



Module Specification

Critical Systems Security

Version: 2023-24, v3.0, 17 Mar 2023

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Part 1: Information

Module title: Critical Systems Security

Module code: UFCF7P-15-M

Level: Level 7

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Computer Sci & Creative Tech

Partner institutions: None

Delivery locations: Not in use for Modules

Field: Computer Science and Creative Technologies

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: This module will introduce students to the cyber security threats and risks in Critical Systems, with a particular focus on Industrial Control Systems (ICS) and Supervisor Control and Data Acquisition (SCADA) systems. Students will

also examine conventional ICS cyber-protection methods and new security approaches proposed by the research community or adopted by the Industry, exploring the emerging challenges and limitations.

Outline syllabus: Introduction to Critical Systems:

Basic Terminology on CI and ICS components.

The evolution of ICS.

ICS as a system of systems and the emerging interdependencies.

ICS types and their components.

Comparison between IT and Critical Systems in the context of cyber security.

Cyber security threats in ICS:

Analysis of known case studies - the examples of Stuxnet, Duqu and Flame.

Other examples found in the literature.

Advanced Persistent Threats (APTs).

Analysis of attack vectors (the notions of cyber-terrorism, state-sponsored attacks and cyber-warfare).

Impact analysis (direct physical impact, physical disruption; systemic impact/ the domino effect).

Challenges and limitations of current cyber security approaches:

The risk of disruption (cyber security operational cost/ the cost of updating/upgrading systems).

Legacy and/or proprietary equipment and protocols (e.g. Modbus; Profibus, EtherCAT etc.).

Contemporary off-the-shelf equipment and protocols (the connection of ICS to the Internet).

Risk modelling and analysis:

Expert Elicited Models, Attack Graphs, Games, Petri Nets.

Measuring risks.

Situational awareness in ICS:

The kill chain process.
Sensors and data in ICS.

Governance and assessment of strategies:

Purpose of governance.

Governance in ICS

ISA 99/IEC 62443 (industrial automation and control systems security) and ISO/IEC 15408, ISO/IEC 27001:2015, ISO/IEC 27002:2013, ISO/IEC 27003:2010, ISO/IEC 27004:2009, ISO/IEC 27005:2011

Part 3: Teaching and learning methods

Teaching and learning methods: See Assessment

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Demonstrate a deep and systematic understanding of conventional and contemporary ICS implementations and their comparison to IT systems in the context of cyber security

MO2 Undertake the analysis of the cyber threat landscape in ICS and evaluate current cyber protection approaches in the field

MO3 Design and evaluate improvements in current cyber protection approaches to tackle the cyber security challenges that arise in ICS

MO4 Demonstrate an understanding of industry-specific regulations and standards for the protection of ICS

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 150

Reading list: The reading list for this module can be accessed at [readinglists.uwe.ac.uk](https://uwe.rl.talis.com/modules/ufcf7p-15-m.html) via the following link <https://uwe.rl.talis.com/modules/ufcf7p-15-m.html>

Part 4: Assessment

Assessment strategy: Written assignment / Report (2500 words) will require an analysis of the current cyber threat landscape and cyber protection approaches in ICS and the challenges that arise in ICS implementations proposing improvements to address these challenges.

The resit assessment will involve the same assessment brief.

Assessment components:

Report (First Sit)

Description: Written assignment / report (2500 words) on a selected case study

Weighting: 100 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4

Report (Resit)

Description: Written assignment / report (2500 words) on a selected case study

Weighting: 100 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Cyber Security [Frenchay] MSc 2023-24

Cyber Security [GCET] MSc 2023-24

Cyber Security [Frenchay] MSc 2022-23