

Networks and Internet Technologies

Code: 43339
ECTS Credits: 6

Degree	Type	Year	Semester
4314660 Computer Engineering	OB	1	1

Contact

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Use of languages

Principal working language: english (eng)

Teachers

Ramon Marti Escale
Ian Blanes Garcia

Prerequisites

There are no previous requirements.

Objectives and Contextualisation

The objective of this module is to provide an introduction to the latest network protocols and to multimedia contents distribution through Internet --focusing on image data--. Communications standards will be reviewed in depth.

Skills

- Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
- Create and exploit virtual environments and create, manage and distribute multimedia content.
- Define and communicate results, guaranteeing high levels of performance and quality.
- Direct work on computer systems, complying with current rules and guidelines and safeguarding the quality of the service.
- Display a spirit of enterprise and innovation and a wide-ranging vision in the search for new areas to explore in a specific field of the computer engineering profession.
- Integrate and apply the knowledge acquired and solve problems in new or little-known situations within broader (or multidisciplinary) contexts.
- Launch, lead and manage manufacturing processes for computer hardware, safeguarding persons and goods and overseeing product quality and certification
- Propose, calculate and design products, processes and installations in all areas of computer engineering.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Understand and apply the workings and organisation of internet, new-generation network technologies and protocols, models of components, intermediary software and services.

- Undertake mathematical modelling, calculation and simulation in technological centres and engineering companies, especially in research, development and innovation tasks in all areas related to computer engineering.

Learning outcomes

1. Analyse and evaluate the prerequisites for implementing network algorithms.
2. Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
3. Decide on the most suitable type of communications standard for the characteristics of the signal and the transmission channel.
4. Define and communicate results, guaranteeing high levels of performance and quality.
5. Direct work on computer systems, complying with current rules and guidelines and safeguarding the quality of the service.
6. Display a spirit of enterprise and innovation and a wide-ranging vision in the search for new areas to explore in a specific field of the computer engineering profession.
7. Integrate and apply the knowledge acquired and solve problems in new or little-known situations within broader (or multidisciplinary) contexts.
8. Launch, lead and manage manufacturing processes for computer hardware, safeguarding persons and goods and overseeing product quality and certification
9. Propose, calculate and design products, processes and installations in all areas of computer engineering.
10. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
11. Undertake mathematical modelling, calculation and simulation in technological centres and engineering companies, especially in research, development and innovation tasks in all areas related to computer engineering.

Content

Internet Technologies

1. Multimedia Contents Distribution.
2. Quality of Experience, Quality of Service.
3. Communications standards: JPEG.
4. Communications standards: JPEG2000.
5. Communications standards: JPEG-XR.
6. Communications standards: H.264.
7. Communications standards: HEVC.
8. Communications standards: JPIP.
9. Challenges in Multimedia Content Distribution.
10. Laboratory sessions.

New Generation Networks Content

1. Ad-hoc Networks and pervasive computing.
2. Wireless sensor networks and RFID.
3. Distributed applications.
4. Delay- and Disruption-Tolerant Networks (DTNs).
5. Mobile agents and their applications.
6. Big Data

Methodology

The methodology will combine the attended lectures, the sessions hosted in the laboratory, homework derived from recommended readings and the independent work of the student. Students will have to make oral presentations on specific subjects related to the works introduced and discussed along the course.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Lectures	34	1.36	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
Type: Supervised			
Laboratory Sessions	10	0.4	1, 7, 9, 10
Oral Presentation Preparation	20	0.8	2, 6, 7, 11
Type: Autonomous			
Homework: exercises resolution, papers reading, sessions preparation	34	1.36	1, 2, 4, 7, 11
Laboratory Sessions	47	1.88	1, 3, 7, 9, 10

Evaluation

The final evaluation mark will take into account the portfolio delivered by the students, the attendance and participation in class, and the oral presentations.

1. Attendance and active participation are compulsory. At least 80% of the lectures shall be attended. Absences might be compensated with a home-work after agreement with the teacher. Mark: 20% (minimum mark: 5 out of 10).
2. Oral presentations of a particular subject. Presentation in English is strongly advised. Mark: 40% (minimum mark: 5 out of 10).
3. Laboratory sessions. Development of an application for image compression. Mark: 40% (minimum mark: 5 out of 10).

To pass the module, a mark equal or higher than 5 in each section must be obtained.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Laboratory Sessions	40	2	0.08	1, 7, 9, 10
Oral Presentation	40	1	0.04	2, 6, 7, 11
Participation in class	20	2	0.08	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

Bibliography

- Thomas M. Cover and Joy A. Thomas (1991). Elements of Information Theory, John Wiley & Sons, Inc
- Mark Nelson (1991). The Data Compression Book, Prentice Hall.

- David S. Taubman and Michael W. Marcellin (2002). JPEG 2000, Kluwer Academic Publishers. ISBN 0-7923-7519-X.
- David Salomon (2006, 4th Edition). Data Compression: The Complete Reference (Hardcover), Springer. ISBN 1-84628-602-5.
- David Salomon, Giovanni Motta (2010, 5th Edition). Handbook of Data Compression (Hardcover), Springer. ISBN 978-1-84882-902-2.
- Khalid Sayood (2012, 4th Edition). Introduction to Data Compression (Hardcover), Morgan Kaufmann. ISBN 978-0-12-415796-5.