Plants Technology

MODULE 2. Central control and protection

MODULE 3. Wind plants

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Electrical Machines

TOPIC: Electrical Machines

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES: Electrical Machines, Mechanical Drives

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_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_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS : Own course documentation

OTHER MATERIALS

Book: Sistemas Eólicos de Producción de Energía Eléctrica ; Amenedo et als (Ed Rueda , Madrid)

53001247 - ACOUSTIC ENGINEERING

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Guillermo de Arcas Castro
TYPE:	Elective - Track Construction Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Introduction to acoustics

MODULE 2. Instrumentation and Metrology

MODULE 3. Noise Control

MODULE 4. Environmental Acoustics

MODULE 5. Industrial applications

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC: Advanced Calculus

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_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_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS

Recuero M. y Gil C. Acústica Arquitectónica Ed. Paraninfo, Madrid 1991.
Harris, Cyril M., Manual para el control del ruido, Instituto de Estudios de Administración Local, Madrid, 1998
Recuero López, Manuel, Acondicionamiento Acústico, Editorial Paraninfo, Madrid, 2001.
Recuero López, Manuel, Acondicionamiento Acústico, Editorial Paraninfo, Madrid, 2001.
Beranek, Leo L., Music, acoustics & architecture, Robert E. Krieger, New York, 2000.
Beranek, Leo L., Music, acoustics & architecture, Robert E. Krieger, New York, 2000.
Recuero, M. (2002). Contaminación acústica. Madrid: Universidad Politécnica de Madrid.

OTHER MATERIALS

53001248 - DESIGN OF STEEL STRUCTURES

LIST OF TOPICS

MODULE 1. Introduction to steel structures

MODULE 2. Materials and structural systems

MODULE 3. Design concepts and criteria

MODULE 4. Structural safety concepts

MODULE 5. Analysis types

MODULE 6. Mechanical properties of steel

MODULE 7. Steel member behavior: Generalities

MODULE 8. Steel member behavior: Material behavior

MODULE 9. Steel member behavior: Panels subjected to tensile and compressive loading

MODULE 10. Steel member behavior: Panels subjected to shear loading

MODULE 11. Steel member behavior: Cross-sections

MODULE 12. Steel member behavior: Beams

MODULE 13. Steel connections

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC: Calculation and Design of Structures

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Strength of materials

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 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_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

OTHER MATERIALS

- UNE-EN 1993
- Código Técnico de la Edificación (CTE)
- Instrucción EAE

53001249 - DESIGN OF REINFORCED CONCRETE STRUCTURES

CREDITS:	6 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Ramón Álvarez Cabal
TYPE:	Elective - Track Construction Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Alternative calculation methods

MODULE 2. Materials

MODULE 3. Section resistance

MODULE 4. Strength of the bars

MODULE 5. Details

MODULE 6. Constructive elements

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC: Calculation and Design of Structures

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):

- Understand the behavior of concrete elements.

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 of 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_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

Calavera, J. *Proyecto y Cálculo de Estructuras de Hormigón.* Edic. INTEMAC. Madrid

OTHER MATERIALS

53001250 - SOIL MECHANICS

CREDITS:	4.5 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Alberto Fraile de Lerma
TYPE:	Elective - Track Construction Engineering
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. General notions. The Three-Phase System.

1) Scope of the course
2) Weight and Volume relationships
3) Interrelationships

MODULE 2. Origin and Classification of Soils

4) Soil origin
5) Classification on the Basis of Grain Size
6) Classification on the Basis of Plasticity
7) Classifying a Soil. Engineering Properties.

MODULE 3. The Effective Stress Principle

8) The Principle and Nature of the Effective Stress
9) Effective Stress under hydrostatic conditions

MODULE 3. Steady State Hydrodynamic Conditions

10) One-dimensional flow. Darcy's Law. Permeability.
11) The General Flow Problems. Condition of Continuity
12) Two-dimensional Steady State Flow. Laplace Equation
13) Filtration forces. Quick conditions.

MODULE 4. Transient Hydrodynamic Conditions

14) Terzaghi's One-dimensional Consolidation Theory
15) Oedometer Test. Coefficients of Compressibility and Consolidation
16) Effective Stress Distribution in a Compressive Layer during Consolidation

MODULE 5. Settlement

17) Consolidation and Settlement. Limitations
18) Stresses and time Dependent Settlement Evaluation

MODULE 6. Shear Strength

19) Coulomb Model
20) Cam-Clay Model
21) Laboratory test. Short and Long Term situations.
22) Constitutive Laws used in software packages

MODULE 6. Applications

23) General rules. Limit Equilibrium Method.
24) Slopes
25) Shallow foundations
26) Deep foundations
27) Retaining Walls

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_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
- ABET_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS

"Geotecnia y Cimientos I. Propiedades de los suelos y de las rocas", J. A. Jiménez Salas y J. L. de Justo Alpañés. Editorial Rueda, 1975.
“Elements of soil mechanics", G.N. Smith and Ian G.N. Smith, Editorial Blackwell Science, 1998.
"Geotecnia y Cimientos II. Mecánica del suelo y de las rocas", J. A. Jiménez Salas, J. L. de Justo Alpañés y A. A. Serrano. Editorial Rueda, 1976.
“A guide to soil mechanics”, M. Bolton. The Macmillan Press. London, 1979.
"Fundamentos de ingeniería geotécnica", B.M. Das. Editorial México. Thomson Learning, cop. 2001.
"Mecánica de suelos", T.W. Lambe y R.V. Whitman. Editorial Limusa-Wiley. México, 1972.
"Propiedades geofísicas de los suelos", J. E. Bowles. Editorial Mc Graw-Hill, 1982.

OTHER MATERIALS

Blackboard
Computer equipment
Theoretical Notes and Solved Problems
Bibliography

53001247 - ACOUSTIC ENGINEERING

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Guillermo de Arcas Castro
TYPE:	Elective - Track Construction Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Introduction to acoustics

MODULE 2. Instrumentation and Metrology

MODULE 3. Noise Control

MODULE 4. Environmental Acoustics

MODULE 5. Industrial applications

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC: Advanced Calculus

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_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_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

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Harris, Cyril M., Manual para el control del ruido, Instituto de Estudios de Administración Local, Madrid, 1998
Recuero López, Manuel, Acondicionamiento Acústico, Editorial Paraninfo, Madrid, 2001.
Recuero López, Manuel, Acondicionamiento Acústico, Editorial Paraninfo, Madrid, 2001.
Beranek, Leo L., Music, acoustics & architecture, Robert E. Krieger, New York, 2000.
Beranek, Leo L., Music, acoustics & architecture, Robert E. Krieger, New York, 2000.
Recuero, M. (2002). Contaminación acústica. Madrid: Universidad Politécnica de Madrid.

OTHER MATERIALS

53001251 - ELASTICITY, PLASTICITY, AND FRACTURE

CREDITS:	4.5 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	A. Ros
TYPE:	Elective - Track Mechanical Engineering
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Static and kinematics of deformable solids

- 1) Equilibrium equations
- 2) Large and small deformations. Infinitesimal deformations. Compatibility equations

MODULE 2. Laws of behavior. Elasticity

- 3) Phenomenology of deformable solid. Thermodynamic considerations

MODULE 3. The linear elastic problem. Applications

- 4) The linear elastic problem. Local approach
- 5) Comprehensive approach. Numerical methods
- 6) Simple problems
- 7) Problems planes
- 8) Torsion

MODULE 4. Plasticity

- 9) Plasticity

MODULE 5. Fracture

- 10) Break through plastic instability
- 11) Fatigue. Local deformation method. Accumulation of damage
- 12) Fracture mechanics. Energy balance
- 13) stress intensity factor
- 14) Subcritical crack growth

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Identify the forces acting on a body and know how to analyze their static equilibrium
- Ask rigorously logical development of a mechanical problem

SPECIFIC OUTCOMES FOR THE COURSE

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

- Analyze the mechanical behavior of structures and machine elements under general loading conditions and different behaviors of the material
- Optimize mechanical designs and accurately assess the safety margins against various failure modes
- Understanding the processes of deformation in cold forming materials
- Using numerical and experimental stress analysis techniques

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_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS:

Mecánica del Sólido

Deformable.

Elasticidad.

Plasticidad. Rotura.

Ed. GARCETA

OTHER MATERIALS:

Laboratory Equipmente

53001252 - VIBRATIONS

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Juan Manuel Muñoz Guijosa
TYPE:	Elective - Track Mechanical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Basic tools and concepts for the study of vibrations in machines.

MODULE 2. Vibration analysis in machines. 1 Degree of Freedom Systems

MODULE 3: Vibration analysis in machines. 2 and n Degree of Freedom Systems

MODULE 4: Modal analysis

MODULE 5: Vibration correction and control through mechanical design

MODULE 6: Random vibration and fatigue life estimation

RECOMMENDED COURSES

RECOMMENDED PREVIOUS COURSES:

COURSE: Differential Equations

TOPIC: Constant coefficient differential equations

COURSE: Algebra

TOPIC: Matrix algebra

COURSE: Materials

TOPIC: Fatigue criteria

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES

Matlab

Simulink

CAE modelling and simulation

SPECIFIC OUTCOMES FOR THE COURSE

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

- -Establish the equations of motion of different linear and nonlinear vibration causes in machinery -Design a mechanical systems from the dynamic loads point of view, whether steady -random or periodical-, where fatigue is the design criterion, or

transient -shock-, where maximum stress is the design criterion. -Improve the dynamic behavior of a mechanical system by determining the necessary changes in stiffness, mass or damping, not only in magnitude but also in location and resolutive principle. -Identify different failure causes in machinery by means of the steady state vibration -Apply different solution methodologies for the same vibration problem -Apply CAE tools for the determination of frequency response functions -Understand the most common experimental vibration analysis and representation techniques -Understand the basic principles of acoustic waves propagation, interference and isolation -Perform basic acoustic measurements by means of acoustic pressure measurement and intensimetry

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_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS

-Mecánica de las Vibraciones, Den Hartog, Ed. C.E.C.S.A.
-Mechanical Vibrations for Engineers, Thompson, W.T., Ed. Prentice Hall
-Vibrations, Balakumar Balachandra. Thomson.
-Acoustics, Allan D. Pierce, Acoustical Society of America
-Manual de medidas acústicas y control del ruido, Cyril M. Harris.

OTHER MATERIALS

-Simulink and Matlab models
-Mechanical system design examples using CATIA and Matlab
-Industry experts presentations
-Acoustical measurement tools and procedures
-High speed rotating machine simulator
-15kg, 2500Hz shaker

INDUSTRIALES
ETSII | UPM

53001254 - DESIGN AND MANUFACTURING WITH POLYMERS

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Juan de Juanes Márquez Sevillano/Andrés Diaz Lantada
TYPE:	Elective - Track Mechanical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Introduction to Polymers Technology and Transformation Industry

MODULE 2. Smart Design and for Polymer Parts

MODULE 3. Transformation Processes for Polymeric Materials

MODULE 4. Injection Mold Design

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Courses Recommended: Manufacturing Technology (55000033), Manufacturing Automation and Robotics (55000401)
Topics: Computer Aided Design, Manufacturing and Engineering, Manufacturing Cost Estimation, Design for Manufacturing

SPECIFIC OUTCOMES FOR THE COURSE

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

• Optimize the process of design of polymer parts or elements in assemblies Materials Selection for specific applications Joining design for polymer parts, use of CAE applications Pre-dimensioning of Injection Mold, Mold Size and Injection Molding Machine Selection Part Design validation for manufacturing and conceptual Mold Design Multi-cavity analysis, feeding sub-systems, and cost of the injected component, use of CAE applications Full analysis on cooling system, optimizing of process parameters, warpage and shrinkage analysis, use of CAE applications Detail Design of Mold, use of CAD applications

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_6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS

Moldes de Inyección para Plásticos. 100 casos prácticos Hans Gastrow Editorial Hanser, 1992
Injection Molding Handbook. Osswald, T.A. Editorial Hanser, 2001
How to make injection molds 2nd Edition. Menges y Mohren Editorial Hanser, 1993

OTHER MATERIALS

http://wikifab.dimf.etsii.upm.es/wikifab/index.php/Clases_1254_2020

53001255 - INDUSTRIAL SAFETY AND MAINTENANCE

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

LIST OF TOPICS

MODULE 1. Introduction

MODULE 2. Failure possibilities

MODULE 3. Theoretical Bases

MODULE 4. fault analysis

MODULE 5. Verification techniques

MODULE 6. Engineering machinery safety

MODULE 7. implementing legislation

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_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

OTHER MATERIALS

53001256 - AUTOMOBILES

CREDITS:	4.5 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Luis Martínez
TYPE:	Elective - Track Mechanical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Suspension systems for cars.

1. Suspension angles and dimensions.
2. Vertical dynamic behavior of the vehicle.
3. Shock Absorbers.

MODULE 2. Braking systems for cars.

4. Braking Components.
5. Design of braking systems.

MODULE 3. Transmission system of automobiles.

6. Transmission systems layouts.
7. Gear Boxes.
8. 4WD Systems.

MODULE 4. Security systems for cars.

9. Multiplexed Data Transmission Systems.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Fourth year of Degree in Engineering in Industrial Technologies.

TOPIC: Vehicle Theory. 55000402.

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):

- To know the operation and design criteria of the main systems of today's cars: suspension, brakes, transmissions and communication buses.
- To know the different security technologies of motor vehicles.

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_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_6. An ability to develop and conduct appropriate experimentation, analyses and interpret data and use engineering judgment to draw conclusions.

BIBLIOGRAPHY

Notes and presentation of all topics distributed through Aulaweb.

TEXT BOOKS

OTHER MATERIALS

53001257 - MATERIALS HANDLING

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Enrique Alcalá Fazio
TYPE:	Elective - Track Mechanical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Concept and handling systems.

MODULE 2. Equipment

MODULE 3. Characterization

MODULE 4. System design support.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

55000403 Diseño de Máquinas; 55000404 Simulación de Sistemas Mecánicos

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):

- To know the main characteristicas and performances of the main materials handling elements.
- To design an ad-hoc materials handling system for an specific manufacturing plant.
- To make use of agent simulation events software applied to materials handling systems.
- To use the materials handling library of anylogic.

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

BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS

- Handbook of materials handling. Edited by Raymond A. Kulwiec Copyright © 1985 John Wiley & Sons, Inc. ISBN: 978-04-710-9782-2
- Introduction to materials handling. Shidarta Ray. ISBN : 978-81-224-2554-3
- Almacenaje Manutención y transporte Interno en la Industria. Francesc Astals. ISBN: 978-84-9880-383-9
- Anylogic sofware

53001258 - EQUIPMENT AND INSTALLATIONS IN RAILWAYS

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Juan de Dios Sanz
TYPE:	Elective - Track Mechanical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Fundamental concepts and application environment

- Technology areas in the railway domain
- Standardization, regulation and safety.
- System approach: Energy, Rolling Stock, Control, Command and Signalling

MODULE 2. Electrification subsystem

- Contact line:
  - Tramway, third rail, overhead contact line (rigid and flexible
  - Mechanical components
  - Environmental issues
  - Interaction to pantograph
- Substation components in DC
- Substation components in AC.

MODULE 3. Rolling Stock subsystem.

- Common terms
- Technical data and Commercial requirements
- Safety criteria
- Compatibility with infrastructure
- Compatibility with control, command and signaling
- Components: typology of trains, mechanical parts, brakes, power,driver interface

MODULE 4. Train control subsystem.

- Signals
- Train detection systems: track circuit (conventional 50 hz and audifrequency), axle counters
- Switches and crossings
- Interlocking: definitions, principles and technological evolution
- Block systems: telephone, electrica-manual, automatic system
- Train Protection: punctual(ASFA), continuous (ATC), CBTC and ERTMS,
- Functions of the Traffic control system
- Train operations and conflicts identification

MODULE 5. Planning &Design

- Rules for section definitions
- Cabling and wiring
- Energy demand by stations and Uninterruptible power supply definition
- Use of the ADIF Network statement

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

None special skills for this subject

SPECIFIC OUTCOMES FOR THE COURSE

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

• Identify areas of railway technology
. Identify components and elements in a railway scheme for signaling and electrification lines
• Determine the status of railway rolling stock
• Identify electric traction installations (substations and overhead contact line)
• Basic and advanced train control
. Understand the European Regulation and the Interoperable understanding
n

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

BIBLIOGRAPHY

TEXT BOOKS

- RAILWAYS SIGNALLING. INSTITUTION OF RAILWAY SIGNAL ENGINEERS. ISBN 0-7136-4167-3
- COMPENDIUM ON ERTMS European Rail Traffic Management System. UIC. Eurailpress. ISBN 978-3-7771-0396-9.
- INGENIERÍA FERROVIARIA. Francisco Javier González Fernández. Julio Fuentes Losa. UNED. ISBN 978-84-362-5293-4.
- INFRAESTRUCTURAS FERROVIARIA. Andrés López Pita. Ediciones UPC. ISBN 978-84-830-1853-8
- LA TRACCIÓN ELÉCTRICA EN LA ALTA VELOCIDAD FERROVIARIA. Roberto Faure Benito. COICaminos. ISBN 978-84-380-0274-

OTHER MATERIALS

- Declaración de red de ADIF……..recurso web desde www.adif.es
- Observatorio del Ferrocaril en España……..recurso web desde www.mitma.gob.es
- Flota de trenes de RENFE……..recurso web desde www.renfe.es
- Especificaciones Técnicas de Interoperabilidad.....recurso disponible desde www.era.europa.eu
- Notes and examples in Moodle server

53001259 - HYBRID VEHICLES

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	José Mª López Martínez
TYPE:	Elective - Track Mechanical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Introduction

MODULE 2. Systems and components

MODULE 3. Electric Vehicles

MODULE 4. Hybrid vehicles

MODULE 5. Fuel cell

MODULE 6. Fuel cell vehicles

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):

- Design an electric vehicle.

STUDENT OUTCOMES

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

López Martínez, José Mª, "**Vehículos híbridos y eléctricos. Diseño del tren prolpulsor"** Publicaciones de la ETSII de Madrid. 2017

OTHER MATERIALS

Pwp of the modules.

53001260 - DESIGN OF ELECTROMECHANICAL SYSTEMS

CREDITS:	4.5 ECTS
DEPARTMENT:	Mechanical Engineering (MEC)
COURSE COORDINATOR:	Mónica Villaverde
TYPE:	Elective - Track Mechanical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Introduction

- Introduction to electromechanical systems
- Measurement and control systems

MODULE 2. Components

- Types of sensors
- Types of actuators
- Servo motors

MODULE 3. System designer

- Case application: position sensors
- Development of an application using software for measuring and controlling

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):

- Designing electromechanical systems choosing adequate sensors and actuators
- Designing measurement systems
- Programming applications for automatic measuring and controlling

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

BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS

Software para el diseño de sistemas automáticos de medida
Recursos propios en las plataformas educativas UPM - ETSII - INGENIERÍA DE FABRICACIÓN:

- https://moodle.upm.es/titulaciones/oficiales/login/login.php
- http://aulaweb.etsii.upm.es

53001263 - PRODUCTIVE MAINTENANCE

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Engineering (MEC) COURSE
COORDINATOR:	Jesús María Pérez
TYPE:	Elective - Track Mechanical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Introduction

MODULE 2. Maintenance management

MODULE 3. Maintenance Types

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: The Master's Degree in Industrial Engineering study plan does not have defined previous subjects recommended for this subject

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES: Basic concepts of Industrial Engineering. Design. Manufacturing. Preparation of technical plans. CAD / PLM systems

SPECIFIC OUTCOMES FOR THE COURSE

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

- Ability for the design, construction, and operation of industrial plants

STUDENT OUTCOMES

- 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_7. An ability to acquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

TEXTBOOKS

Fumio Gotoh, TPM para departamentos de ingeniería, ISBN 84-87022-23-5, Productivity Press, 1996

OTHER MATERIALS

53001264 - SIDERURGY

CREDITS:	4.5 ECTS
DEPARTMENT:	Applied Physics and Materials Engineering (P&M)
COURSE COORDINATOR:	Miguel Panizo Laiz
TYPE:	Elective - Track Materials
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Introduction

MODULE 2. Steelmaking processes I

MODULE 3. Steelmaking processes II

MODULE 4. Electric steelmaking processes

MODULE 5. Other processes

MODULE 6. Steel casting

MODULE 7. rolling process

MODULE 8. wiredrawing and calibration process

MODULE 9. Coated products

MODULE 10. manufacture of stainless steel

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):

- Read profitably technical literature on Steel so that it can deepen the knowledge acquired in the course

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
- 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

Monografías sobre tecnología del acero. J.L. Enríquez Berciano. Madrid 2009
Fabricación de hierro, aceros y fundiciones. Tomo 1 y 2. J. Apraiz Barreiro. Editorial URMO. 1984
Metal Working. ASM. Volumen 14 A y B.

OTHER MATERIALS

Siderurgia.etsii.upm.es

53001265 - STRUCTURAL MATERIALS DESIGN

CREDITS:	3 ECTS
DEPARTMENT:	Applied Physics and Materials Engineering (P&M)
COURSE COORDINATOR:	Antonio Portolés García
TYPE:	Elective - Track Materials
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Materials and service conditions in the design of structures

MODULE 2. Joint Design

- Design of Welded Joints. Calculation
- Adhesive Joint Design. Calculation

MODULE 3. Implications, meaning and analysis of the requirements of the design codes. Technical specifications for the construction of structures.

- General Requirements
- Construction of Steel Structures
- Construction of Aluminum Alloy Structures

MODULE 4. Component Design According to ASME Codes

MODULE 5. Design Using the Finite Element Method

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: GITI

TOPIC: Materials

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES: Knowledge of materials and their properties

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 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_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS:

Ciencia de Materiales: Selección y Diseño.

ASM Handbook 10th Edition Vol 20: Materials selection and design

Diseño en Ingeniería Mecánica

Engineer's Guide to Pressure Equipment

OTHER MATERIALS:

Power Point Presentations in Classroom of the subject

Standards UNE-EN

BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS

53001266 - FUNCTIONAL MATERIALS AND NANOMATERIALS

CREDITS:	3 ECTS
DEPARTMENT:	Applied Physics and Materials Engineering (P&M)
COURSE COORDINATOR:	Mohammed Naffakh Cherradi-Hadi
TYPE:	Elective - Track Materials
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Nanomaterials

1.1. Historical Backgrounds, Fundamentals and Current Status

1.2. Processing and Characterization

1.3 Nanocomposites - Classification Types: Properties and Applications

1.4 New Trends

1.5 Nanosafety

MODULE 2. Functional Materials

Optical, Electrical and Magnetic Properties, among others

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):

• Able to understand the fundamental scientific knowledge related to functional materials and nanomaterials, and their processing–structure–property relationships.

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_7. An ability to acquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

TEXT BOOKS

- M.F. Ashby, P.J. Ferreira, D.L. Schodek. Nanomaterials, Nanotechnologies and Design. Butterworth-Heinemann 2009. ISBN 9780750681490.
- D. Aravind, Y. Zhong-Zhen, M. Yiu-Wing. Polymer Nanocomposites Towards Multi-Functionality. Springer 2016. ISBN 978-1-4471-6809-6.
- J. Leng, A. Kin-tak Lau. Multifunctional Polymer Nanocomposites. CRC Press 2010. ISBN-10: 1439816824
- S. Banerjee, A.K. Tyagi. Functional Materials: Preparation, Processing and Applications. Elsevier 2012. ISBN. 978-0-12-385142-0.

OTHER MATERIALS

Scientific Papers and self-presentations

Course Syllabi. Elective (Profile I)

53001267 - BIOMATERIALS

CREDITS:	4.5 ECTS
DEPARTMENT:	Applied Physics and Materials Engineering (P&M)
COURSE COORDINATOR:	García Ruiz, Ana M.
TYPE:	Elective - Track Materials
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Fundamentals of Biochemistry and Molecular Biology

MODULE 2. Fundamentals of Cytology and Histology

MODULE 3. Fundamentals and Types of Biomaterials

MODULE 4. Clinical Applications of Biomaterials

MODULE 5. Biocompatibility and Biodeterioration of Biomaterials

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Metallic Materials Science, Strength of Materials, Structure and Properties of Non-Metallic Materials

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Materials structure and properties (crystal systems, microstructure, alloy phase diagrams)
Mechanical properties of materials: Elastic and plastic behaviour fundamentals

SPECIFIC OUTCOMES FOR THE COURSE

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

• -Know the fundaments of materials for medical devices. -Understand the processes of biochemistry, molecular biology, cytology, histology, biocompatibility, and biodeterioration involved in the use of biomaterials. -Prepare and defend work related to the content of the course.

STUDENT OUTCOMES

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

BIBLIOGRAPHY

TEXT BOOKS

Lehninger: Principles of Biochemistry. 2013. D.L. Nelson, M.M. Cox, A.L. Lehninger (eds.). W.H. Freeman and Company, New York

Biología Celular y Molecular. 2016. Harvey Lodish, Arnold Berk, Chris A. Kaiser, Montyh Krieger, Anthony Bretscher, Hidde Ploegh, Angelika Amon, Matthew P. Scott (eds.) 7ª edición. Ed. Médica Panamericana.

Biomateriales. 2004. R. Sastre, S. de Aza, J. San Román. Ed. CYTED, Programa Iberoamericano de Ciencia y Tecnología para el Desarrollo.

Biomaterials: Principles and Applications. 2003. Joon B. Park, Joseph D. Bronzino. Ed. CRC Press.

Biomaterials Science: An Introduction to Materials in Medicine. 2004. Buddy B. Ratner, Allan S. Hoffman, Frederich JH. Schoen, Jack E. Lemons. Ed. Elsevier.

Roitt's Essential Immunology. 2017. Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. Wiley-Blackwell. 13th Edition.

OTHER MATERIALS

The following laboratories will be available in the Department of Applied Physics and Materials Engineering:

-Biodeterioration Laboratory, including autoclave, laminar flow cabinet, epifluorescence microscopy, microbiological incubators, etc.

-Materials Testing and Analysis Laboratory, including ovens for heat treatment, tensile testing machines, pendulum for the Charpy V-notch impact test, durometers and microdurometers, etc.

Moodle platform and CES EduPack software from GRANTA Design will also be used as teaching resources.

53001268 - BEHAVIOUR OF MATERIALS IN SERVICE

CREDITS:	3 ECTS
DEPARTMENT:	Applied Physics and Materials Engineering(P&M)
COURSE COORDINATOR:	Antonio Portolés García
TYPE:	Elective - Track Materials
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Degradation of Materials
- Corrosion of metallic materials
- Degradation of polymeric materials

MODULE 2. Mechanical Behaviour
- Fracture. Types
- Fracture Mechanics
- Fatigue. Calculation of useful life
- Creep

MODULE 3. Service failures
- Analysis of failures in service
- Metodology

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: GITI

TOPIC: Materials

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES: Knowledge of materials and their properties

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_3. An ability to communicate effectively with a range of audiences

BIBLIOGRAPHY

TEXT BOOKS:

Failure Analysis Case Studies

Practical Engineering Failure Analysis

Elementary Engineering Fracture Mechanic

Advanced Fracture Mechanics

ASM Handbooks 10th Edition Vols: 11, 12, 13 and 19

OTHER MATERIALS

Power Point Presentations in Classroom of the subject

53001269 - LOGISTICS

CREDITS:	4.5 ECTS
DEPARTMENT:	Organization Engineering, Business Administration and Statistics (MAS)
COURSE COORDINATOR:	Eva Ponce
TYPE:	Elective - Track Industrial Management
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Introduction to Logistics

MODULE 2. Procurement

MODULE 3. Warehousing and handling

MODULE 4. Hub design and layout

MODULE 5. Real operations

MODULE 6. IT applied to Logistics

MODULE 7. Transportation and Physical Distribution

MODULE 8. Introduction to Reverse Logistics

MODULE 9. Case study: design of a logistics system

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Work organization and Human Resources Management
Organisation of Manufacturing Systems
Manufacturing Management
Decision making support methods

SPECIFIC OUTCOMES FOR THE COURSE

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

- Understand Logistics on the job
- Apply logistics knowledge to real life

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_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_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

OTHER MATERIALS

Investigación de Operaciones. Hamdy Taha. Editorial Pearson Educación. Mexico

Integral Logistics Structures. Sjoerd Hoekstra/Jac Rommerç. Editorial Mc Graw Hill

Warehouse and Distribution Science. John J. Bartholdi III, Steven T Hackman. Self-edition

Gestión y Diseño de Almacenes. Juan Carlos Viela. Self-edition

La Cadena Logística Optima. Juan Carlos Viela. Self -edition

Logística y Productividad. Blog www.loypro.wordpress.com

Going backwards. Reverse logistics, trends and practices. Dale S. Rogers, Ronald S. Tibben-Lembke. Self-edition

53001270 - INFORMATION SYSTEMS

CREDITS:	4.5 ECTS
DEPARTMENT:	Industrial Management, Business Administration and Statistics (MAS)
COURSE COORDINATOR:	Santos Eguren
TYPE:	Elective - Track Industrial Management
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Organizations, administration and business networking

MODULE 2. Information technology infrastructure

MODULE 3. Applications of major systems for the digital age

MODULE 4. Construction and systems management

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_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_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

OTHER MATERIALS

53001271 - ECONOMICS

CREDITS:	6 ECTS
DEPARTMENT:	Industrial Management, Business Administration and Statistics (MAS)
COURSE COORDINATOR:	Alberto Urueña López
TYPE:	Elective - Track Industrial Management
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Microeconomics

1. Economic Science and the bases of economic reasoning
2. The Economy of the Consumption Unit
3. The Theory of Production
4. The Theory of Costs
5. Markets

MODULE 2. Macroeconomics

6. The National Accounts
7. The Theory of Determination of Income
8. Money and the Monetary System. The Money Market
9. Joint balance between the Market for Goods and Services and the Monetary. The Aggregate Supply Model and the Aggregate demand. Macroeconomic policies.
10. International Economy. Balance of payments. Exchange rates

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):

Knowledge and use of the principles and tools of micro and macro-economic analysis. Understanding of the environment in which an engineer will develop his professional activity and training to carry out a assessment of the scope that said environment may imply in the development of its professional activity.

STUDENT OUTCOMES

- ABET_2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of 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_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS

Economics (Mankiw, Taylor), 3th edition, Ed. Paraninfo

Economy: Theory and Practice. Juan Manuel Blanco, 6th Edition, McGraw Hill Education

53001272 - INTRODUCTION TO CAPITAL MARKETS

CREDITS:	3 ECTS
DEPARTMENT:	Industrial Management, Business Administration and Statistics (MAS)
COURSE COORDINATOR:	Mercedes Grijalvo
TYPE:	Elective - Track Industrial Management
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Introduction

MODULE 2. asset valuation

MODULE 3. portfolio management;

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_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

53001273 - INDUSTRIAL CHEMISTRY

CREDITS:	4.5 ECTS
DEPARTMENT:	Chemical and Environmental Engineering (CHE)
COURSE COORDINATOR:	Manuel Rodríguez Hernández
TYPE:	Elective - Track Chemical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Processes of Inorganic Chemistry

MODULE 2. Processes of Organic Chemistry

MODULE 3. Other processes

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC: Chemical Process

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_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_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

Introduction to Chemical Engineering: solved mass and energy balance problems/Introducción a la ingeniería química: problemas resueltos de balance de material y energía. Izquierdo, J.F., Costa, J., Martínez de la Ossa, E., Izquierdo, M. Reverté

Mass and Energy Balances Basic Principles for Calculation, Design, and Optimization of Macro/Nano

Systems. Ali Ashra- zadeh, S., Zhongchao Tan, Z. Springer

Chemical Process Analysis: Mass and Energy Balances. Luyben, W.L., Wenzel, L.A. (Prentice Hall International Series, the Physical and Chemical Engineering Sciences)

OTHER MATERIALS

53001274 - EXPERIMENTATION IN CHEMICAL ENGINEERING

CREDITS:	3 ECTS
DEPARTMENT:	Chemical and Environmental Engineering (CHE)
COURSE COORDINATOR:	Emilio J. González Gómez
TYPE:	Elective - Track Chemical Engineering
YEAR AND SEMESTER:	2nd Year / First semester

LIST OF TOPICS

MODULE 1. Separation operations

MODULE 2. Kinetics and Reactors

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

Chemical Processes (1st year)

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Responsibility for chemical laboratory work
- Preparation of reports
- Teamwork
- Search for scientific information
- Personal organization and proper execution of work

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_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_6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.

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BIBLIOGRAPHY

TEXT BOOKS

- W. L. McCabe, J. C. Smith y P. Harriott, "Unit Operations of Chemical Engineering", Mac Graw-Hill, 7th Ed. (2005).
- Shammas N.K. "Coagulation and Flocculation". In: Wang L.K., Hung YT., Shammas N.K. (eds) Physicochemical Treatment Processes. Handbook of Environmental Engineering, vol 3. Humana Press, (2005).
- H. S. Fogler, "Elements of Chemical Reaction Engineering", Prentice Hall, 4th Ed. (2012).
- O. Levenspiel, Chemical Reaction Engineering, Wiley, 3rd Ed. (1998).
- J. M. Smith, Chemical Engineering Kinetics, McGraw-Hill, 3rd Ed. (1981).
- G. Stephanopoulos, "Chemical Process Control: An Introduction to Theory and Practice", Prentice Hall, 1st Edition (1984).
- B. Bequette, "Process Control: Modeling, Design, and Simulation", Prentice Hall, 1st Ed. (2003).
- F. Rouquerol, J. Rouquerol and K. Sing, "Adsorption by Powders and Porous Solids", Academic Press, 2nd Ed. (2012).

OTHER MATERIALS

- Practical guides

53001275 - PROCESS AND PRODUCT ENGINEERING

CREDITS:	4.5 ECTS
DEPARTMENT:	Chemical and Environmental Engineering (CHE)
COURSE COORDINATOR:	María González Miquel
TYPE:	Elective - Track Chemical Engineering
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

1. Introduction. Process diagrams.
2. Process simulation.
3. Process design.
4. Equipment sizing and cost.
5. Process economics.
6. Product design.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Chemical Engineering Principles; Separation Processes; Chemical Reactor Design.

TOPIC: Chemical Process

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_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_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

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BIBLIOGRAPHY

TEXT BOOKS

Dimian, A. C. (2003). “Integrated design and simulation of chemical processes. Computer aided chemical engineering”; Volume 13. Elsevier.

Cussler and Moggridge (2011), "Chemical Product Design", 2n Ed, Cambridge.

OTHER MATERIALS

Slides and exercises provided throughout the module.

53001276 - CHEMICAL PROCESS CONTROL

CREDITS:	6 ECTS
DEPARTMENT:	Chemical and Environmental Engineering (CHE)
COURSE	Manuel Rodríguez Hernández
COORDINATOR: TYPE:	Elective - Track Chemical Engineering
YEAR AND	2nd Year / Fall

LIST OF TOPICS

MODULE 1. General concepts

MODULE 2. Unit Operations Control

MODULE 3. Advanced Process Control

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES: Unit operations and Chemical Reactors

COURSE: 3

TOPIC: Chemical Process

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

It is recommended to have knowledge related to how different basic operations and reactors work, besides some basic concepts of automation, chemical and physical equilibria, transport phenomena and mass and energy balances are welcome.

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 fo public health,safety,and welfare,as well as global,cultural,social,environmental,and economic factors

BIBLIOGRAPHY

TEXT BOOKS

1. Acedo Sánchez, J. “Control Avanzado de Procesos”, Ed. Díaz de Santos, 2003
2. Corripio, A.B. “Designand applicationof processcontrol systems”, Ed ISA (International societyformeasurementand control), 1998
3. Deshpande, P.B. “Distillation dynamics and control”, Ed. Edward Arnold, 1985
4. Luyben,W.L., Tyréus, B.D. y Luybe, M.L. “Plantwide Process Control”, Ed. McGraw-Hill,1999
5. Luyben, W.L. “Process Modeling, Simulation and Control for Chemical Engineers”, Ed. McGraw-Hill, 2nd edition, 1990.

6. Ollero de Castro, P. y Fernández Camacho, E. ”Control e instrumentación de procesos químicos” Ed. Síntesis, 1997
7. Shinskey, F.G. “Process Control Systems”, Ed. McGraw-Hill, 4th edition, 1996.
8. Shinskey, F.G. “Distillation control”, Ed. McGraw-Hill, 1977
9. Smith, C.A. “Automated Continuous Process Control”, Ed. Wiley& Sons, 2002
10. Stephanopoulos, G. ”Chemical Process Control”, Ed. Prentice-Hall, 1984 11. Svrcek,W. Y., Mahoney, D.P. y Young B.R. ”A Real-time approach to process control”, Ed. John Wiley& Sons, 2000
12. Harold Wade. Basic and advanced regulatory control, ISA (The Instrumentation, Systems and Automation society)
13. N. E. Batthika. The condensed handbook of measurementand control, ISA (The Instrumentation, Systems and Automation society)
14. Bela Liptak. Instruments Engineering Handbook. Process measurement and analysis, 4ed.,2003, CRC Press
15. G. Mc Millan. Process Indutrial instruments and control handbook, 1999, Mc Graw Hill.

OTHER MATERIALS

53001277 - RADIATION PROTECTION

CREDITS:	3 ECTS
DEPARTMENT:	Energy Engineering (ENE)
COURSE COORDINATOR:	Eduardo Gallego Díaz
TYPE:	Elective - Track Energy Techniques
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Introduction and basics

MODULE 2. Dosimetry and shielding of ionizing radiation

MODULE 3. Instrumentation for detection and dosimetry of ionizing radiation

MODULE 4. The Radiation Protection System

MODULE 5. Environmental radiological impact

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_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_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

- **Radiation Protection and Dosimetry. An Introduction to Health Physics. Michael G. Stabin** Editorial Springer, 2010
- **Radiation Protection. A Guide for Scientists and Physicians (4Edition) Jacob Shapiro** Editorial Harvard University Press, Cambridge, Massachusetts, 2002
- **Radiation Detection and Measurement (4th Edition) Glenn F. Knoll** Editorial John Wiley & Sons, 2010
- **Elementos de Radioprotección M.R. Ortega, A. Vidal-Quadras y A. Villar** Editorial Universidad Autónoma de Barcelona, 1987
- **Radiaciones Ionizantes. Utilización y riesgos I. X. Ortega y J. Jorba, (editores).** Editorial Edicions UPC, 1996
- **Fundamentos de dosimetría teórica y Protección Radiológica(2vol) P. Coll** Editorial Universitat Politècnica de Catalunya , 1990
- **Radioprotection et Ingénierie Nucléaire H. Métivier** Editorial EDP Sciences, 2006
- **Atoms, Radiation, and Radiation Protection (3rd Edition) James E. Turner** Editorial WILEY-VCH Verlag GmbH & Co., 2007

OTHER MATERIALS

53001278 - THERMAL POWER STATIONS

CREDITS:	4.5 ECTS
DEPARTMENT:	Energy Engineering (ENE)
COURSE COORDINATOR:	José A Fernández Benítez
TYPE:	Elective - Track Energy Techniques
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

MODULE 1. Introduction to thermal power generation

MODULE 2. Types and mechanisms. Thermodynamic cycles

MODULE 3. Power plants analysis: fuel and steam generation systems

MODULE 4. Power plants analysis: energy conversion system

MODULE 5. Cogeneration. New technologies in thermal generation. Decarbonization

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Introduction to power plants. Thermalhydraulics. Thermal Engineering

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 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_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

Source books:

Black & Veatch. *Power plant engineering*

Babcock & Wilcox Company. *Steam: Its Generation and Use*

OTHER MATERIALS

Moodle presentations

Software EES (Engineering Equation solver)

53001279 - ELECTRIC POWER PLANTS

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AEE)
COURSE COORDINATOR:	Luis Fernández Beites/Carlos Antonio Platero Gaona
TYPE:	Elective - Track Energy Techniques
YEAR AND SEMESTER:	2nd Year / Spring

LIST OF TOPICS

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC: Hydro and wind machines

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES: Electrical Machines, Circuit Theory, power systems

SPECIFIC OUTCOMES FOR THE COURSE

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

- Understand the working of synchronous machines in Power Plants.
- Understand and design electrical auxiliary systems and protections in Power Plants.
- Understand the control of power plant in the power system.

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_6. An ability to develop and conduct appropriate experimentation,analyse and interpret data,and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS

Information upload in web servers.

53001280 - FLUIDS ENGINEERING

CREDITS:	4.5 ECTS
DEPARTMENT:	Energy Engineering (ENE)
COURSE COORDINATOR:	Miguel Ángel Parrales
TYPE:	Elective - Track Energy Techniques
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Viscous liquids and viscoelasticity

MODULE 2. Stokes flow - Couette flow – Rayleigh problem

MODULE 3. Fundamentals of Rheology

MODULE 5. Stability of non-linear dynamical systems. Chaos

MODULE 6. Reynolds experiment. Laminar turbulent transition

MODULE 7. Bénard convection. Natural convection cells

MODULE 8. Taylor-Couette flow. Rotational vortex rings

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Fluid Mechanics I, II

TOPIC: Navier-Stokes equations, Viscous flows, Turbulent flows

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Algebra and Calculus. Fundamentals of thermodynamics. Numerical methods.

SPECIFIC OUTCOMES FOR THE COURSE

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

• Apply the laws of conservation and characterize the different regimes of the fluid motion. Analytical ability to characterize the fluid as a continuum and its applications. Approach and resolution of problems of transport involving fluids. Solve numerically basic fluid mechanics problems.

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_6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions

BIBLIOGRAPHY

TEXT BOOKS

Mecánica de Fluidos. A. Crespo. Ediciones Paraninfo (2010); Fundamentos y Aplicaciones de la Mecánica de Fluidos. A. Barrero y M. Pérez-Saborid. McGraw-Hill (2005); Fluid Mechanics, 5th Edition. F.M. White. McGraw-Hill (2004)

OTHER MATERIA

53001281 - RADIATION TECHNOLOGIES

CREDITS:	3 ECTS
DEPARTMENT:	Energy Engineering (ENE)
COURSE COORDINATOR:	Emma del Río Redondo
TYPE:	Elective - Track Energy Techniques
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Radioisotopes: sources and applications

MODULE 2. Accelerators: types and applications

MODULE 3. Lasers: types and Applications

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):

- - Analyze the physical basis of the intense source of radiations of scientific and technological interest - Recognise the more important applications of the radiation sources according to its type and intensity

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

- Radiochemistry and nuclear chemistry.Choppin, Gregory, Jan Rydberg and Jan-Olov Liljenzin. 2001.3rd ed. Oxford: Butterworth-Heinemann

- Radiochemistry and nuclear methods of analysis. Ehmann, William and Vance, Diane E. 1991. John Wiley and Sons Inc.
Tecnología
- Nuclear and radiochemistry: Fundamentals and applications. Lieser, Karl H. 2001. 2nd ed. Berlin: Wiley-VCH
- Introduction to nuclear science. Bryan, Jeff C. 2009. CRC Press: Taylor & Francis Group
- Handbook of modern Ion Beam materials analysis. Yongqiang Wang and Michael Nastasi, MRS. ISBN 978-1-60511-215-1
- Fundamentals of Surface and Thin Film Analysis, North-Holland (1986)
- Lasers. Anthony E. Siegman. 1986. University Science Books
- Lasers. Theory and Applications. K. Thyagarajan and A.K. Ghatak. 1981. Plenum Press
- Principles of Lasers. O. Svelto. Springer. 2010.

OTHER MATERIALS

- http://www.rp-photonics.com/encyclopedia.html

53001283 - NUCLEAR SAFETY

CREDITS:	3 ECTS
DEPARTMENT:	Energy Engineering (ENE)
COURSE COORDINATOR:	Eduardo Gallego Díaz
TYPE:	Elective - Track Energy Techniques
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. Introduction and Basics

MODULE 2. Accumulation and release of radioactivity in Nuclear Power Plants

MODULE 3. Analysis of Nuclear Power Plant Accidents

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Nuclear Technology, Nuclear Power Plants.

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_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_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

- Lee J.C., McCormick N. J., Risk and Safety Analysis of Nuclear Systems. Wiley (2011).
- Petrangeli G., Nuclear Safety. Butterworth-Heinemann (2006).
- Abramson P.B. (Editor), "Guidebook to Light Water Reactor Safety Analysis". Hemisphere Publishing Co., Washington (1985).
- Alonso A., "Introducción a la Seguridad Nuclear"; Vol. I: Fundamentos; Vol. II: La seguridad en la ubicación, proyecto, construcción y explotación de las centrales nucleares; Editorial Instituto de Estudios Nucleares, Junta de Energía Nuclear, Madrid (1975).
- Alonso A., y col., "Curso monográfico sobre análisis de accidentes". Editorial Instituto de Estudios de la Energía. CIEMAT, Madrid (1988).
- Eurocourse on Analysis of Severe Accidents in Light Water Reactors. F2I2-ETSII-UPM. 1997.
- Goded, F., Serradell, V., Martinez-Val, J.M y Oltrá, F., Teoría de Reactores y elementos de Ingeniería Nuclear, J.E.N., Madrid (1975, tomo I) (1981, tomo II).
- Lewis E.E., "Nuclear Power Reactor Safety". John Wiley & Sons, N.York (1977).
- Thompson T.J., Beckerley J.G. (Editors), "The Technology of Nuclear Reactor Safety"; Vol 1: Reactor Physics and Control; Vol. 2: Reactor Materials and Engineering. The M.I.T. Press, Cambridge, Massachusetts (1964 y 1973).
- Sehgal B.R., Nuclear Safety in Light Water Reactors: Severe Accident Phenomenology. Academic Press. (2012).

OTHER MATERIALS

53001227 - COMPLEMENTS OF ELECTROMAGNETISM

CREDITS:	6 ECTS
DEPARTMENT:	Applied Physics and Materials Engineering (P&M)
COURSE COORDINATOR:	José Luis Ocaña Moreno
TYPE:	Elective - Track
YEAR AND SEMESTER:	1st Year / Spring

LIST OF TOPICS

MODULE 1. Maxwell Equations

Maxwell equations. Invariance in the frame of Special Relativity. Interrelation of Electric and Magnetic Fields in moving frames. Electrostatic and Magnetostatic approaches

MODULE 2. Electrostatics

Electrostatic Field and Potential. Poisson and Laplace Equations. Explicit solutions for the Electrostatic Potential. Conductors. Electric Field in material media. Electrostatic Energy and Mechanical actions.

MODULE 3. Magnetostatics

Electric currents. Charge conservation equation and electric current density. Magnetic fields due to stationary currents. Magnetic Vector Potential. Magnetic Fields in material media. Ferromagnetic materials. Magnetic circuits

MODULE 4. Electromagnetic induction

Induced Electromotive Force. Faraday-Henry Law of Electromagnetic Induction and Maxwell Equations. Autoinduction and mutual induction coefficient of electric circuits. Currents induced through magnetic flux variation and mechanical motion. Electric generators, motors and transformers. Electromagnetic energy and mechanical actions. High frequency effects.

MODULE 5. Electromagnetic waves

Electromagnetic energy balance and electromagnetic waves. Maxwell equations and wave equations for coupled electric and magnetic fields. Poynting vector. Propagation of waves in vacuum and material media at low frequencies. Emission by oscillating electric and magnetic dipoles

MODULE 6. Electromagnetic waves interaction with matter

Electromagnetic waves interaction with matter at low frequencies: Isolators and good conductive materials. Energy deposition by electromagnetic waves in matter. Reflectivity and attenuation coefficient. Skin depth in good conductors. Wave polarization effects.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

Differential/Integral Calculus

Differential Equations

General Physics

Vector Mechanics

SPECIFIC OUTCOMES FOR THE COURSE

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

- Formal expression of Maxwell Equations and their possibility of simplification for stationary electric charge distributions and currents
- Interpret Electromagnetic Phenomena in the frame of Special Relativity. Recognize the interrelation between electric and magnetic fields.
- Analytical determination of electrostatic fields and potentials in vacuum and material media
- Evaluation of electrostatic energy and mechanical actions in typical charge/material configurations
- Analytical determination of magnetostatic fields in vacuum and material media
- Evaluation of electromagnetic energy and mechanical actions in typical current/material configurations
- Analytical coupled determination of induced electromagnetic fields due to non-stationary and/or moving currents.
- Electromagnetic energy balance and waves generation and propagation in vacuum and material media.
- Electromagnetic waves interaction and energy deposition to material media

STUDENT OUTCOMES

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

• 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

- A.M. Sánchez: "Ampliación de Física I". Publicaciones ETSII-UPM (2002)
- J.R. Reitz, F. Milford, R.W. Christy: "Fundamentos de la Teoría Electromagnética", 4ª Edición. Addison-Wesley Interamericana S.A. (1996).
- D.K. Cheng: "Fundamentos de Electromagnetismo para Ingeniería". Addison-Wesley Interamericana S.A. (1998).
- R.K. Wangsness: "Campos Electromagnéticos". Editorial Limusa S.A. (1992).
- P. Lorrain, D.R. Corson: "Campos y Ondas Electromagnéticos". Selecciones Científicas (1976).
- P. Lorrain, D.R. Corson, F. Lorrain: "Electromagnetic Fields and Waves". W. H. Freeman and Company (1988).
- D.J. Griffiths: "Introduction to Electrodynamics". Prentice Hall (1999).

OTHER MATERIALS

53001289 – Negotiation

CREDITS:	3. ECTS
DEPARTMENT:	Organization Engineering, Business Administration and Statistics
COURSE COORDINATOR:	EMILIO MARCOS GARCÍA
TYPE:	
YEAR AND SEMESTER:	2

LIST OF TOPICS

1. General information of the subject of Negotiation
2. Study of forces
3. Ten fundamental principles of negotiation
4. How to lay the foundation for success
5. Behavior in trading
6. Mobilizing negotiating power
7. The area and boundaries of the negotiation
8. Polling and presentation
9. Resistance and pressure
10. Price negotiation
11. Demands, conditions and action
12. Contentious negotiations and disputes
13. agreement
14. Negotiation parking space
15. Negotiation of reform work

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Basic math. Skill for the management of the concepts of calculus, algebra and differential equations.
- Familiarity with the basics of programming (best in Matlab)

SPECIFIC OUTCOMES FOR THE COURSE

The Negotiation subject provides an overview of the usual processes in the commercial, labor and social world and seeks to help:

• Understand the central value of negotiation processes in the development of any activity.
• The solution of the differences between the different parties involved in business decision-making goes through the development of conciliatory strategies, among them negotiation is undoubtedly the most effective. The purpose of this course is to help the student understand negotiation as an exchange process oriented towards the search for the common good.

• Promote and develop skills in all negotiations: know the techniques that help improve the chances of success in negotiation.

STUDENT OUTCOMES

More generally, students, after taking the course:
☐ They will deepen their knowledge of contemporary issues, especially those related to the Humanities: history, economics, law, international relations, etc. and its complement with the technical training they already have.
☐ Broad education necessary to understand the impact of engineering solutions in a global social context.
☐ Ability to work and find solutions to the problems of the current business world in multidisciplinary teams through complex and systemic solutions.
In addition, given the methodology of the subject, students will have the possibility of putting into practice and improving their skills to:

☐ Teamwork
☐ Make oral presentations.
☐ Empathic listening.
☐ Analysis of cases of relative complexity
☐ Establish action plans

BIBLIOGRAPHY

- **The ten rules of negotiation. J. Winkler; Ed. Deusto**
- Get the Yes. The art of negotiating without giving in. Fisher, R., Ury, W., Patton, B. Management 2000.com
- The 12 laws of negotiation. Alfred Font. 2013. Connect.

53001290 – COMPETITIVE INTELLIGENCE & TECHNOLOGY SURVEILLANCE

CREDITS:	3 ECTS
DEPARTMENT:	Organization Engineering, Business Administation and Statistics
COURSE COORDINATOR:	José Antonio Blanco
TYPE:	
YEAR AND SEMESTER:	2nd Year / Fall

LIST OF TOPICS

MODULE 1. TECH INFORMATION: IP SCOUTING

MODULE 2. TECHNOLOGICAL SURVEILLANCE

MODULE 3. THE INTELLIGENCE PROCESS & RESULTS

MODULE 4. IMPLEMENTATION: TECH INTELLIGENCE REPORTS

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Basic knowledge about Business Administration and Statistics
- Fluent level of English.
- Research capacity: students must carry out research work in this field. Internet

SPECIFIC OUTCOMES FOR THE COURSE

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

The student should assimilate the basic knowledge about surveillance of technological developments and implements a system of intelligence in the industrial sector and also should learn how to integrate these within the value chain and the manufacturing process.

The student should assimilate the basic knowledge about surveillance of technological developments and implements a system of intelligence in the industrial sector and also should learn how to integrate these within the value chain and the manufacturing process.

STUDENT OUTCOMES

ABET 3 Communication

(1) Ability to work in a bilingual environment (English).

(2) Ability to communicate effectively.

ABET 4: Social Responsibility

(3) Understanding of ethical and professional responsibility

(4) Extensive education necessary to understand the impact of engineering solutions in a global social context..

ABET 5: Personal Skills

(5) Ability to work in multidisciplinary teams.

(6) Recognition of the need and ability to commit to continuous learning.

(7) OrganizatioN and planning in the field of the company, and other institutions and organizations of projects and human teams..

(8) Creativity.

Abet 6: Tools for Engineering Practice

(9) Ability to use the modern engineering techniques, skills and tools necessary for engineering practice.

BIBLIOGRAPHY

TEXT BOOKS

PORTER, Alan L. / CUNNINGHAM, Scott W. (2005), Tech Mining "Exploiting New Technologies for Competitive Advantage", Hobolen (New Jersey) Willey InterScience

VIBERT, Conor, (2004), Competitive intelligence : a framework for web-based analysis and decision making, Mason (Ohio), Thomson/South-Western

OTHER MATERIALS

53001294 – Knowledge Management for Technological Industries

CREDITS:	3 ECTS
DEPARTMENT:	ENERGY ENGINEERING
COURSE COORDINATOR:	GONZALO JIMÉNEZ VARAS
TYPE:	ELECTIVE
YEAR AND SEMESTER:	1ST COURSE, 1ST SEMESTER

LIST OF TOPICS

MODULE 1. INTRODUCTION TO KNOWLEDGE MANAGEMENT

MODULE 2. CONCEPTS AND METHODS

MODULE 3. SELF KNOWLEDGE MANAGEMENT

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

No previous courses are needed.

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- No previous knowledge is needed.

SPECIFIC OUTCOMES FOR THE COURSE

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

- Designing a knowledge management strategy for a company.
- Designing a knowledge management strategy for themselves.

STUDENT OUTCOMES

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

BIBLIOGRAPHY

TEXT BOOKS

- Recommended textbook: Learning to Fly: Practical Knowledge Management from Leading and Learning Organizations. C. Collison and G. Parcell. John Wiley & Sons, 2004.

OTHER MATERIALS

The lectures are available in pdf at Moodle.

53001295 History of Engineering

CREDITS:	3
DEPARTMENT:	ENERGY ENGINEERIING
COURSE COORDINATOR:	NATIVIDAD CARPINTERO SANTAMARIA
TYPE:	OPTIONAL
YEAR AND SEMESTER:	2021-22 – SECOND SEMESTER

LIST OF TOPICS

MODULE 1. ANCIENT AND MEDIEVAL ENGINEERING

MODULE 2. INDUSTRIAL REVOLUTIONS

MODULE 3. UNIVERSAL SPANISH ENGINEERING DISCOVERIES

MODULE 4. 20TH CENTURY ENGINEERING

MODULE 5. 21th CENTURY ENGINEERING

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES: INTEREST IN SOCIOLOGICAL AND HISTORICAL ENGINEERING AND SCIENTIFIC DEVELOPMENT IN A UNIVERSAL CONTEXT.

SPECIFIC OUTCOMES FOR THE COURSE

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

To learn challenges of 21st engineering practices.

Universal achievements of Spanish engineers to development of mankind.

Knowledge and social responsibility.

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 he alth, 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_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: GA_05_AZ_53001295

OTHER MATERIALS: GA_05_AZ_53001295

Auntes disponibles para los alumnos en plataformas como Aulaweb o Moodle

53001296 – Organization, Development and Participation in Scientific Dissemination Events

CREDITS:	3 ECTS
DEPARTMENT:	Mechanical Enginering Department.
COURSE COORDINATOR:	Blanca Arenas-Ramírez
TYPE:	OP
YEAR AND SEMESTER:	1th - Second semester

LIST OF TOPICS

MODULE 1. Planning and organization of the event

MODULE 2. Planning the development of scientific events

MODULE 3. Preparation for participation in the scientific event

MODULE 4. Participation in the scientific event

MODULE 5. Closure of the scientific event and evaluation of the experience

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:
N/A

TOPIC:
N/A

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- English language
- Familiarity with the web search tools

SPECIFIC OUTCOMES FOR THE COURSE

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

- Challenges Analysis. The student analyze the challenges of engineering in the 21st century.
- Effective communication. The student use the appropriate style to facilitate the understanding of the reader taking into account their expectations and previous knowledge
- Flexible Behaviour. The student brings ideas to the group and is flexible to adapt his ideas to the group (observed in meetings of teams with the teacher).
- Self-Organization. The student is able to organize and direct their learning autonomously to expand their knowledge in a subject.
- Communication mean use. The student developed the ability to use graphic resources and the necessary means to effectively communicate information.

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_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

N/A

OTHER MATERIALS

Selection of scientific works and technological. Bibliography. Search in databases.

Thematic library in manager web references. Web resources.Library by topic in the reference manager

Mendeley.

Virtual class. Web resources.Telematics teaching with web resources: TEAMS, ZOOM, BLACKBOARD, etc.

53001980 – Communication and outreach of science and technology

CREDITS:	4,0 ECTS
DEPARTMENT:	Chemical and Environmental Engineering
COURSE COORDINATOR:	Gabriel Pinto Cañón
TYPE:	Elective (transversal competences)
YEAR AND SEMESTER:	First/Second Year, 2nd Semester

LIST OF TOPICS

MODULE 1. The language of science and technology.

MODULE 2. Communication and dissemination of science and technology

MODULE 3. Science and technology outreach

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:
TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Basic knowledge of science and technology
- Familiarity with the basics of computer programs for word processing and presentations.

SPECIFIC OUTCOMES FOR THE COURSE

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

- Know some contributions of engineering to the development of mankind.
- Organize the information
- Know the influence of scientific and technical discoveries in the transformation of societies.
- Ability to communicate their conclusions and knowledge to non-specialized audiences of a clear mode.
- Expand their communication skills (the ability to transmit knowledge, express ideas and arguments in a clear, rigorous and convincing way, both orally and written), using graphic resources and the necessary means.
- Correctly uses oral communication techniques.
- Ability to communicate their conclusions, and the knowledge and ultimate reasons that support them, to specialized audiences in a clear and unambiguous way.

STUDENT OUTCOMES

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

BIBLIOGRAPHY

TEXT BOOKS

OTHER MATERIALS

Presentations andavailable to students on the Moodle platform.