COMMUNICATIONS ELECTRONICS ENGINEERING B. Eng

ELECTIVE COURSES TYPE A

Table of Contents

Year 2015/16

Course Name:	Industrial Automation	**Course Code:**	595010041
Year:	3	**Semester:**	6
Credits (ECTS):	4,5	**Credit Hours:**	3
Area:	Elective	**Type:**	Elective / Type A
Term:	Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Microprocessor-based Systems Control Systems	
Coordinator:		Agustín Rodríguez Herrero	
Bachelor Engineering Program:		Communications Electronics Engineering	

Course Contents

1. Introduction to the automatic
2. Programmable Automatons
3. Development of SCADA applications
4. Industrial Communications

ABET Student Outcomes

(a) An ability to apply knowledge of mathematics, science, and engineering

(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) An ability to function on multidisciplinary teams

(j) A knowledge of contemporary issues

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Study Outcomes (according to the Spanish program definition)

CE EC03 Ability to specify, implement, document and adjust equipment and electronic systems for instrumentation and control, considering both technical and regulatory aspects.

CE EC04 Ability to apply electronics as a support technology in other fields and activities, not just in the field of Information and Communication Technologies.

CE EC06 Ability to understand and use the feedback theory and electronic control systems.

Specific outcomes of instruction (according to the Spanish program definition)

1.- Apply a commercial tool for the development of SCADA applications.
2.- Understand the need for the standardization of industrial buses and analyze different types.
3.- Describe the operation of an industrial communications protocol.
4.- The use of a microprocessor-based system as a solution to the industrial control and its application as a solution to the industrial control systems.
5.- Develop control programs in Contact Diagram graphic language..
6.- Learn about the architecture, hardware, operating system and programming of a next-generation programmable software.
7.- Analyze the architecture of a system of control supervision and data acquisition (SCADA) and solutions employed usually to develop them.

Bibliography

Ingeniería de la Automatización Industrial. 2º edición. Ramón Piedrafita Moreno. Editorial RA-MA. ISBN 84 7897 604 3. 2004.

Introducción a LabVIEW. M. Ruiz y G. Arcas. Dpto. Publicaciones EUIT Telecomunicación.

Allen Bradley. Reference Manual: Logix5000TM Controllers General Instructions. Rockwell Automation. Publication 1756-RM003G-EN-P -June 2003.

Year 2015/16

Course Name:	Photovoltaic Engineering	**Course Code:**	595010042
Year:	3	**Semester:**	6
Credits (ECTS):	4,5	**Credit Hours:**	3
Area:	Elective	**Type:**	Elective / Type A
Term:	Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		None	
Coordinator:		Manuel Vázquez López	
Bachelor Engineering Program:		Communications Electronics Engineering	

Course Contents

1. Introduction
2. Solar cell and photovoltaic module
3. Solar Radiation
4. Photovoltaic systems connected to network
5. Autonomous Photovoltaic Systems

ABET Student Outcomes

(a) An ability to apply knowledge of mathematics, science, and engineering

(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) An ability to function on multidisciplinary teams

(j) A knowledge of contemporary issues

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Study Outcomes (according to the Spanish program definition)

CE EC03 Ability to specify, implement, document and adjust equipment and electronic systems for instrumentation and control, considering both technical and regulatory aspects.

CE EC04 Ability to apply electronics as a support technology in other fields and activities, not just in the field of Information and Communication Technologies.

CE EC05 Ability to design analog and digital electronic circuits, analog-to-digital and digital-to-analog conversion circuits, radiofrequency circuits, and electric power supply and conversion circuits for applications in telecommunications and computing.

Specific outcomes of instruction (according to the Spanish program definition)

1.- Understand the characteristic curve of the cell and analyze the influence of the different parameters which affect the characteristic curve.
2.- Sizing up a photovoltaic system connected to network and evaluate its production.
3.- Understand the different functionalities of elements of a photovoltaic system connected to network.
4.- Learn about the regulations related to photovoltaic solar installations.
5.- Understand the photovoltaic effect and apply the knowledge to the operation of a solar cell.
6.- Understand the importance of solar PV in the current energy system.
7.- Sizing up an autonomous photovoltaic system.
8.- Understand and manage the data sheet of the manual of a photovoltaic module.

Bibliography

Ingeniería Fotovoltaica. E. Lorenzo. Editorial Progensa

Year 2015/16

Course Name:	Applications for Raspberry Pi	**Course Code:**	595010047
Year:	3	**Semester:**	6
Credits (ECTS):	4,5	**Credit Hours:**	3
Area:	Elective	**Type:**	Elective / Type A
Term:	**Spring**	**Language:**	Spanish
Prerequisites / Co-requisites:		Programming II Operating Systems Microprocessor-Based Systems	
Coordinator:		Mariano Ruiz González	
Bachelor Engineering Program:		Communications Electronics Engineering	

Course Contents

1. Description of the architecture and the hardware resources of the RaspBerry-PI
2. Installation of a Linux operating system in RPI. Raspbian installation and verification of its operation. Basic Linux tutorial
3. Description of software applications for the RaspBerry PI
4. Pooling. Presentation in class by the students of the commissioning of the RPI. Evaluation activity
5. Creation of a distribution tailored to Linux using Buildroot
6. Development of software applications in C for RPI using Eclipse
7. Development of applications for RPI

ABET Student Outcomes

(a) An ability to apply knowledge of mathematics, science, and engineering

(b) An ability to design and conduct experiments, as well as to analyze and interpret data

(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) An ability to function on multidisciplinary teams

(j) A knowledge of contemporary issues

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Study Outcomes (according to the Spanish program definition)

CG 02	Ability to search and select information, develop critical thinking and produce and defend arguments within the area..
CG 03	Ability to express oneself in oral and written form, and to convey information through documents and public presentations.
CG 04	Ability to abstract, analyze, and synthesize, and to solve problems.
CE EC01	Ability to build, utilize and manage systems for the acquisition, transport, representation, processing, storage, management and presentation of multimedia information, from the point of view of electronic systems.
CE EC03	Ability to specify, implement, document and adjust equipment and electronic systems for instrumentation and control, considering both technical and regulatory aspects.
CE EC04	Ability to apply electronics as a support technology in other fields and activities, not just in the field of Information and Communication Technologies.
CE EC05	Ability to design analog and digital electronic circuits, analog-to-digital and digital-to-analog conversion circuits, radiofrequency circuits, and electric power supply and conversion circuits for applications in telecommunications and computing.
CE EC07	Ability to design devices for interfacing, data acquisition and storage, and terminals for telecommunication services and systems.
CE EC08	Ability to specify and use electronic instrumentation and measurement systems.

Specific outcomes of instruction (according to the Spanish program definition)

1.- Know the basic hardware features of an electronic system embedded as RaspBerry IP based on a System On Chip.

2.- Identify the functionality of each of the digital and analog interfaces included in the RaspBerry-PI.

3.- Install a Linux operating system and software applications in the RaspBerry Pi.

4.- Learn about the elements of a distribution of Linux for an embedded system.

5.- Configure and build a distribution of the Linux operating system using the Buildroot for the RaspBerry-IP platform.

6.- Connect a basic electronic circuit to one of the RaspBerry IP digital interfaces.

7.- Develop a basic software application using RaspBerry IP interfaces.

8.- Document the development of an application with RaspBerry-PI and present it in public.

9.- Present and defend in public proposed techniques to solve problems.

10.- Write technical papers presenting the steps followed and the conclusions obtained in the implementation of an application.

Bibliography

Moodle Web resources

Year 2015/16

Course Name:	Advanced Digital Design	**Course Code:**	595010043
Year:	4	**Semester:**	7
Credits (ECTS):	4,5	**Credit Hours:**	3
Area:	Elective	**Type:**	Elective / Type A
Term:	Fall	**Language:**	Spanish
Prerequisites / Co-requisites:		Digital Design I Digital Design II	
Coordinator:		Miguel Ángel Freire Rubio	
Bachelor Engineering Program:		Communications Electronics Engineering	

Course Contents

1. Advances applications with VHDL language
2. Introduction to System Verilog language
3. Random tests of functional coverage
4. UVM

ABET Student Outcomes

(a) An ability to apply knowledge of mathematics, science, and engineering

(b) An ability to design and conduct experiments, as well as to analyze and interpret data

(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) An ability to function on multidisciplinary teams

(g) An ability to communicate effectively

(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(j) A knowledge of contemporary issues

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Study Outcomes (according to the Spanish program definition)

CG 02 Ability to search and select information, develop critical thinking and produce and defend arguments within the area..

CG 04	Ability to abstract, analyze, and synthesize, and to solve problems.
CG 07	Ability to design, manage, and direct projects.
CE EC01	Ability to build, utilize and manage systems for the acquisition, transport, representation, processing, storage, management and presentation of multimedia information, from the point of view of electronic systems.
CE EC03	Ability to specify, implement, document and adjust equipment and electronic systems for instrumentation and control, considering both technical and regulatory aspects.
CE EC04	Ability to apply electronics as a support technology in other fields and activities, not just in the field of Information and Communication Technologies.
CE EC05	Ability to design analog and digital electronic circuits, analog-to-digital and digital-to-analog conversion circuits, radiofrequency circuits, and electric power supply and conversion circuits for applications in telecommunications and computing.
CE EC07	Ability to design devices for interfacing, data acquisition and storage, and terminals for telecommunication services and systems.

Specific outcomes of instruction (according to the Spanish program definition)

1.- Apply techniques of auto verification of tests using SVA.
2.- Use the object oriented programming for the accomplishment of tests with SystemVerilog language.
3.- Perform tests of digital systems using the classes of UVM libraries .
4.- Apply CAD tools to capture, simulate and make digital systems .
5.- Carry out random tests controlled by functional coverage with SystemVerilog language..
6.- Use advanced techniques for carrying out tests and models with VHDL language .
7.- Define the functional coverage of the SystemVerilog language system.
8.- Make models and tests with SystemVerilog language .

Bibliography

Moodle Resources

Year 2015/16

Course Name:	Product Engineering	**Course Code:**	595010044
Year:	4	**Semester:**	7
Credits (ECTS):	4,5	**Credit Hours:**	3
Area:	Elective	**Type:**	Elective / Type A
Term:	Fall	**Language:**	Spanish
Prerequisites / Co-requisites:		Electronics I Electronics II	
Coordinator:		Neftali Núñez Mendoza	
Bachelor Engineering Program:		Communications Electronics Engineering	

Course Contents

1. Introduction
2. Product and System Design.
3. Life cycle of the product (LCA).
4. Reliability of products and systems.
5. Theoretical bases of environmental, electrical, mechanical, optical testing and EMC.
6. Test plans for the qualification and validation of systems.

ABET Student Outcomes

(a) An ability to apply knowledge of mathematics, science, and engineering

(b) An ability to design and conduct experiments, as well as to analyze and interpret data

(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) An ability to function on multidisciplinary teams

(g) An ability to communicate effectively

(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) A recognition of the need for, and an ability to engage in life-long learning

(j) A knowledge of contemporary issues

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Study Outcomes (according to the Spanish program definition)

CG 02	Ability to search and select information, develop critical thinking and produce and defend arguments within the area..
CG 10	Ability to handle specifications, rules and regulations and to apply them in the practice of the profession.
CG 13	Learning skills with a high degree of autonomy.
CE EC03	Ability to specify, implement, document and adjust equipment and electronic systems for instrumentation and control, considering both technical and regulatory aspects.
CE EC04	Ability to apply electronics as a support technology in other fields and activities, not just in the field of Information and Communication Technologies.
CE EC09	Ability to analyze and solve interference and electromagnetic compatibility problems.

Specific outcomes of instruction (according to the Spanish program definition)

1.- Undertake the design of a test plan of a team for a sector-specific application.
2.- Know the tests for the qualification of systems and equipment.
3.- Carry out a study of prediction of reliability of an electronic equipment.
4.- Learn about and plan the lifecycle and prediction of reliability of components and systems.
5.- Learn about the interaction of the product design and manufacturing process chains.
6.- Learn about new products of high added value from technology-based strategies.

Bibliography

Moodle Resources

Year 2015/16

Course Name:	Automatic Test Equipments	**Course Code:**	595010045
Year:	4	**Semester:**	7
Credits (ECTS):	4,5	**Credit Hours:**	3
Area:	Elective	**Type:**	Elective / Type A
Term:	Fall	**Language:**	Spanish
Prerequisites / Co-requisites:		Microprocessors Digital Signal Processing Industrial Automatic Programming I Computer Networks	
Coordinator:		Eduardo Barrera	
Bachelor Engineering Program:		Communications Electronics Engineering	

Course Contents

1. Introduction to the ATE (Automatic Test Equipment)
2. Standard bus used in ATEs
3. Description and analysis of the ATE
4. The ATE control software
5. The ATE equipment control
6. The ATE-oriented software architecture
7. Development of an ATE for the realization of the functional test of a voltmeter

ABET Student Outcomes

(a) An ability to apply knowledge of mathematics, science, and engineering

(b) An ability to design and conduct experiments, as well as to analyze and interpret data

(d) An ability to function on multidisciplinary teams

(g) An ability to communicate effectively

(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) A recognition of the need for, and an ability to engage in life-long learning

(j) A knowledge of contemporary issues

(k) An ability to use the techniques, skills, and modern engineering tools necessary for

engineering practice.

Study Outcomes (according to the Spanish program definition)

CG 02	Ability to search and select information, develop critical thinking and produce and defend arguments within the area..
CG 03	Ability to express oneself in oral and written form, and to convey information through documents and public presentations.
CE EC01	Ability to build, utilize and manage systems for the acquisition, transport, representation, processing, storage, management and presentation of multimedia information, from the point of view of electronic systems.
CE EC04	Ability to apply electronics as a support technology in other fields and activities, not just in the field of Information and Communication Technologies.
CE EC07	Ability to design devices for interfacing, data acquisition and storage, and terminals for telecommunication services and systems.
CE EC08	Ability to specify and use electronic instrumentation and measurement systems.
CE TEL01	Ability to independently learn new knowledge and skills adequate for the design, development or utilization of telecommunication systems and services.
CE TEL03	Ability to use computer tools of search of bibliographical resources or of information related to the telecommunications and the electronics.

Specific outcomes of instruction (according to the Spanish program definition)

1.- Perform searches on the characteristics of one or several of the standard bus used in ATEs, extract the most relevant information, develop a rigorous technical documentation in this regard and a technical presentation of the key features.

2.- Develop a modular software architecture, ATEs-oriented, enabling development in parallel of the different modules, the participation of a multidisciplinary team, the independence of the system of the equipment used and the realization of simply-oriented future modifications or extensions.

3.- Learn about the development environment of LabVIEW as a tool for control of an ATE.

4.- Develop basic applications of control of instruments and/or DAQ cards on different communication buses.

5.- Learn about the main features of an automatic measurement system: architecture, types of instruments, used buses, control software and application areas.

6.- Know the parameters, protocols and basic performance characteristics of the standard buses used in ATEs and be able to perform qualitative and quantitative comparisons between them.

7.- Parse a document of specifications of an ATE and consider different solutions for their implementation, evaluating the advantages and disadvantages of each one of them.

8.- Develop, starting from minimum specifications, and applying the knowledge obtained previously, an ATE which performs the functional test of a hand voltmeter.

Bibliography

Slides and documentation. Moodle resources

Year 2015/16

Course Name:	Power Electronics	**Course Code:**	595010046
Year:	4	**Semester:**	8
Credits (ECTS):	4,5	**Credit Hours:**	3
Area:	Elective	**Type:**	Elective / Type A
Term:	Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Electronic Power Systems	
Coordinator:		Manuel Vázquez	
Bachelor Engineering Program:		Communications Electronics Engineering	

Course Contents

1. Introduction to Power Electronics
2. Magnetic components in power electronics
3. Isolated DC/DC converters
4. DC/AC Inversors
5. Electronic and electrical power techniques

ABET Student Outcomes

(d) An ability to function on multidisciplinary teams

(e) An ability to identify, formulate, and solve engineering problems

(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(j) A knowledge of contemporary issues

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Study Outcomes (according to the Spanish program definition)

CG 02 Ability to search and select information, develop critical thinking and produce and defend arguments within the area..

CG 03 Ability to express oneself in oral and written form, and to convey information through documents and public presentations.

CG 04 Ability to abstract, analyze, and synthesize, and to solve problems.

CE EC04 Ability to apply electronics as a support technology in other fields and

activities, not just in the field of Information and Communication Technologies.

CE EC05 Ability to design analog and digital electronic circuits, analog-to-digital and digital-to-analog conversion circuits, radiofrequency circuits, and electric power supply and conversion circuits for applications in telecommunications and computing.

Specific outcomes of instruction (according to the Spanish program definition)

1.- Develop design solutions based on isolated switching converters.

2.- Learn the techniques of inversion of voltage using sinusoidal PWM modulation.

3.- Know the relationships between topology, control and function of power converter circuits.

4.- Know the methodology of design of magnetic components used in electronic power conversion systems.

5.- Select the appropriate topology, mode of conduction and control of switched converters with galvanic isolation.

6.- Learn practical solutions of circuits or power systems, by selecting the appropriate ones in an electrical or electronic loads power project.

7.- Learn the main concepts, techniques and circuitry necessary to understand, specify and design electronic power conversion systems.

Bibliography

Diseño de bobinas y transformadores con núcleo de ferrita. Antonio Pérez Ballaltas, Manuel Vázquez Rodríguez.

Fuentes de alimentación conmutadas. Antonio Pérez Ballaltas, Manuel Vázquez Rodríguez.

Moodle Web Resources.