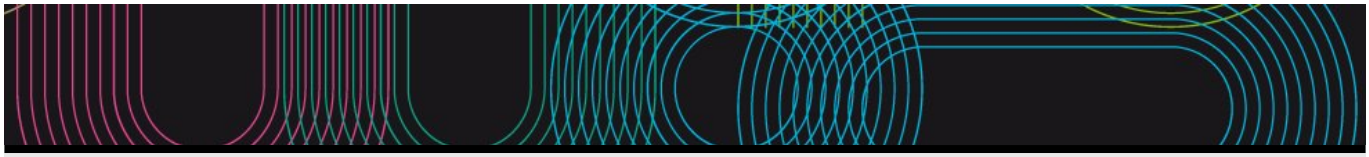

IDENTIFYING DATA				
Basics of computer networks				
Subject	Basics of computer networks			
Code	P52G381V01503			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	5th	1st
Teaching language	Spanish			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Fernández García, Norberto Fernández Gavilanes, Milagros			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://moovi.uvigo.gal			
General description	This subject is part of the Intensification in Naval Technologies, and it is sought to provide the students with training, both theoretical and practical, on the fundamental concepts of communication networks and telematic services: basis on data transmission technologies, architecture of networks and communication services, the main components of ICT infrastructures and information systems, network management and planning methods, and basic aspects of computer network security. In the final part of the subject, basic questions related to cyber defense and cybersecurity are also introduced. The classroom sessions will be used to introduce theoretical concepts, which will be complemented with different laboratory practices and problem solving during the tutoring sessions and the seminars.			

Training and Learning Results	
Code	
B3	Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
C31	CITN6/OPT2 To acquire the ability to understand the concepts of network architecture, protocols and communication interfaces.
C32	CITN7/OPT3 To acquire the ability to differentiate the concepts of access and transport networks, circuit switching and packet switching networks, as well as knowledge of methods of interconnecting networks and routing.
C33	CITN8/OPT4 To know and use correctly the information systems.
D1	Analysis and synthesis
D2	Problems resolution.
D3	Oral and written proficiency
D6	Application of computer science in the field of study.
D8	Decision making.
D9	Apply knowledge.
D10	Self learning and work.

Expected results from this subject	Training and Learning Results		
Know the technological basis of telematics and data transmission.	B3	C31 C32 C33	D1 D3 D6 D9 D10

Understand the basic principles and architectures of communication networks and services.	B3	C31 C32 C33	D3 D6 D9 D10
Know the main components of ICT infrastructures.	B3	C31 C32 C33	D1 D2 D3 D6 D8 D9 D10
Know the basic security aspects of computer networks.	B3	C31 C32 C33	D1 D3 D6 D9 D10
ENAEE learning outcome: 1.- Knowledge and understanding. LO 1.3.- Be aware of the multidisciplinary context of engineering. Level of development: Adequate (2)		C31 C32 C33	
ENAEE learning outcome: 5.- Practical application of engineering. LO 5.1.- Understanding of the applicable techniques and analysis, project and research methods and their limitations in the field of their specialty. Level of development: Adequate (2)			D9
ENAEE learning outcome: 5.- Practical application of engineering. LO 5.3.- Knowledge of the application of materials, equipment and tools, technology and engineering processes and their limitations in the field of their specialty. Level of development: Adequate (2)		C31 C32 C33	D6 D9
ENAEE learning outcome: 6.- Elaboration of judgements LO 6.1- Ability to collect and interpret data and handle complex concepts within their speciality, in order to make judgements involving reflection on ethical and social issues.		C31 C32 C33	

Contents

Topic	
Introduction, protocols and layers.	Introduction and motivation. Basic network concepts. Reference models. Standardisation bodies. History of the Internet.
Physical and link layers.	Introduction to the physical layer. Transmission media. Limit capacity of communication channels. Introduction to the link layer. Frame delimitation. Introduction to transmission errors. Detection and correction of errors.
Retransmission, multiple access and switching.	Retransmission. Random multiple access. Multiple access without contention. Switched Local Area Networks (LAN). Virtual LAN.
Packet forwarding and network connection.	Introduction to the network layer. IP protocol (v4 and v6). ARP protocol Packet fragmentation ICMP protocol Network Address Translation (NAT).
Routing.	Introduction to routing. Dijkstra's algorithm. Routing algorithms in networks. Hierarchical routing. Border Gateway Protocol (BGP).
Transport layer. Reliable transport.	Introduction to the transport layer. Connectionless protocols: User Datagram Protocol (UDP). Connection-oriented protocols: Transmission Control Protocol (TCP). - Connection establishment and release. - Reliability mechanisms. - Flow control. - Congestion control.

Quality of service.	Introduction to quality of service. Multimedia data transmission over best effort networks. Content distribution networks. Differentiated services.
Application layer.	Introduction to the application layer. Domain Name System (DNS). Hypertext Transfer Protocol (HTTP). Dynamic Host Configuration Protocol (DHCP).
Cyberdefense and cybersecurity.	Introduction to security in computer networks. Ethical-social aspects of network security. Cybersecurity risk management. Confidentiality of messages. Authenticity and integrity of messages. Security protocols: WPA, IPsec, TLS. Security software tools.
Networked information systems.	Architecture and components of an information system. Big data and cloud computing. Intelligent Systems.
Information and command and control systems in the Navy.	Intranet overview. Command and control systems. NATO Secret WAN. Naval command system. SIJE. Future of information systems. SIM.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	47	75
Laboratory practical	12	12	24
Problem solving	7	0	7
Mentored work	15	14	29
Presentation	2	2	4
Laboratory practice	3	0	3
Essay questions exam	2	0	2
Essay questions exam	6	0	6

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Presentation by the lecturer of the contents on the subject under study, theoretical basis and guidelines of a work, exercise or project to be developed by the student.
Laboratory practical	Activities with the goal of applying knowledge to specific situations and for the acquisition of basic and procedural skills related to the subject matter of the study. They take place in special spaces with specialized equipment (laboratories, computer rooms, etc.).
Problem solving	Activity in which problems and exercises related to the course are formulated. The student must develop the appropriate or correct solutions through the exercise of routines, the application of formulas or algorithms, the application of transformation procedures of the available information and the interpretation of the results.
Mentored work	An intensive course will be developed in which the students who have not passed the course in ordinary call will work, under the supervision of the lecturer, reviewing the theoretical and practical concepts and carrying out activities, problems and exercises in preparation for the examination of the extraordinary call.

Personalized assistance

Methodologies	Description
Lecturing	The lecturers of the course will personally answer the doubts and queries of the students, both in person, according to the schedule that will be published on the center's website, and through telematic means (email, videoconference, Moovi forums, etc.) by previous appointment.
Laboratory practical	The lecturers of the course will personally answer the doubts and queries of the students, both in person, according to the schedule that will be published on the center's website, and through telematic means (email, videoconference, Moovi forums, etc.) by previous appointment.

Mentored work	The lecturers of the course will personally answer the doubts and queries of the students, both in person, according to the schedule that will be published on the center's website, and through telematic means (email, videoconference, Moovi forums, etc.) by previous appointment.
Problem solving	The lecturers of the course will personally answer the doubts and queries of the students, both in person, according to the schedule that will be published on the center's website, and through telematic means (email, videoconference, Moovi forums, etc.) by previous appointment.

Assessment

	Description	Qualification	Training and Learning Results		
Presentation	Submission and presentation of a work related to the subject matter (TL): Evaluation of the work related to the subject and their presentations (approximate date: week 13 of the semester)	15	B3	C31 C32 C33	D1 D3 D6 D8 D10
Laboratory practice	Practical examination (PL): Individual test to evaluate the knowledge acquired in the practical sessions (approximate date: week 14 of the semester). It consists of solving problems similar to those analyzed in the practical sessions.	15	B3	C31 C32 C33	D1 D2 D3 D6 D9 D10
Essay questions exam	Partial examination (PT, 30% of the grade): Written exam to evaluate the knowledge acquired in the theory sessions T1 to T6 (approximate date: week 8 of the semester). Final Exam (ET, 40% of the grade): Final written exam to evaluate the knowledge acquired in the theory sessions T1 to T11 (approximate date: week 14 of the semester). These examinations can be in the form of a multiple choice questionnaire, short answer questionnaire, problem solving, or some combination of the above.	70	B3	C31 C32 C33	D1 D2 D3 D6 D8 D9

Other comments on the Evaluation

Final mark and minimum requirements to pass the course through continuous assessment:
To ensure that the student has acquired the minimum skills in each of the aspects of the course, students will be required to achieve a minimum score of 4.0 out of 10 in the final theory exam. If we name MED_CON to the average grade for continuous assessment, which is calculated as:

MED_CON = 0.3 * PT + 0.4 * ET + 0.15 * PL + 0.15 * TL

The final continuous assessment mark (NEC) will coincide with MED_CON in the event that ET is greater than or equal to 4.0 and, otherwise, it will be calculated as:

NEC = min (4, MED_CON)

This grade (NEC) should be equal to or greater than 5 (on a scale of 10) to pass the course. The student who does not pass the course in this call must take the ordinary exam.

Final mark and minimum requirements to pass the course in the ordinary exam:
The final grade in the ordinary exam (NEO) is calculated with the following formula:

NEO = 0.7 * T + 0.3 * L

Where:

- T represents the theoretical part of the ordinary exam of the course. Individual written exam to evaluate the knowledge acquired in the theory sessions T1 to T11. It can be in the form of a multiple choice questionnaire, short answer questionnaire, problem solving, or some combination of the above.
- L represents the practical part of the ordinary exam of the course. Individual written exam to evaluate the knowledge acquired in the practical sessions of the subject. It consists of solving problems similar to those analyzed in the practical sessions and / or questions about the work presented and / or presentations.

This grade (NEO) should be equal to or greater than 5 (on a scale of 10) to pass the course. The student who does not pass the course in this call or in continuous assessment must attend the extraordinary call.

Final mark and minimum requirements to pass the course in the extraordinary exam:
The final grade in the extraordinary exam (NEE) is calculated with the following formula:

$$NEE = 0.7 * T + 0.3 * L$$

Where:

- T represents the theoretical part of the extraordinary exam of the course. Individual written exam to evaluate the knowledge acquired in the theory sessions T1 to T11. It can be in the form of a multiple choice questionnaire, short answer questionnaire, problem solving, or some combination of the above.
- L represents the practical part of the extraordinary exam of the course. Individual written exam to evaluate the knowledge acquired in the practical sessions of the subject. It consists of solving problems similar to those analyzed in the practical sessions and / or questions about the work presented and / or presentations.

This grade (NEE) should be equal to or greater than 5 (on a scale of 10) to pass the course.
ACADEMIC INTEGRITY:
Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo*, as well as point 6 of the fifth rule of *Order DEF/711/2022, of July 18th, which establishes the requirements for evaluation, progress, and ongoing enrolment in military educational training centres for incorporation into the ranks of the Armed Forces,* **any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity,** regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

Sources of information

Basic Bibliography

A. S. Tanenbaum, N. Feamster, D. Wetherall, **Computer Networks: Global Editionnal Version**, 6a edición, Prentice-Hall, 2021

J. F. Kurose , K. W. Ross, **Redes de computadoras: Un enfoque descendente**, 7a edición, Pearson Education, 2017

Complementary Bibliography

K. R. Fall, W. R. Stevens, **TCP/IP Illustrated, Volume 1: The Protocols**, 2a edición, Addison-Wesley, 2011

K. R. Fall, W. R. Stevens, **TCP/IP Illustrated, Volume 2: The Implementation**, 2a edición, Addison-Wesley, 2011

Recommendations

Other comments

In order for the student to successfully pass this subject, it is advisable to have:

- Well-developed written and oral comprehension skills.
- Ability to abstract and synthesize information.
- Skills for group work and group communication.