COURSE PROGRAM

Academic Year: 2024-25

Identification and characteristics of the course				
Code	401076	ECTS Credits		6
Course name (English)	COMMUNICATION TECHNOLOGIES AND PROTOCOLS			
Course name (Spanish)	TECNOLOGÍAS Y PROTOCOLOS DE COMUNICACIÓN			
Degrees programs	Master in Informatics Engineering (MUII) Master in Telecommunications Engineering (MUIT) Master in ICT Management (MUDT)			
Faculty/School	School of Technology			
Semester	1	Type of course	Compulsory	
Module	Telecommunication Technologies (MUIT) Technologic (MUDT) Based on Computer Science Technologies (MUI2)			
Matter	Network and Telematic Services (MUIT) Communication and Computer Science Technologies (MUDT) Communication and Computer Science Technologies (MUI2)			
Lecturer/s				
Name		Office	E-mail	Web page
Javier Corral García New Assistant Professor		I.15 CS	javiercg@unex.es	
Subject Area	Computer Languages and Systems Telematic Engineering			
Department	Informatics and Telematics Systems Engineering			
Coordinator Lecturer	Javier Corral García			

Competences

Master in Telecommunications Engineering

Basic competences

- CB7 - Ability to apply the acquired knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
- CB8 - Ability to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.

General Competences

- CG1 - Ability to plan, calculate and design products, processes and facilities in all areas of telecommunications engineering.
- CG2 - Capacity for project management and facilities for telecommunications systems, complying with current legislation, ensuring the quality of service.
- CG4 - Capacity for mathematical modeling, calculation and simulation in technology centers and engineering companies, particularly in research, development and innovation in all areas related to the Telecommunications Engineering and related multidisciplinary fields.
- CG6 - Capacity for the overall direction, technical direction and project management research, development and innovation, in companies and technology centers.
- CG10 - Ability to apply principles of economics and human resource management and projects as well as legislation, regulation and standardization of telecommunications..
- CG11 - Ability to learn to communicate (oral and written) findings, and the knowledge and rationale underpinning these, to public-skilled and unskilled in a clear and unambiguous way.

Specific competences

- CETT8 - Ability to understand and know how to apply the operation and organization of the Internet, Internet technologies and protocols for next generation models of components, middleware and services.

Transversal competences

- CT11 - Autonomous learning capacity
- CT13 - Ability to integrate knowledge and face the complexity of formulating opinions from incomplete or limited information.

Master in ICT Management

Basic competences

- CB7 - Ability to apply the acquired knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
- CB8 - Ability to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.

General competences

- CG4 - Provide a global approach to ICT management (IT + Telecommunications + Business) from a comprehensive point of view.
- CG9 - Provide graduates with the necessary skills for the management of ICT Departments.
- CG10 - Provide graduates with the necessary leadership skills and knowledge of tools for managing human teams in the field of ICT.

Specific competences

- CETEC2 - Ability to understand and apply the operation and organization of the Internet, the technologies and protocols of new generation networks, component models, intermediary software and services.

Transversal competences

- CT10 - Ability to adapt to new problematic situations and changes.

Master in Informatics Engineering

Basic competences

- CB7 - Ability to apply the acquired knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
- CB8 - Ability to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.

General Competences

- CG1 - Ability to plan, calculate and design products, processes and facilities in all areas of telecommunications engineering.
- CG4 - Capacity for mathematical modeling, calculation and simulation in technology centers and engineering companies, particularly in research, development and innovation in all areas related to the Telecommunications Engineering and related multidisciplinary fields.
- CG8 - Ability to apply acquired knowledge and solve problems in new or little-known environments within broader and multi-disciplinary contexts, being able to integrate this knowledge.
- CG9 - Ability to understand and apply ethical responsibility, legislation and professional deontology of the activity of the Informatics Engineering profession.

Specific competences

- CETI2 - Ability to understand and apply the operation and organization of the Internet, the technologies and protocols of new generation networks, component models, intermediary software and service.

Transversal competences

- CT11 - Autonomous learning capacity.
- CT13 - Ability to integrate knowledge and face the complexity of formulating opinions from incomplete or limited information.

Group

This subject is taught in a single group regardless of the student profile (Computer Science or Telecommunications). The syllabus covers all the aforementioned competencies of the MUII, MUIT, and MUDT programs.

Contents

Course outline[1]

New generation routing and transport protocols. Network autoconfiguration. Self-organizing networks. Quality of service. Integration of network services. Design and architecture of component models. Intermediary software. Web services.

Course Syllabus

Name of lesson 1: Introduction to distributed systems.
Contents of topic 1: Introduction to distributed systems. Passing messages.

Name of lesson 2: Distribution middleware (intermediary software).
Contents of Topic 2: Concept of middleware. Remote invocation styles. Basic patterns of remote invocation. ICE Middleware Java Message Service.

Name of lesson 3: Web Services.
Contents of the topic 3: Introduction. Support technology (xml, wsdl, soap). Specifications WS. REST services.

Name of lesson 4: Link, Network and Transport Protocols
Contents of topic 4: Link, network and transport protocols on the Internet. New generation routing and transport protocols.

Name of lesson 5: Quality of Service
Contents of topic 5: Definition of Quality of Service. Service models. Provision of Quality of Service.

Name of lesson 6: Software-Defined Networks and Network Function Virtualization
Contents of topic 6: SDN data and control planes. Generalized forwarding. NFV. SFC.

Name of lesson 7: Self-configuration of Network and Self-organizational Networks
Contents of topic 7: Network autoconfiguration protocols. Self-organizing networks. Networks and overlay services.

Evaluation activities[1]

Students workload in hours by lesson		**Lectures**	**Practical activities**				**Monitoring activity**	**Homework**
Lesson	**Total**	**L**	**HI**	**LAB**	**COM**	**SEM**	**SGT**	PS
1	25	8		3				14
2	22	7		2				13
3	22	7		2				13
4	20	5		2				13
5	21	6		2				13
6	19	5		2				12
7	19	5		2				12
Evaluation	2	2						
TOTAL	**150**	**45**		**15**				**90**

L: Lectures (85 students).
HI: Hospital internships (7 students).
LAB: Laboratory or field practices (15 students).

COM: Computer room or language laboratory practices (20 students).
SEM: Problem classes or seminars or case studies (40 students).
SGT: Scheduled group tutorials (educational monitoring, ECTS type tutorials).
PS: Personal study, individual or group work and reading of bibliography.

Teaching Methodologies

The teaching methodologies include:

- Participatory classes
- Problem-solving
- Problem-based learning
- Project-based learning
- Cooperative and collaborative learning

Planned teaching activities

Some of the teaching activities proposed throughout the course to help the students achieve the learning objectives are detailed next. These activities have been classified into three categories: lectures, lab sessions, and homework, although some of them may appear in more than one category. Some of these activities will be individual, while others will be developed in group.

Lectures

- Traditional lectures.
- Exercise and problem solving.
- Collaborative work aimed at solving problems and reaching agreements.
- Rubric-based self-assessment.
- Rubric-based peer evaluation.
- Questionnaires.
- Presenting problem solutions.

Computer lab sessions

- Software demonstration.
- Guided lab activities.
- Open-lab activities.
- Portfolio of activities.
- Requirements elicitation.
- Project development.
- Design/Program modification.
- Portfolio review.

Homework

- Individual study.
- Team meetings.
- Autonomous study.
- Program implementation.
- Writing program internal documentation.
- Web search.
- Collaborative document creation using the Virtual Campus.
- Using the Virtual Campus forums to communicate with lecturers and classmates.
- Development of reports and presentations.

Learning outcomes

Master in Telecommunications Engineering

Learning outcomes related to technical competences

- To know routing and transport new generation protocols.
- To know techniques of self-configuration networks.
- To know self-organizing network technologies, such as P2P networks.
- Master the concepts related to the specification of Quality of Service in networks.
- To know fundamentals and techniques for the integration of network services.
- To know the design and architecture of the component models.
- To know different types of middleware and the technologies on which they are based.
- Master the operation and technology of web services

Master in ICT Management

Learning outcomes related to technical competences

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Master in Informatics Engineering

Learning outcomes related to technical competences

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Assessment systems

According to the Evaluation Regulations for official Bachelor's and Master's degrees of the University of Extremadura, the course can be passed either through a continuous assessment system or a comprehensive final exam. In accordance with these regulations, students must choose the assessment system they wish to follow by following the indicated procedure, which will be made available to them (via the course's virtual campus, within the first weeks of the semester). By default, it is understood that the student chooses continuous assessment.

To evaluate the achievement of the learning objectives of this course, both those related to technical competencies and those corresponding to transversal competencies, the following assessment instruments have been deemed appropriate: activity portfolio and written exams, the latter only for students who have not passed the continuous assessment.

In order to evaluate the achievement of the learning outcomes previously defined, related to both technical and transversal competences, the following evaluation instruments have been considered: activities portfolio and written exams. The latter type only for those students who could not pass the continuous evaluation.

Activities portfolio

The portfolio of activities gathers a number of assignments carried out by the students throughout the semester, including tasks developed during the lectures, the computer lab sessions, or at home.

These activities may be of different types: problem solving, answering questionnaires, peer assessment of the activities developed by classmates, information search, team work, documenting meetings, creating conceptual maps, taking part in debates, attending 75% minimum to classroom etc.

Apart from the impact of each portfolio activity in the students' progress and grades, these activities contribute a key added-value as they provide both the students and the lecturer with a general overview of all the work carried out during the course, allowing both to reflect on the learning process and to early identify potential problems so that they can be corrected in time or even prevented.

Written exams

Only for those students who could not pass the continuous evaluation. One or more written exams, including problem solving, test- or short-answer questions, etc. will guarantee that the students have acquired the minimum required technical competencies and knowledge.

Evaluation criteria

- In order to pass this subject, students must fulfil the requirements associated to the set of continuous evaluation activities that will be included in the portfolio.
- The portfolio will be evaluated using a continuous assessment approach on a number of activities proposed throughout the course. Depending on their nature, these activities will be developed during the lectures, the computer lab sessions, or at home, with the support of the Virtual Campus.
- A minimum grade of 5 over 10 needs to be obtained in order to pass it.
- The mark of the activities portfolio will represent the 100% of the subject mark in case that all the activities have been passed.

Those students who do not pass the continuous evaluation will do a global exam during the exams period. In order to pass it, a minimum mark of 5 over 10 is required. This exam may include problem solving and test- or short-answer questions. Besides, the questions could have a minimum grade be used to calculate the weighted average grade. The mark of the global exam will represent the 100% of the subject mark in case the student did not pass the continuous evaluation.

Biography (Basic and complementary)

Basic Biography

- Redes de computadoras. Un enfoque descendente (7ª Ed.). J.F. Kurosse, K.W. Ross. Pearson, 2017.
- Redes e Internet de alta velocidad rendimiento y calidad de servicio. William Stallings Ed. Prentice Hall, 2003.
- Technical, commercial, and regulatory challenges of QoS : an internet service model perspective. XiPeng Xiao. Ed. Elsevier / Morgan Kaufmann, 2008.

- Zero Configuration Networking: The Definitive Guide. Daniel H Steinberg, Stuart Cheshire. Ed. O'Reilly Media, 2005.
- Distributed Systems: Concepts and Design. Coulouris, Dollimore, Kindberg and Blair. Addison-Wesley, 5th Edition, 2011.
- Remoting Patterns. Foundations of Enterprise, Internet and Realtime Distributed Object Middleware. Marcus Völter, Michael Kircher, uwe Zdun. John Wiley & Sons. 2005.
- ICE middleware web page. http://www.zeroc.com/

Complementary biography

- P2P Networking and Applications. John F. Buford, Heather Yu and Eng Keong Lua. Elsevier, 2009.
- Network-Centric Service-Oriented Enterprise. William Y. Chang. Springer, 2008
- Distributed systems architecture: a middleware approach. Arno Puder, Kay Römer and Frank Pilhofer. Elsevier, 2006.
- SOA in Practice: The Art of Distributed System Design. Nicolai M. Josuttis. O'Reilly. 2007
- Service-oriented architecture : concepts, technology, and design. Erl, Thomas. Prentice-Hall. 2005
- *Component Software, Beyond Object-Oriented Programming*, second edition, by Clemens Szyperski. Addison-Wesley, 2002.
- Enterprise SOA: designing IT for business innovation. Dan Woods, Thomas Mattern. O'Reilly Media. 2006.
- Advancing open standards for the information society. http://www.oasis-open.org/

Other resources and complementary education materials

Resources: subject's virtual room, available at the Campus Virtual of the University of Extremadura.