3rd/4th Year

Track 2: Electrical Engineering

1	55000052	Applied Mathematics
2	55000112	Multivariable Control Systems
3	55000201	Electrical Machines II
4	55000202	Industrial Electronics
5	55000203	Electrical Installations I
6	55000218	Electrotechnics II
7	55000205	Electrical Measurement and Relying
8	55000206	Electrical Machines Control
9	55000207	Electrical Energy Systems I

55000052 - APPLIED MATHEMATICS

CREDITS:	4.5 ECTS
DEPARTMENT:	Industrial and Applied Mathematics (MAT)
COURSE	Dolores Barrios Rolanía
COORDINATOR: TYPE:	Common
YEAR AND SEMESTER:	3rd Year / Spring

LIST OF TOPICS

MODULE 1. Round-off errors and computer arithmetic.

MODULE 2. Interpolation.

MODULE 3. Nonlinear equations.

MODULE 4. Numerical linear algebra.

MODULE 5. Functions approximation.

MODULE 6. Numerical integration.

MODULE 7. Numerical solutions for ordinary differential equations.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Basic mathematics: Calculus, algebra and differential equations.
- Numerical linear algebra
- Fundamentals of programming (in Matlab)

SPECIFIC OUTCOMES FOR THE COURSE

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

- Solving systems of equations.
- Understanding numerical solutions
- Formulate engineering problems by using mathematical language.

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_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

Numerical Analysis, R. L. Burden, J. D. Faires, A. M. Burden. 10th ed. Cengage learning, 2016

Análisis numérico: las matemáticas del método científico, D. Kinkaid, W. Cheney. Addison Wesley Iberoamericana 1994

OTHER MATERIALS

Compilation of exercises, scripts for practices with MatLab

55000112 - MULTIVARIABLE CONTROL SYSTEMS

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	P. Campoy
TYPE:	Track (Electrical Engineering)
YEAR AND SEMESTER:	4th Year / Spring

LIST OF TOPICS

MODULE 1. System Modelling and Dynamic Analysis in State Space

- 1) State Space Modelling
- 2) Time Evolution in the State Space

MODULE 2. Controllability and State Feedback Control

- 3) Controllability
- 4) State Feedback Control

MODULE 3. Observability and Observed State Feedback Control

- 5) Observability
- 6) Observers and Observed State Feedback Control

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Basis for Automation (“Fundamentos de Automática”)

TOPIC: Feedback Control, PID Control

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Matlab-Simulink
- Group Working

SPECIFIC OUTCOMES FOR THE COURSE

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

- Build a **model of a system** representing all its internal information, that is expressed in the State Space. Special emphasis is made in Linear Time Invariant models, that are obtained by linearization.
- Calculate (analytically) and simuated (numerically) the **evolution of LTI systems** modelled using State Space, from both no-null initial conditions and no-null inputs.
- Calculate and isolate the **variables that can be controlled**, given a LTI State Space model. The minimum energy input signal is also calculated.
- Calculate the space **feedback structure** that allows changing the dynamics of system represented by a LTI model.
- Calculate and isolate the state **variables that can be observed** form the input-output time behavior.
- Calculate the structure of an **observer that can dynamically estimate** the value of the internal state variables
- Calculate the complete **structure of an observer plus a feedback control** and check its behavior both as an observer and as a

controlled system
- Have skills in using Matlab and Simuink for solving time evolution and controlling Space State LTI models
- Work in a group with different roles for solving a practical problem

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 economicfactors
- ABET_3. An ability to communicate effectively with a range ofaudiences
- 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

- "Control en el espacio de estado (2ª edición) "
  S. Dominguez, P.Campoy, J.M.Sebastián y A.Jimenez,
  Editorial: Prentice Hall

OTHER MATERIALS

- Slides for every topic available in Moodle
- Weekly assignments in Matlab/Simulink available in Moodle
- Videos explaining several parts available in Moodle

55000201 - ELECTRICAL MACHINES II

CREDITS:	6 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Francisco Blázquez García
TYPE:	Track (Electrical Engineering)
YEAR AND SEMESTER:	3rd Year / Spring

LIST OF TOPICS

MODULE 1. Large transformers and asynchronous machines (14 h)

- 1) Operation with unbalanced load (2 h)
- 2) Excitation current. More frequent connections (2 h)
- 3) Transformers for Measurement and protection systems. Voltage regulation(2 h)
- 4) Winding Factors (1 h)
- 5) Operating as a generator connected to isolated network (1 h)
- 6) Asynchronous Motors starting (2 h)
- 7) Speed regulation (3 h)
- 8) Motor specification. Regulations (1 h)

MODULE 2. Synchronous machines (32 h)

- 9) Load and no-load performance. Armature reaction (3h)
- 10) Cylindrical and salient pole rotors. Linear model (2h)
- 11) Characterisation tests. Calculating excitation current (3h)
- 12) Isolated and coupled to an infinite network operations. P and Q regulation (5h)
- 13) Load diagram. Operating Limits (3h)
- 14) Synchronous motor (1h)
- 15) Transient model (3h)
- 16) Permanent magnet synchronous machines. Constitution (2h)
- 17) Permanent magnet synchronous machines. Dimensioning and design (4h)
- 18) Permanent magnet synchronous machines. Regulation (2h)
- 19) Reluctance machines. Constitution (2h)
- 20) Reluctance machines. Regulation (2h)

MODULE 3. DC machines (10 h)

- 21) Constitution and operation principle (1h)
- 22) Armature reaction and commutation (1h)
- 23) DC Motor. Starting and braking (1h)
- 24) DC motor speed control (2h)
- 25) Brushless DC motor. Operation principle (2h)
- 26) Speed control of brushless DC motors (3h)

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Electrical Machines, Electrotechnics I

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- To Know the basic operation of transformers and asynchronous machines
- Capability of abstraction and representation of the engineering problems
- Critical thinking in the analysis of the results and notion of the magnitude order
- Ability to establish interrelationships between different physical phenomena

SPECIFIC OUTCOMES FOR THE COURSE

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

- Strengthen and broaden the knowledge on transformer and asynchronous machines acquired in the course of electrical machines (55000019)
- To Analyze the model and the parameters used for the operation of an electric drive with DC and their possible regimes (motor-generator - brake)
- To Know the basic tests on various types of electrical machines
- To Analyze the model and parameters that are used to control the operation of a synchronous machine, working as a generator (in network isolated or connected to the network) or as an engine in a regulated drive

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

BIBLIOGRAPHY

TEXT BOOKS

Máquinas Síncronas y Máquinas de Corriente Continua
F. Blázquez, J. Rodríguez, A. Alonso, C. Veganzones. Editorial Sección de Publicaciones de la E.T.S. Ingenieros Industriales. U.P.M, 2007

Complementos de Máquinas Eléctricas
F. Blázquez, J.R. Arribas. Editorial Sección de Publicaciones. ETSII. UPM, 2005

Maquinas Eléctricas
Javier Sanz Feito Editorial Pearson Educacion , 2002

Curso moderno de máquinas eléctricas rotativas. Tomo 4. M.Sinc.
Manuel Cortés Cherta Editorial Editores Técnicos Asociados, 1990

Electric Machinery
A. E. Fitzgerald, Charles Kingsley Jr., Stephen Umans Editorial McGrau-Hill

Brushless Permanent-Magnet and Reluctance Motor Drives
T.J. E. Miller Editorial Clarendon Press-Oxford

OTHER MATERIALS

Aulaweb/moodle: Additional bibliography about solved exercises, tutor schedule, …

55000202 - INDUSTRIAL ELECTRONICS

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	O. García
TYPE:	Track (Electrical Engineering)
YEAR AND SEMESTER:	4th Year / Fall

LIST OF TOPICS

MODULE 0. Basics of Power Electronics

- 1) Introduction
- 2) Passive Components
- 3) Power semiconductors (IGBTs, GTOs, MOSFET, DIODEs, SCRs)
- 4) Thermal behaviour

MODULE 2. Circuits of Power Electronics

- 5) Rectifiers
- 6) AC Regulators
- 7) DC/DC Converters
- 8) Power Inverters

MODULE 3. Applications of Power Electronics

- 9) Electric vehicles
- 10) Renewable energy: PV solar and eolic
- 11) Satellites
- 12) Airplanes
- 13) Lightning

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Electrotechnics (2nd year)

COURSE: Fundamentals of Electronics (3rd year)

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 of electronic components for applications in power conversion.
- Capacity for analysis and design of power conversion topologies for using electronic circuits
- Ability to analyze power systems are used in industry
- Handling an electrical simulator for analysis of power electronic circuits

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

- Mohan, Undeland, Robbins, Power Electronics. Converters, applications and design, John Wiley 2003
- M. Rashid, Power Electronics. Circuits, devices and applications, Prentice Hall 1993
- S. Martinez, J.A Gualda, Electrónica de potencia. Componentes, topologías y equipos, Thomson 2006
- A.Barrado, A.Lázaro, Problemas de Electrónica de Potencia, Pearson Prentice Hall 2007

OTHER MATERIAL

- U. Drofenik, W. Kolar, Interactive Power Electronics Seminar, www.ipes.ethz.ch
- Youtube: Power Electronics, Ericksson, Univ Colorado and Mohan, Univ Minnesota

55000203 - ELECTRICAL INSTALLATIONS I

CREDITS:	3 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	RM. Castro
TYPE:	Track (Electrical Engineering)
YEAR AND SEMESTER:	4th Year / Fall

LIST OF TOPICS

MODULE 1. Project of high-voltage power lines

- 1) Regulation of high-voltage power lines
- 2) Overhead lines and underground cables

MODULE 2. Overhead power lines

- 3) Description of elements
- 4) Mechanical calculation of the conductor in overhead power lines
- 5) Electrical calculations on overhead power lines

MODULE 3. Lines of high voltage underground cables

- 6) Description of the conductors
- 7) General requirements
- 8) Electrical calculations

MODULE 4. Distribution networks

- 9) Overview
- 10) Analysis of various configurations
- 11) Radial electrical power distribution system
- 12) Ring electrical power distribution system

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE:

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Know and use the principles of circuit theory.
- Systematically analyze the behavior of electrical circuits, identifying the particular operating characteristics of the most common schemes in Electrical Engineering DC, AC and transient regime.
- Knowing and using the principles of mechanics and strength of materials.
- Recognize some technological applications of electricity and use the knowledge gained in solving common problems.

SPECIFIC OUTCOMES FOR THE COURSE

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

- Ability to project high voltage power lines.
- Ability to calculate and design electricity transmission power lines.

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

BIBLIOGRAPHY

TEXT BOOKS

Cálculo y diseño de líneas eléctricas de alta tensión.
Pascual Simón Comín ; Alberto González Sanz ; Fernando Garnacho Vecino ; Jorge Moreno Mohíno ; Editorial Garceta, 2011

Overhead power lines
F. Kiessling, P. Nefzger, J. F. Nolasco, V. Kaintzyh Editorial Springer, 2003

Cálculo de líneas eléctricas aéreas de alta tensión.
J. Moreno Clemente , 4ª edición 1999

Reglamento sobre líneas eléctricas de alta tensión.
MITC Editorial Real decreto 223/08 15 de febrero de 2008

OTHER MATERIALS

Los disponibles en la plataforma AulaWeb.

55000205 - ELECTRICAL MEASUREMENT AND RELAYING

CREDITS:	4.5 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	H. Rocha
TYPE:	Track (Electrical Engineering)
YEAR AND SEMESTER:	4th Year / Fall

LIST OF TOPICS

MODULE 1. Electrical system modelling and low-voltage electrical equipment.

MODULE 2. General earthing system: earthing installation.

MODULE 3. Protection against electric shock.

MODULE 4. Conductor sizing.

MODULE 5. Overcurrent protection principles.

MODULE 6. Unbalanced electrical circuits.

MODULE 7. Symmetrical components.

MODULE 8. Analysis of Non-Sinusoidal Waveforms.

MODULE 9. Fourier transform and application.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: ELECTROTECHNICS, ELECTRICAL MACHINES

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Ability to solve unbalanced electrical circuits.
- Ability to design a low-voltage protection system.
- Treatment of digital measurements applied to electrical systems.

SPECIFIC OUTCOMES FOR THE COURSE

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

- Use the principles of unbalanced circuit theory.
- Ability to understand and design low-voltage electrical protections.
- Ability to use digital measurements applied to electrical 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

BIBLIOGRAPHY

TEXT BOOKS

Power Systems Signal Processing for Smart Grids.
Ribeiro, P. F., Duque, C. A., Ribeiro, P. M., & Cerqueira, A. S. (2013). John Wiley & Sons.

Tecnología Eléctrica.
José Roger Folch, Martín Riera Guasp, Carlos Roldán Porta. (2012). Síntesis.

OTHER MATERIALS

55000206 - ELECTRICAL MACHINES CONTROL

CREDITS:	6 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	J. Rodríguez
TYPE:	Track (Electrical Engineering)
YEAR AND SEMESTER:	4th Year / Spring

LIST OF TOPICS

MODULE 1. Industrial electric drives including the load

- 1) Drive definition. Components of an electric drive system
- 2) Types of electric drives. Scope of the different types of electrical machines. Positive sign criteria proposed for the mechanical variables
- 3) Reduction mechanism of the transmission system and load to the motor shaft. Example of a Crane type drive
- 4) Mechanical characteristic of different mechanisms (loads). Types of resistance load. Relationship between the mechanical characteristic of electrical machines, electrical drive regulated in closed loop and load torque
- 5) Criteria for evaluating the mechanical characteristics of the machines and electrical drives. Operating point. Stability
- 6) Operating regimes of electric machines. Flow analysis of mechanical and electrical power. Assessment of losses in the drive from mechanical characteristic. Losses in transient processes.
- 7) Simplified models of DC machines, asynchronous and synchronous machines. Analysis of acceleration and load torque transient processes.
- 8) Oscillograms and graphics in the speed-torque coordinate system for different duty cycles of various electrical drives

MODULE 2. Vector control of induction motors

- 9) Introduction. Review of U/f Control of an asynchronous motor
- 10) Introduction to space vectors
- 11) Space vector model of an Induction Motor (IM)
- 12) Clasic space-vector control systems for IM (FOC)
- 13) Direct torque control (DTC)

MODULE 3. Vector Control of Synchronous Motors

- 14) Introduction. Review of the scalar Control of a synchronous motor
- 15) Space vector model for SM.
- 16) Vector control systems for Synchronous Motors (SM, PMSM, RSM)
- 17) Electronics involved in an electric drive (sensors, DSPs, power converter, modulation, etc)

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Electrical Machines (55000019 ME), Electrical Machines 2 (55000201 ME2), Industrial Electronics (55000202)

TOPIC: Electric motors, power electronics and systems control (Automatic Control Fundamentals (55000026))

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Capacity for abstraction and representation of engineering problems.
- Critical sense in the analysis of results and notion of the orders of magnitude.
- Ability to establish relationships between different physical phenomena.

SPECIFIC OUTCOMES FOR THE COURSE

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

- - Reinforce practical knowledge (Lab) from the operation and management of different electrical machines.
- - Knowledge of how the electric motor is integrated in an industrial operation (ventilation type and pumping, lifting, machine tools, etc.) and as the whole drive (drive motor load control system) is handled.
- - It is intended that students acquire basic knowledge about electric drives and to consolidate and strengthen their knowledge of the most common motors in the industry: asynchronous machines, synchronous machines and DC machines.
- - Knowledge of control of asynchronous motors using space vectors. This technique is today the most spreaded in the industry and allows dynamic drive control, that is, it allows a precise control even during the transitions between different operating points and not only in steady state.

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

BIBLIOGRAPHY

TEXT BOOKS

Vector control of AC drives
I. Boldea, S. Nasar , 1992

"Control of electrical drives",
W. Leonhard Editorial Springer,, 1997

"Advanced Electric Drives".
N. Mohan. Wiley.

OTHER MATERIALS

In Aulaweb: Collection of solved problems, previous exams with solutions, lab sessions guides, classroom presentations (ppt), complementary bibliography, self-study exercises with self-evaluation, weekly tutorial timetable, etc.

55000207 - ELECTRICAL ENERGY SYSTEMS I

CREDITS:	6 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Sergio Martínez
TYPE:	Track (Electrical Engineering)
YEAR AND SEMESTER:	4th Year / Spring

LIST OF TOPICS

MODULE 1. Fundamentals of electrical power systems.

- 1) Three-phase balanced systems. Per-unit values. Three-phase unbalanced systems.

MODULE 2. Models of system elements.

- 2) Generators. Transfomers. Transmission lines. System equivalents.

MODULE 3. Analysis of electrical power systems.

- 3) Transmission lines in steady state. Load flow. Transients in transmission lines.

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Electrotechnics, Electrotechnics II, Electrical Measurements and Relaying, Electrical Installations I

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Knowledge about operating regimes of electric circuits.
- Knowledge about the operating regimes of electric machines.
- Capacity for analysis of electrical circuits.

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

BIBLIOGRAPHY

TEXT BOOKS

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

Fundamentos de Tecnología Eléctrica
J. García Mayordomo Editorial Sección de publicaciones de la ETSI Industriales UPM, 2012

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

OTHER MATERIALS

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

55000218 - ELECTROTECHNICS II

CREDITS:	4.5 ECTS
DEPARTMENT:	Automatic Control, Electrical and Electronics Engineering and Industrial Informatics (AUT)
COURSE COORDINATOR:	Rafael Asensi
TYPE:	Track (Automatic Controls and Electronics) / Track (Electrical Engineering)
YEAR AND SEMESTER:	4th Year / Fall

LIST OF TOPICS

MODULE 1. Transients in circuits

MODULE 2. Quadripole and multipole

MODULE 3. Inductive coupling

MODULE 4. Nonlinear circuits

MODULE 5. Circuit frequency response

RECOMMENDED COURSES OR KNOWLEDGE

RECOMMENDED PREVIOUS COURSES:

COURSE: Electrotecnia, Ecuaciones diferenciales, Electromagnetismo

TOPIC:

RECOMMENDED PREVIOUS KNOWLEDGE OR ABILITIES:

- Know the principles of circuit theory.
- Ability to analyze electrical circuits using systematic methods.
- Know the particular characteristics of the most common schemes in Electrical Engineering: DC, AC, and transient operation.
- Knowledge of the fundamentals of linear algebra and differential equations.
- Basic electromagnetism.

SPECIFIC OUTCOMES FOR THE COURSE

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

- Knowing the particular characteristics of complex systems operating in Electrical Engineering.
- Systematically analyze the behavior of electric circuits, using advanced techniques.
- Recognize more technological applications of electricity and use the knowledge gained in solving common 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 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_7. An ability to acquire and apply new knowledge as needed using appropriate learning strategies

BIBLIOGRAPHY

TEXT BOOKS

Circuitos eléctricos. Vol. I y II. A. Pastor, J. Ortega, V. M. Parra, A. Pérez. UNED, 2003.

OTHER MATERIALS

Class documentation (Powerpoint presentations, documents, Matlab programs, collection of class exercises…) elaborated by the professor.