

TELEMATICS ENGINEERING B. Eng.
ELECTIVE COURSES TYPE A

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Year 2015/16

Course Name:	Network and System Administration	Course Code:	595010242
Year:	3	Semester:	6
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Spring	Language:	Spanish
Prerequisites / Co-requisites:			
Coordinator:		Javier Martín	
Bachelor Engineering Program:		Telematics Engineering	

Course Contents

1. Unix Systems Basic Administration
2. Basic Network Services
3. NFS Network File Systems
4. DNS Domain Name Service
5. LDAP Directory Service
6. E-mail Service

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
- (e) An ability to identify, formulate, and solve engineering problems
- (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 TE 03 Ability to build, utilize, and manage telematic services, employing analytic planning, dimensioning, and analysis tools
- CE TE 05 Ability to follow the technologic progress of transmission, commutation and process to improve the networks and telematic services.
- CG 02 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.
- CG 10 Ability to handle specifications, rules and regulations and to apply them in the practice of the profession.
- CG 11 Skills for the use of Information and Communication Technologies..

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

- 1.- Implement a web server that handles multiple virtual sites.
- 2.- Share file systems on a LAN using NFS.
- 3.- Perform secure communications (session of terminal, remote execution, file transfer, tunnels, generation and use of pairs of keys) using SSH tools.
- 4.- Synchronize the clock of a machine using an external NTP server.
- 5.- Get to know the components and operation of the DNS on the Internet service.
- 6.- Diagnose DNS problems using tools at a low level.
- 7.- Install a type LAMP web application on a web server.
- 8.- Define simple access controls to the contents of a web server.
- 9.- Generate X.509 certificates and use them to encrypt communications from a web server and mail server.
- 10.- Know the most common network and application level firewall architectures and implement network-level filters.
- 11.- Manage the most basic functions of a Unix server (create accounts, mounting file systems, configure startup services, information about the status and the implementation of services).
- 12.- Register and delegate a DNS domain on the Internet and deploy at least two servers authoritative DNS for that domain.
- 13.- Implementing and administering an LDAP server with a simple directory tree structure.
- 14.- Implement a service of SMTP Internet e-mail with a post and POP/IMAP access to mailbox.
- 15.- Learn the main techniques for filtering of spam and virus emails.
- 16.- Implement an FTP server both to access authenticated as anonymous.
- 17.- Learn how to attach generic LDAP clients to an LDAP server.
- 18.- Learn about the architecture of the Internet e-mail service.
- 19.- Design and implement a DHCP service to a local area network.

Bibliography

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Unix system administration handbook? (3ª edición), E. Nemeth, G. Snyder, S. Seebass, T.R. Hein, Ed. Prentice-Hall (2001)

TCP/IP Network Administration, 3rd Edition, C. Hunt, Ed. O'Reilly (2002)

The Practice of System and Network Administration. T.A.Limoncelli, C. Hogan. Ed. Addison-Wesley (2002)

Year 2015/16

Course Name:	Access Networks Technologies	Course Code:	5950100246
Year:	3	Semester:	6
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Spring	Language:	Spanish
Prerequisites / Co-requisites:		Advanced Networks and Services Transmission Systems	
Coordinator:		Antonio Redondo	
Bachelor Engineering Program:		Telematics Engineering	

Course Contents

1. Introduction to Access Networks
2. Copper Pair Access Networks
3. Mixed access fiber-coaxial networks
4. Networks with wavelength multiplexing
5. Optical access networks

ABET Student Outcomes

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (e) An ability to identify, formulate, and solve engineering problems
- (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 TM02 Ability to apply techniques on which telematic networks, services and applications are based, such as management, signaling and switching, routing, security (cryptographic protocols, tunneling, firewalls, digital payment, authentication, and content protection), traffic engineering (graph theory, queuing theory, tele traffic), billing, reliability and quality of service, whether in fixed or mobile environments, local or long distance, with different bandwidths, including telephony and data.
- CE TM06 Ability to design client-server and P2P architectures, and to adapt operating systems and virtual machines.

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

- 1.- Understand characteristics (with rules, network architectures, components, limitations and services) of access networks that use as carriers of pairs of copper wires.

- 2.- Dimension access networks that use pairs of copper wires as carriers of.
- 3.- Understand characteristics (with rules, network, components, limitations and services architecture) networks with multiplexing (WDM) wavelength.
- 4.- Dimension access networks using fiber optic cables as carriers.
- 5.- Sized networks with multiplexing (WDM) wavelength.
- 6.- Understand the basic concepts of access networks.
- 7.- Sized mixed access networks using fiber optic cables and coaxial cables as carriers.
- 8.- Understand characteristics (with rules, network, components, limitations and services architecture) of mixed access networks using fiber optic cables and coaxial cables as carriers.
- 9.- Understand characteristics (with rules, network, components, limitations and services architecture) of access networks that use as carriers of fiber optic cables.

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Charles K. Summers. ADSL: standards, implementation, and architecture. CRC Press, 1999

Ashwin Gumaste. DWDM network designs and engineering solutions. Cisco Press, 2003

C. Siva Ram Murthy. WDM optical networks: concepts, design, and algorithms. Prentice Hall PTR, 2002

Year 2015/16

Course Name:	Mobile Applications Development	Course Code:	595010243
Year:	4	Semester:	7
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Fall	Language:	Spanish
Prerequisites / Co-requisites:	Information Processing in Telematic Applications Advanced Application Programming Mobile Communications Networks		
Coordinator:	Antonio Da Silva		
Bachelor Engineering Program:	Telematics Engineering		

Course Contents

1. Introduction to applications and services for mobile web
2. Cross-Platform Mobile Application Development with HTML5
3. Android Native Application Development

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
- (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
- (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)

CE TM02 Ability to apply techniques on which telematic networks, services and applications are based, such as management, signaling and switching, routing, security (cryptographic protocols, tunneling, firewalls, digital payment, authentication, and content protection), traffic engineering (graph theory, queuing theory, tele traffic), billing, reliability and quality of service, whether in fixed or mobile environments, local or long distance, with different bandwidths, including telephony and data.

CE TM07 Ability to program networked, distributed, or interactive services and applications, taking into account usability and accessibility criteria.

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

CG 05 Ability for teamwork in multidisciplinary environments.

CG 13 Learning skills with a high degree of autonomy.

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

- 1.- Deploying mobile applications with a concrete platform.
- 2.- Learn about the problems related to the adaptation of existing WEB content to mobile devices features.
- 3.- Know the main platforms for designing and implementing applications for mobile devices.
- 4.- Understand the model of development of applications for mobile devices.

Bibliography

Programming the Mobile Web, M. Firtman, O'Reilly Media Inc

Android Cookbook, I. F. Darwin, O'Reilly Media Inc

Year 2015/16

Course Name:	Systems Engineering	Course Code:	595010245
Year:	4	Semester:	7
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Fall	Language:	Spanish
Prerequisites / Co-requisites:	Modeling Languages Advanced Applications Programming Computer Networks		
Coordinator:	Jesús Moreno		
Bachelor Engineering Program:	Telematics Engineering		

Course Contents

1. Introduction to Systems Engineering
2. Project Management
3. Quality Management
4. Systems Engineering Techniques

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
- (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)

- CE TEL02 Ability to use applications of communication and computer (office automation, databases, advanced calculus, management of projects, visualization...) to support the development and utilization of nets, services and applications of telecommunication and electronics.
- CG 03 Skilled for public speaking and in written and communicating information throughout documents and public speeches.

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

CG 08 Ability to organize, plan and make decisions.

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

- 1.- Learn techniques and methods that allow designing and developing high quality telematics applications and services.
- 2.- Understand the principles of systems engineering oriented to telematics projects.
- 3.- Learn the techniques of management of the quality of a product.
- 4.- Use techniques, methods, notations and models allowing to solve problems associated with the definition, design, implementation and deployment of a software product.
- 5.- To know the fundamentals to measure, estimate and plan the development of software products.
- 6.- Learn techniques and approaches to systems for the development of software product engineering.

Bibliography

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Ian SOMMERVILLE. Ingeniería del Software. Ed. Prentice Hall

Erich GAMMA, Richard HELM, Ralph JOHNSON y John VLISSIDES. Patrones de diseño: elementos de software orientado a objetos reusable. Ed. Pearson Educación

Semantic Web and Model-Driven Engineering. Fernando S. Parreiras. John Wiley & Sons 2012

Model driven architecture: applying MDA to enterprise computing. David Frankel. Wiley

Object-Oriented and Classical Software Engineering. 8th Edition. Stephen R Schach, VANDERBILT U NASHVILLE.

Year 2015/16

Course Name:	Applications for Raspberry Pi	Course Code:	595010247
Year:	4	Semester:	7
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:	Telematics 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 express oneself in oral and written form, and to convey information through documents and public presentations..
- CG 03 Skilled for public speaking and in written and communicating information

throughout documents and public speeches.

- CG 04 Ability to abstract, analyze, and synthesize, and to solve problems.
- CE EC01 Ability to construct, take advantage and manage feedback systems, transport, representation, processing, storage, management and presentation of multimedia information, from the point of view of the electronic systems.
- CE EC03 Ability to perform the specification, implementation, documentation and adjustment of equipment and electronic systems of instrumentation and control, considering both the technical aspects and the corresponding regulations.
- CE EC04 Ability to apply electronic as support technology in other fields and activities, not only in the field of Information Technologies and Communications.
- CE EC05 Ability to design circuits of analogical and digital electronics, circuits of analogical-digital and digital-analogical conversion, radiofrequency circuits and conversion of electric power for applications of telecommunication and computing.
- CE EC07 Ability to design interface devices, data capture and storage, and terminals for services and systems of telecommunication.
- 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:	Web Based Telematic Applications	Course Code:	595010241
Year:	4	Semester:	8
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Spring	Language:	Spanish
Prerequisites / Co-requisites:	Information Processing in Telematic Applications Advanced Application Programming		
Coordinator:	Sara Lana		
Bachelor Engineering Program:	Telematics Engineering		

Course Contents

1. Principles and Components of Web Technologies
2. Men-Machine Interaction in Web based Applications
3. Dynamic Information Generation
4. Access and Information Repositories Management

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
- (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)

- CE TM03 Ability to build, utilize, and manage telematic services, including internet, web, architectural design (data and protocols), programming, distributed knowledge management, multimedia information management, using analytic tools for planning, dimensioning, and analysis.
- CE TM07 Ability to program networked, distributed, or interactive services and applications, taking into account usability and accessibility criteria.

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

- 1.- Understand and apply techniques of design of web-based applications.
- 2.- Understand and use technology for the generation of dynamic information services through web servers.
- 3.- Use and manage platforms for deployment, support, and use of telematic applications based on web.
- 4.- Understand the basic concepts of architecture of web-based applications and components.
- 5.- Understand and use technology for the generation of web-based applications user interfaces.
- 6.- Understand the modeling of information systems supported by relational database management systems.
- 7.- Use database management systems for the generation and manipulation of information through web-based applications.

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R. ELMASRI, S.B. NAVATHE, Sistemas de bases de datos: conceptos fundamentales, Addison Wesley Longman de México, 1997.

C.J. DATE, Introducción a los sistemas de bases de datos. Pearson Educación, 2001.

Year 2015/16

Course Name:	Distributed Systems Development	Course Code:	595010244
Year:	4	Semester:	8
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Spring	Language:	Spanish
Prerequisites / Co-requisites:		Communications Software	
Coordinator:		Javier Martín	
Bachelor Engineering Program:		Telematics Engineering	

Course Contents

1. Problems of Distributed Systems
2. Event Temporary Ordering
3. Communication in Process Groups
4. Replication
5. The Internet of Things
6. P2P 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
- (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)

- CE TM03 Ability to build, utilize, and manage telematic services, including internet, web, architectural design (data and protocols), programming, distributed knowledge management, multimedia information management, using analytic tools for planning, dimensioning, and analysis.
- CE TM07 Ability to program networked, distributed, or interactive services and applications, taking into account usability and accessibility criteria.
- CG 02 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.
- 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.

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

- 1.- Learn techniques for the location of information and peer in P2P networks .
- 2.- Implement mechanisms for the transfer of State between replicated servers.
- 3.- Know the major architectures to design replicated and fault-tolerant distributed systems.
- 4.- Learn about the principles and the issue of the composition and orchestration of services.
- 5.- Know and apply reference models based on IoT.
- 6.- Study the implementation of basic distributed algorithms derived from consensus and evaluate its complexity.
- 7.- Develop distributed applications with concurrent access and synchronization between operations requirements.
- 8.- Know and apply mechanisms for the detection of faults in a distributed system .
- 9.- Learn about the fundamental problem in distributed systems.
- 10.- Learn the techniques used to temporarily order of events in a distributed system and common kinds of management (FIFO, causal, total).
- 11.- Know and apply mechanisms for the reliable radiated from messages and process groups temporary ordination.
- 12.- Discover the architecture and functioning of fundamental P2P applications .
- 13.- Understand the main components and strategies for the development of middleware for distributed systems.
- 14.- Learn about different architectures for distributed event-oriented solutions.
- 15.- Learn the techniques used to synchronize physical clocks in a distributed system, fundamentally NTP.
- 16.- Understand the principles of dissemination of information on P2P networks.

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Distributed Systems: principles and paradigms (2^a edición), Tanenbaum A.S., van Steen M., Ed. Pearson Prentice-Hall (2007)

Reliable Distributed Systems, Birman K.P., Ed. Springer (2005)

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