



GENERAL INFORMATION

Data of the subject	
Subject name	Cybersecurity in Critical Industries and Infrastructures
Subject code	DEAC-MCS-511
Main program	Official Master's Degree in Telecommunications Engineering
Credits	3,0 ECTS
Type	Obligatoria
Department	Department of Electronics, Control and Communications
Course overview	The purpose of this course is to provide the a vision of how industrial control system (ICS) works, its impact in a Critical Infrastructure (CI) and in its services, analyzing an appropriate cybersecurity approach for their protection. It is a mixture of technical aspects of an ICS, understanding of the cybersecurity and methodologies to be used in the defense of an ICS and a CI. The course contains traditional classes and uses as reference books the following texts: • Industrial Cibersecurity, Efficiently secure critical infrastructure systems, Pascal Ackerman • Guideline for Portecting Critical Infrastructures, Borredá Foundation After the course the students: • Will know the basic functions of a control system and the main control systems they could find today • Will know the main legislative references to CI cybersecurity in Spain (and close countries). • Will acquire a basic knowledge of the current trends in the protection of control systems • Will be prepared to apply the r

Teacher Information	
Teacher	
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DESCRIPTION OF THE SUBJECT

Contextualization of the subject
Prerequisites
Although it is not strictly needed, a previous knowledge of control system basic concepts and cybersecurity basic concepts (legal and technical), that will be presented and developed during the course will be beneficial for the student.

Course contents

Contents
Contents
CHAPTER 1: Industrial control systems, ICS
• Introduction to Industrial Control Systems (ICS) • ICS basic functions and ICS basic components



- ICS types and their architectures

CHAPTERS 2 & 3: Insecure by inheritance and Attack Scenario Description

- Difficulties associated to the historical design of an ICS
- Importance of the communications in an ICS and details on the most usual ICS communication protocols
- ICS attack Methodology
- ICS attack example

CHAPTER 4: ICS Risk Analysis

- Risk analysis basic concepts
- ICS risk analysis example

CHAPTER 5: ICS Reference Architecture

- Global and resilient architecture for a firm that uses ICSs
- Purdue Model adopted in ISA99

CHAPTERS 6, 7, 8, 9, 10 & 11: Defense in depth and its details

- Defense in Depth and Diversity concept
- Physical Security
- Network Security
- Computer Security
- Application Security
- Device Security

CHAPTER 12: Cybersecurity Program Development

- Process for developing the cybersecurity program of an Industrial company and of a Critical Infrastructure (IC)
- Program details and iterative methodology for its development

CHAPTERS 13 & 14: Details on Critical Infrastructures (CIs) and its protection

- Essential service in our society
- Critical Infrastructure concept in Spain and in close countries
- Applicable regulation for protecting critical infrastructures and essential services (based on control systems, networks and information systems). Critical Operator and Essential Services Operator
- Critical Operator obligations and Essential Services Operator obligations

CHAPTERS 15, 16, 17 & 18: Interesting Research for the defense of ICSs

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- Certification against Value Chain ENC4V (NIST/CIP?)
- Light Risk Analysis in Industrial Systems.
- Indicators for cyber resilience improvement.



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CIHS

Syllabus
2026 - 2027

- Incident Response Guideline.

EVALUATION AND CRITERIA

The use of AI to produce full assignments or substantial parts thereof, without proper citation of the source or tool used, or without explicit permission in the assignment instructions, will be considered plagiarism and therefore subject to the University's General Regulations.

Grading

Regular Assessment

- **15%** of the mark will be based on the proactivity and effort of the student
- **15%** of the mark will be provided by the intermediate exam
- **20%** of the mark will be provided by labs or empirical requested work
- **50 %** of the mark will be provided by the final exam
- The course will require a mark of 5 in the final exam.

Retakes

- Mark of Proactivity and presentation will be maintained.
- An extraordinary exam will be made for providing the 65% of the mark
- The course will require a mark of 5 in the extraordinary exam.

BIBLIOGRAPHY AND RESOURCES

Basic References

Industrial Cybersecurity, Efficiently secure critical infrastructure systems, Pascal Ackerman

Guía de Protección de Infraestructuras Críticas, Fundación Borredá.

In compliance with current regulations on the **protection of personal data**, we would like to inform you that you may consult the aspects related to privacy and data that you have accepted on your registration form by entering this website and clicking on "download"

<https://servicios.upcomillas.es/sedelectronica/inicio.aspx?csv=02E4557CAA66F4A81663AD10CED66792>