Universida_{de}Vigo

IDENTIFYING DATA Computer systems Subject Computer systems Security Subject Computer systems Security Code O06G151V01401 Study Study Grado en Ingeniería programent Informática Descriptors ECTS Credits Choose Year Quadmester 6 Mandatory 4th 1st Ist Teaching #EnglishFriendly Ist Ist Ist Cordinator Ribadas Pena, Francisco José Ecturers Ribadas Pena, Francisco José Ecturers Ribadas Pena, Francisco José Ecturers Ribadas Pena, Francisco José Ecturers Ribadas Pena, Francisco José Ecturers Social Informática ¹ . It is a compulsory course that pretends to integrate, complement and expand contents relate with the computer security is a wide and diverse field, the main aim of this subject is to provide an introduction to this branch of the computer science and give an overview of the mostable aspects the computer security. So that it could serve to the student as a starting point in case that they decide to run t professional paths in this field. English Friendly subject: International students may request from the teachers: a) materials and bibliograp references in English, b) tutoring sessions in English, c) ex				Su	bject Guide 2023 / 2024
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B9 Ability to solve problems by taking the initiative, making decisions and acting independently and creatively. Ability communicate the knowledge contents, skills and abilities of the Computer Science Engineer profession.	B9 Ability t commu	to solve problems by taking the initiative, making decis inicate the knowledge contents, skills and abilities of th	ions and acting ir e Computer Scier	ndependently and nce Engineer prof	l creatively. Ability to ression.
B11 Ability to analyze and assess the social and environmental impact of technical solutions, being aware of the ethical professional responsibilities involved in the professional practice of a Computer Science Engineer.	B11 Ability t	to analyze and assess the social and environmental imp ional responsibilities involved in the professional practi	act of technical s	solutions, being a	ware of the ethical and r.
B12 Knowledge and application of basic elements of economics and human resource management, organization and planning of projects, as well as legislation, regulation and standardization in the field of computer projects, accordi the knowledge acquired.	B12 Knowle plannin the kno	dge and application of basic elements of economics and g of projects, as well as legislation, regulation and stan pwledge acquired.	d human resource dardization in the	e management, o e field of compute	prganization and er projects, according to

C7 Ability to design, develop, choose and assess computer applications and systems to guarantee their reliability, safety and quality, according to ethical principles and existing legislation and regulations.

C29 Ability to identify, assess and deal with associated risks that could potentially arise.

- C32 Ability to select, design, implement, integrate, assess, build, manage, exploit and maintain hardware, software and network technologies, within the appropriate costs and quality requirements.
- C34 Ability to select, design, implement, integrate and manage networks and communications infrastructures in organizations.
- C37 Ability to understand, apply and manage the security and safety of computing systems.

- D4 Analysis, synthesis and evaluation capacity
- D7 Ability to search, relate and structure information from various sources and to integrate ideas and knowledge.
- D8 Ability to work in situations of lack of information and / or under pressure
- D9 Ability to quickly integrate and work efficiently in unidisciplinary teams and to collaborate in a multidisciplinary environment
- D11 Critical thinking

D12 Leadership

D13 Entrepreneurial spirit and professional ambition

D14 Have motivation for quality and continuous improvement

Expected results from this subject Expected results from this subject Training and Learning Results RA2: Know the security architecture of modern operating systems and know configure them and A2 Β3 C7 D7 manage them in a safe way Β4 C29 D9 Β7 C32 D11 Β9 C37 D14 B12 C7 D7 RA3: Manage a computer network in a safe way A3 Β3 Β4 C29 D8 Β7 C32 D9 Β9 C34 D14 C37 B11 B12 RA4: Know the most common types of computer attacks and the alternatives to protect against A2 B3 C7 D7 them A3 B7 C29 D8 Β9 C34 D12 B11 C37 D13 B12 D14 RA5: Know how manage a security incident B3 C7 D4 A2 A3 Β7 C29 D7 Β9 C32 D8 B11 C34 D11 B12 C37 D12 D13 D14

Contents	
Торіс	
BLOCK I. Information security	
1. Context of the security in computer systems	1.1 Concepts and terminology
	1.2 Levels of the security: physics, logical, organisational
	1.3 Norms and recommendations
2. Cryptography	2.1 Foundations and evolution
	2.2 Symmetric encryption
	2.3 Asymmetric encryption
	2.4 Criptographic infraestructure: certificates, digital signatures, PKI
3. Secure application development	3.1 Software vulnerabilities and threats
	3.2 Exploitation of vulnerabilities
	3.3 Safe programming
BLOCK II. Operating systems security	
4. Safe administration of O.S.	4.1 Authentication mechanisms
	4.2 Monitoring tools
	4.3 Typical vulnerabilities
	4.4 Security incident response
BLOCK III. Network security	
5. Secure network protocols	5.1 Vulnerabilities in TCP/IP networks
	5.2 Security at network layer: IPSec
	5.3 Security at transport layer: SSL/TLS
	5.4 Security at application layer: SSH
6. Perimeter protection	6.1 Firewalls: types and topologies
	6.2 Intrusion detection systems
	6.3 Virtual private networks
	6.4 Network security analysis

- Use of encryption APIs
 Security analysis in networks, systems and services
 Design and deployment of perimeter protection solutions
 Web application security analysis and countermeasures deployment

Planning

	Class hours	Hours outside the classroom	Total hours		
Lecturing	20	20	40		
Laboratory practical	26	52	78		
Mentored work	0	15	15		
Presentation	1	3	4		
Objective questions exam	2	10	12		
Essay	1	0	1		
*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 teacher and discussion of the theorical contents in the course's didactic guide. It includes activities such as study of practical cases and examples, presentation of studies and / or research, review and evaluation of security tools.
Laboratory practical	Practical works to realize in the laboratory. It will consist of a collection of guided exercises (individual or in couples) related with secure systems administration of operative systems and computer networks.
	CONTINUOUS ASSESSMENT Character: mandatory Attendance: not mandatory GLOBAL ASSESSMENT Character: not mandatory
Mentored work	Small research work, individual or in couples, related with aspects of the computer security not cobered by the main topics of this subject. Research themes can be proposed by students. The result of the work will reflect in a writtern report and a short public presentation.
	CONTINUOUS ASSESSMENT Character: mandatory Attendance: not mandatory GLOBAL ASSESSMENT Character: not mandatory
Presentation	Public presentation and discussion of the more relevant aspects of students research works. CONTINUOUS ASSESSMENT Character: not mandatory Attendance: not mandatory

Personalized assistance				
Methodologies	Description			
Mentored work	Autonomous work (or in couples) with teacher tutoring and development guides			
Laboratory practical	Autonomous work (or in couples) with teacher tutoring and development guides			

Assessment						
	Description		Qualification Training and L			
				ĸ	esuits	
Laboratory	Evaluation of the programming project with cryptographic APIs.	45	A2	B3	C7	D7
practical				B4	C29	D8
	Evaluation of guided exercises about network and operative			B7	C32	D9
	systems security.				C34	D11
						D12
	- LEARNING OUTCOMES: RA1, RA2, RA3, RA4, RA5					D14
Presentation	Evaluation of the presentation of research work. It will evaluate	5	A3	B7	C7	D4
	synthesis and communication skills, as well as the encouragement			B11	C29	D7
	of the discussion around questions from teacher and other students			B12	C37	D13
	- LEARNING OUTCOMES: RA2, RA3, RA4, RA5					

Objective questions exam	Written multiple selection test, also with short answer questions, regarding contents from theoretical sessions and practical exercises.	40	А3	B3 B7	C7 C29 C32 C34	D4 D7 D8
	- LEARNING OUTCOMES: RA1, RA2, RA3, RA4, RA5				C37	
Essay	Evaluation of the written report with the results of the research work.	10	A3	B7 B11 B12	C7 C29 C37	D4 D7 D9
	- LEARNING OUTCOMES: RA2, RA3, RA4, RA5					D11

Other comments on the Evaluation

(1) CONTINUOUS ASSEMENT SYSTEM TEST 1: Java Encryption API Project

Description: Evaluation of the code and memory of the development project employing the JCA encryption API.

Applied methodology: Laboratory practical

% Qualification: 10%

Minimum %: grade equal to or greater than 4 points (out of 10)

Evaluated learning results: B3, C7, C32

Expected results: RA1

TEST 2: Guided practices

Description: Evaluation of the deliverables and questions corresponding to the security practices in networks and OS.

Applied methodology: Laboratory practical

% Qualification: 35%

Minimum %: grade equal to or greater than 4 points (out of 10)

Evaluated learning results: A2,B3,B4,B7,C7,C29,C32,C34,D7,D8,D9,D11,D12,D14

Expected results: RA2, RA3, RA4, RA5

TEST 3: Tutored work/essay

Description: Evaluation of the report/essay from the tutored research work.

Applied methodology: Essay

% Qualification: 10%

Minimum %: no minimum

Evaluated learning results: A3,B7,B11,B12,C7,C29,C37,D4,D7,D9,D11

Expected results: RA2, RA3, RA4, RA5

TEST 4: Presentation

Description: Evaluation of the presentation of the supervised research work.

Applied methodology: Presentation

% Qualification: 5%

Minimum %: no minimum

Evaluated learning results: A3,B7,B11,B12,C7,C29,C37,D4,D7,D13

Expected results: RA2, RA3, RA4, RA5

TEST 5: Final exam

Description: Multiple-choice exam on the theoretical contents of the subject.

Applied methodology: Objective questions exam

% Qualification: 40%

Minimum %: grade equal to or greater than 4 points (out of 10)

Evaluated learning results: A3,B3,B7,C7,C29,C32,C34,C37,D4,D7,D8

Expected results: RA1, RA2, RA3, RA4, RA5

ADDITIONAL CLARIFICATIONS

- To pass the subject it is necessary to reach the minimums indicated in the previous tests and to add in the final weighted grade a minimum of 5 points out of 10.
- In the case of finding unethical behavior (copying, plagiarism) in any of the deliveries made (total or partial), the total contribution of the corresponding evaluation element on the final grade will be annulled.

(2) GLOBAL ASSEMENT SYSTEMProcedure for selecting the global assessment modality:

- $\circ\;$ The continuous assessment modality is assumed by default.
- Students who opt for the global evaluation must communicate it via Moovi, using the mechanisms that are enabled and within the stipulated period, once the period of one month from the beginning of the term has passed.

TEST 1: Java Encryption API Project

Description: Evaluation of the code and memory of the development project employing the JCA encryption API.

Applied methodology: Laboratory practical

% Qualification: 10%

Minimum %: grade equal to or greater than 5 points (out of 10)

Evaluated learning results: B3, C7, C32

Expected results: RA1

TEST 2: Guided practices

Description: Evaluation of the deliverables and questions corresponding to the security practices in networks and OS.

Applied methodology: Laboratory practical

% Qualification: 35%

Minimum %: grade equal to or greater than 5 points (out of 10)

Evaluated learning results: A2,B3,B4,B7,C7,C29,C32,C34,D7,D8,D9,D11,D12,D14

Expected results: RA2, RA3, RA4, RA5

TEST 3: Final exam

Description: Multiple-choice exam on the theoretical contents of the subject.

Applied methodology: Objective questions exam

% Qualification: 55%

Minimum %: grade equal to or greater than 5 points (out of 10)

Evaluated learning results: A3,B3,B7,C7,C29,C32,C34,C37,D4,D7,D8

Expected results: RA1, RA2, RA3, RA4, RA5

ADDITIONAL CLARIFICATIONS

- To pass the subject it is necessary to reach the minimums indicated in the previous tests and to add in the final weighted grade a minimum of 5 points out of 10.
- In the case of finding unethical behavior (copying, plagiarism) in any of the deliveries made (total or partial), the total contribution of the corresponding evaluation element on the final grade will be annulled.

(3) ASSESSMENT CRITERIA FOR EXTRAORDINARY AND FINAL CALLS- The continuous and global evaluation systems described above will be used.

- In these calls, students must only take the tests in which they have not obtained the minimum grade indicated.

(4) GRADING PROCESS In the case of students who pass part of the evaluated elements, but do not reach the minimum required to pass the whole

subject, the grade to be included in the respective minutes will be calculated as the minimum between the weighted

average of the parts passed and 4.9.

(5) EVALUATION DATES

The official exam dates of the different calls, officially approved by the Xunta de Centro of the ESEI, are published on

the ESEI website https://esei.uvigo.es/docencia/horarios/.

(6) USE OF MOBILE DEVICES All students are reminded of the prohibition of the use of mobile devices in exercises and practices, in compliance with

article 13.2.d) of the University Student Statute, regarding the duties of university students, which establishes the

duty to "Refrain from using or cooperating in fraudulent procedures in the assessment activities, in the delivered

assignments or in official documents of the university."

(7) TUTORING SCHEDULE AND PERSONAL TUTORING REQUEST The tutoring schedule, and the way to request a personal tutoring, is published in the personal page of the teaching staff, accessible through https://esei.uvigo.es/docencia/profesorado/.

Sources of information

Basic Bibliography

W. Stallings, **Cryptography and Network Security: Principles and Practice**, 978-1292158587, 7th edition, Prentice Hall, 2017

W. Stallings, L. Brown, **Computer Security: Principles and Practice**, 978-0134794105, 4rd edition, Prentice Hall, 2018 J. L. García Rambla, **Ataques en redes de datos IPv4 e IPv6**, 978-8409240630, 2da edición, 0xWORD, 2014

Complementary Bibliography

Carlos Álvarez Martín y Pablo González Pérez, **Hardening de servidores GNU / Linux**, 978-84-09-24061-6, 4ª edición, 0xWORD, 2020

Darril Gibson, Microsoft Windows Security Essentials, 978-1118016848, 1st Edition, John Wiley & amp; Sons, 2011

Recommendations

Other comments

Basic knowledge on OS administration, GNU/Linux and TCP/IP networks is assumed.

Programming assignment will require knowledge of Java language.

Network security exercises will employ virtual machines on VirtualBox (www.virtualbox.org). Basic knowledge of this tool is mandatory.