

R5.3.1

REWIRE Fiches

Title	R5.3.1 REWIRE Fiche IV
Document description	This document identifies, documents and promotes best and good practices aiming at addressing cybersecurity skills and shortages as well as fostering multi-stakeholder partnerships.
Nature	Public
Task	T5.3 REWIRE Fiches
Status	Final
WP	WP5
Lead Partner	EfVET
Partners Involved	All
Date	19/12/2023



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1. INTRODUCTION

Since after completing its first year of implementation, REWIRE partners have been identifying and documenting the most relevant practices at regional, national and European/International levels aimed at addressing cybersecurity skills shortages and mismatches.

Additionally, they have been gathering pertinent practices with the goal of fostering partnerships among stakeholders from various institutions and organizations working in the cybersecurity field, including industry, social partners, education and training providers, and public authorities.

The engagement of these stakeholders in REWIRE is crucial for the achievement of the project specific objectives and ensure its successful outcome and for its success. In the case of REWIRE Fiches, the purpose is to illustrate the project’s skills strategy for Cybersecurity, which includes bringing together lessons from other cybersecurity related initiatives and enhancing exchange of knowledge and practices between project partners and stakeholders.

As described in the fiche I ([R5.3.1 REWIRE Fiche I](#)), these reports aim at collecting as many initiatives or actions as possible, with the anticipation that it will be used as a basis for further study and analysis, namely by identifying and promoting best and good practices addressing skills and shortages as well as fostering multi-stakeholder partnerships. The existence of the skills gap and shortages in the field of cybersecurity is undeniable, as is the effort made over the last years to address this challenge at the European level. The REWIRE consortium identified 12 different areas of interest (fig.1).



Figure 1: Categorization of the identified initiatives (source: REWIRE R5.3.1_fiche1)

The current fiche aims at pointing out relevant and significant best practices in terms of Cybersecurity-related Higher Education courses. At this level, initiatives have become more and more common. This category includes bachelor's and master's degrees, among which students will have not only a theoretical part, but also a practical one through internships done at the end of the different degrees. Providing the correct education in cybersecurity will allow to prepare students become proficient workers in the present field to protect the European Infrastructure Area. The total number of courses founded in higher education is of 198 ([R5.3.1 REWIRE Fiche I](#), p. 7).

The REWIRE project has also produced a report focused on improving the accessibility of courses and certification schemes by proposing a new web application that works as a database but also understanding which skills are required in a specific cybersecurity work role ([REWIRE, R3.4.1](#)). As mentioned in that report, the availability, accessibility, and quality of cybersecurity courses and certifications will play a pivotal role in tackling the global shortage of cybersecurity experts. Moreover, a deep understanding of which skills and knowledge are needed in a specific work role is also fundamental for the preparation of cybersecurity experts.

2. ANALYSIS OF THE BEST PRACTICES

While REWIRE partners are currently promoting the pilot of four new online courses via National Info days and similar initiatives, this fiche, following the above mentioned aims of the project, aims at identifying relevant and significant best practices in terms of Cybersecurity-related Higher Education courses currently existing.

The methodology behind this report has included the following steps:

- Mapping and analysis of Cybersecurity-related Higher Education courses, via specific databases (please, also cfr. [REWIRE, R3.4.1](#)).
- Out of the several emerging data, the partners have highlighted a total of 24 groups of practices which could be analysed.
- Update and fine-tune of a list of stakeholders, based on REWIRE consortium's contribution, including several categories, namely: Education and Training providers; Higher Education Institutions; VET Networks; Umbrella Associations; Policymakers; Industrial Companies and their Associations; Research Institutes; Certification and Standardization Bodies; End Users; ICT Professionals.
- A further selection has been proposed to the list of stakeholders of the REWIRE project who have been requested to provide feedback in terms of relevance and transferability of the list of practices which have been shortlisted.
- After the collection of feedback, this fiche has been finalized.

2.1. GENERAL OVERVIEW

The REWIRE partners have produced a wide list of best practices in terms of Higher Education courses, which are grouped here below, in national tables, in alphabetical order.

Table 1: Austria

Country	Austria
Institutions: Courses	<ul style="list-style-type: none"> - University of Applied Sciences Upper Austria (FHOÖ): Bachelor Degree in Security of Information Systems. Year established: 2000. Student intake: 48. European Credit Transfer System (ECTS): 180. - Sankt Pölten University of Applied Science <ul style="list-style-type: none"> o Bachelor Degree in IT Security. Year established: 2006. Student intake: 50. European Credit Transfer System (ECTS): 180. Focus: System security, network security, component security, SW security. o Master in Cybersecurity and Resilience. Year established: 2020. Student intake: 30. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security; organisational, risk management, business, compliance disciplines. o Master in Information Security. Year established: 2009. Student intake: 36. European Credit Transfer System (ECTS): 120. - FH Joanneum: Bachelor Degree in IT and Mobile Security. Year established: 2006. Student intake: 25. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security with other course components not specified. - FH OÖ: Master in Security of Information Systems. Year established: 2004. Student intake: 20. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security with other course components not specified. - FH Campus Wien: Master in IT security. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. - Alpen-Adria University of Klagenfurt: Master in Artificial Intelligence and Cybersecurity. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. - TU Wien: <ul style="list-style-type: none"> o MSc Software Engineering and Internet Computing - Specialization in Security and Privacy. Year established: 2020. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. o Doctoral College for Secure and Intelligent Human-Centric Digital Technologies. Year established: 2020. Student intake: 10. Research focus: Interdisciplinary by establishing synergies between different research fields (security and privacy, machine learning, and formal methods). The research programme includes: Design of machine learning algorithms resistant to adversarial attacks; design of machine learning algorithms for security and privacy analysis; security analysis of personal medical devices; design of secure and privacy-preserving contact tracing apps; enforcement of safety for dynamic robots.
Student Intake	220+
Source(s)	https://www.enisa.europa.eu/topics/cybersecurity-education/education-map/education-courses?country=Austria

<https://www.cyberwiser.eu/austria>

Table 2: Belgium

Country	Belgium
Institutions: Courses	<ul style="list-style-type: none"> - Howest University of Applied Sciences: Bachelor of Applied Computer Science: Major in Cybersecurity. Year established: 2020. Student intake: 300. European Credit Transfer System (ECTS): 180. Focus: System security, network security, component security, SW security. Preparation for professional certification: CEH, CompTIA Security+, CISSP, CISA, NCSF. - Université Libre de Bruxelles, Université Catholique de Louvain, Université de Namur, Ecole Royale Militaire, HELB, ESI : Master of Science in Cybersecurity. Year established: 2016. Student intake: 50. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. - KU Leuven: Master of Electrical Engineering (ICT Security and Networks). European Credit Transfer System (ECTS): 120. Focus: cryptography and information security; developing and managing mobile communication networks. - Haute Ecole Bruxelles: Brabant Ecole Supérieure d'Informatique – Post-graduate course in Security of Research and Information Systems. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security.
Student Intake	350+
Source(s)	https://www.cyberwiser.eu/belgium-be

Table 3: Bulgaria

Country	Bulgaria
Institutions: Courses	<ul style="list-style-type: none"> - University of Library Studies and Information Technologies (ULSIT): <ul style="list-style-type: none"> o Bachelor Degree in Cybersecurity. Year established: 2015. Student intake: 25. European Credit Transfer System (ECTS): 240. Focus: the degree combines knowledge on System security, network security, component security, SW security with law, ethics, policy, privacy, cybercrime disciplines and organisational, risk management, business, compliance disciplines. o Master Degree in Cybersecurity. Year established: 2018. Student intake: 40. European Credit Transfer System (ECTS): 90. Focus: System security, network security, component security, SW security. - University of National and World Economy: Master in Management of Cybersecurity. Year established: 2019. Student intake: 25. European Credit Transfer System (ECTS): 65 Focus: System security, network security, component security, SW security.
Student Intake	90
Source(s)	https://www.enisa.europa.eu/topics/cybersecurity-education/education-map/education-courses?country=Bulgaria https://www.cyberwiser.eu/bulgaria-bg

Table 4: Croatia

Country	Croatia
Institutions: Courses	<ul style="list-style-type: none"> - University of Zagreb: <ul style="list-style-type: none"> o Faculty of Electrical Engineering and Computing: Postgraduate specialist study Information security, o Faculty of organisation and informatics: Postgraduate specialist study programme Information Systems Security and Auditing Management (ISSMA)
Student Intake	NA
Source(s)	https://www.concordia-h2020.eu/map-courses-cyber-professionals/ https://www.fer.unizg.hr/en/studies/specialist/information_security https://www.foi.unizg.hr/en/about-us/psp/spds#general-info

Table 5: Cyprus

Country	Cyprus
Institutions: Courses	<ul style="list-style-type: none"> - European University Cyprus: Master in Cybersecurity. Year established: 2017. Student intake: 60. European Credit Transfer System (ECTS): 90. Focus: Filling need for increasing demand for innovative approaches to the complexities and multi-disciplinary aspects of cybersecurity policy and practices, spanning technical skills, an understanding of law, ethical hacking and cryptography. - University of Central Lancashire Cyprus (UCLan Cyprus): Master in Cybersecurity. Year established: 2015. Student intake: 50. European Credit Transfer System (ECTS): 90. Focus: System security, network security, component security, SW security. - Open University of Cyprus: Master in Computer and Network Security. European Credit Transfer System (ECTS): 90. - University of Nicosia: MSc Computer Science, Cybersecurity concentration. European Credit Transfer System (ECTS): 90. Focus: System security, network security, component security, SW security.
Student Intake	110+
Source(s)	https://www.cyberwiser.eu/cyprus-cy https://www.enisa.europa.eu/topics/cybersecurity-education/education-map/education-courses?country=Cyprus

Table 6: Czechia

Country	Czechia
Institutions: Courses	<ul style="list-style-type: none"> - Masaryk University: <ul style="list-style-type: none"> o Bachelor in Cybersecurity o MSc in Computer Systems, Communication and Security (Information Security Specialization) o MSc in Software Systems and Services Management - Management of Cybersecurity - Brno University of Technology: <ul style="list-style-type: none"> o Bachelor and MSc in Information Security
Student Intake	NA
Source(s)	https://www.cyberwiser.eu/czech-cz

Table 7: Denmark

Country	Denmark
Institutions: Courses	<ul style="list-style-type: none"> - Technical University of Denmark: Master of Cyber Security - Aalborg University: Master of Cyber Security
Student Intake	NA
Source(s)	https://www.cyberwiser.eu/denmark-dk

Table 8: Estonia

Country	Estonia
Institutions: Courses	<ul style="list-style-type: none"> - Tallinn University of Technology: Master of Cybersecurity
Student Intake	60
Source(s)	https://www.cyberwiser.eu/estonia-ee

Table 9: Finland

Country	Finland
Institutions: Courses	<ul style="list-style-type: none"> - Laurea University of Applied Sciences: <ul style="list-style-type: none"> o Bachelor's Degree Programme in Business Information Technology (Cybersecurity Specialisation). Year established: 2019. Student intake: 60. European Credit Transfer System (ECTS): 210. Focus: Broad spectrum of topics, spanning system security, network security, component security, SW security; law, ethics, policy, privacy, cybercrime disciplines; organisational, risk management, business, compliance disciplines; internship. It also includes preparation for professional certification: Security+; CISM; CISSP; CASP+; CYSA+; CEH; CCSP. o Bachelor's Degree Programme in Business Information Technology (ICT with Cybersecurity orientation). Year established: 2005. Student intake: 170. European Credit Transfer System (ECTS): 210. Focus: Broad spectrum of topics, spanning system security, network security, component security, SW security; law, ethics, policy, privacy, cybercrime disciplines; organisational, risk management, business, compliance disciplines; internship. It also includes preparation for professional certification: Security+; CISM; CISSP; CASP+; CYSA+; CEH; CCSP. - JAMK University of Applied Sciences: <ul style="list-style-type: none"> o Bachelor of Engineering, ICT with Cyber Security Orientation. Year established: 2015. Student intake: 115. European Credit Transfer System (ECTS): 240. Focus: system security, network security, component security, SW security. o Master's Degree in Information Technology, Cyber Security. Year established: 2013. Student intake: 30. European Credit Transfer System (ECTS): 60. Focus: system security, network security, component security, SW security. - University of Turku: Cyber Security, Master of Science in Technology. Part of the EIT Digital Master School Cyber Security double degree programme (the only one in Finland). Year established: 2010. Student intake: 30. European Credit Transfer

	System (ECTS): 120. Focus: system security, network security, component security, SW security.
	- University of Jyväskylä: Master in Cybersecurity . Year established: 2014. Student intake: 40. European Credit Transfer System (ECTS): 120. Focus: system security, network security, component security, SW security.
Student Intake	445
Source(s)	https://www.cyberwiser.eu/finland-fi

Table 10: Germany

Country	Germany
Institutions: Courses	<ul style="list-style-type: none"> - Mannheim University of Applied Sciences: Bachelor Degree in Cyber Security. Year established: 2018. Student intake: 45. European Credit Transfer System (ECTS): 210. Focus: System security, network security, component security, SW security; internships. - University of Bonn: Bachelor Degree in Cyber Security. European Credit Transfer System (ECTS): 180. Student intake: 70 - University of Passau: Master in Computer Science. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security - IUBH University of Applied Sciences: Master Degree: Computer Science in Cyber Security. - SRH Berlin University of Applied Sciences: Master in Cyber Security. European Credit Transfer System (ECTS): 180-210, depending on course options. Focus: Implementing security systems and measures in different business environments, blockchain, DevSecOps, information security, security technologies, IT security management, data analysis. Business processes and legal challenges of data protection. - Brandenburg University of Technology: Master in Cyber Security. Focus: Principles and methods of cybersecurity and practical knowledge of their applications. Design, implementation and management of cybersecurity concepts for the protection of IT systems and critical infrastructures. - Academic Institute: Master in Cyber Psychology of Online Communication Student Intake: 50. European Credit Transfer System (ECTS): 90.
Student Intake	160+
Source(s)	https://www.cyberwiser.eu/germany-de https://www.enisa.europa.eu/topics/cybersecurity-education/education-map/education-courses?country=Germany

Table 11: Greece

Country	Greece
Institutions: Courses	<ul style="list-style-type: none"> - Athens University of Economics & Business: Master in Information Systems Security & Development. Year established: 2020. Student Intake: 35. European Credit Transfer System (ECTS): 90. Focus: System security, network security, component security, SW security with other modules included. - International Hellenic University: MSc in Cybersecurity. Year established: 2005. Student Intake: 25. European Credit Transfer

	<p>System (ECTS): 90. Focus: System security, network security, component security SW security.</p> <ul style="list-style-type: none"> - University of Piraeus: <ul style="list-style-type: none"> o Master in Digital Systems Security. Year established: 2009. Student Intake: 40. European Credit Transfer System (ECTS): 90. Focus: System security, network security, component security, SW security. o Master in Distributed Systems, Security and Emerging Information Technologies. Year established: 2018. Student Intake: 40. European Credit Transfer System (ECTS): 90. Focus: System security, network security, component security SW security. - University of the Aegean: MSc in Information and Communication Systems Security. Student Intake: 30. European Credit Transfer System (ECTS): 90. Focus: System security, network security, component security SW security. - University of Crete: PhD in Computer Science. Year established: 1984. European Credit Transfer System (ECTS): 240. Focus: System security, network security, component security SW security.
Student Intake	170+
Source(s)	https://www.cyberwiser.eu/greece-gr https://www.enisa.europa.eu/topics/cybersecurity-education/education-map/education-courses?country=Greece

Table 12: Latvia

Country	Latvia
Institutions: Courses	<ul style="list-style-type: none"> - BA School of Business Finance: Professional Master's Degree in Cybersecurity Management Year established: 2015. Student Intake: 100. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security; Organisational, risk management, business, compliance disciplines. Preparation for professional certification: Based on CISM certification. - Vidzema University of Applied Sciences: Master Degree in Cybersecurity Engineering. Year established: 2018. Student Intake: 15. European Credit Transfer System (ECTS): 120. Focus: Training future professionals that will handle the security of information systems, preventing cyber-attacks and security incidents, carrying out risk analysis and security measures to mitigate threats in workplace or external clients. Partners include CERT.LV; Ministry of Defence. Exchange programmes: Erasmus+; Nordplus. - Riga Technical University: Cybersecurity Engineering
Student Intake	165
Source(s)	https://www.enisa.europa.eu/topics/cybersecurity-education/education-map/education-courses?country=Latvia https://www.cyberwiser.eu/latvia-lv

Table 13: Lithuania

Country	Lithuania
Institutions: Courses	<ul style="list-style-type: none"> - Mykolas Romeris University: <ul style="list-style-type: none"> o Bachelor Degree in Cybersecurity and Technologies

	<p>Management. Year established: 2020. Student Intake: 60. European Credit Transfer System (ECTS): 210. Focus: Organisational, risk management, business, compliance disciplines</p> <ul style="list-style-type: none"> ○ Master Degree in Cybersecurity Management. Year established: 2016. European Credit Transfer System (ECTS): 90. Focus: Organisational, risk management, business, compliance disciplines; Law, ethics, policy, privacy, cybercrime disciplines. - Vilnius University Kaunas Faculty: Bachelor Degree in Information Systems and Cyber Security. Year established: 2017. Student Intake: 60. European Credit Transfer System (ECTS): 210. Focus: Security systems, organisational and legal aspects. - Vilnius Gedmininas Technical University: Master Degree in Information and Information Technologies Security. Year established: 2011. Student Intake: 60. European Credit Transfer System (ECTS): 210. Focus: Security systems, organisational and legal aspects.
Student Intake	280
Source(s)	https://www.cyberwiser.eu/lithuania-lt https://www.enisa.europa.eu/topics/cybersecurity-education/education-map/education-courses?country=Lithuania

Table 14: Luxembourg

Country	Luxembourg
Institutions: Courses	<ul style="list-style-type: none"> - University of Luxembourg, Luxembourg Institute of Science and Technology (LIST): Master in Information System Security Management. Student Intake: 15. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security with some forensics.
Student Intake	15
Source(s)	https://www.cyberwiser.eu/luxembourg-lu

Table 15: Malta

Country	Malta
Institutions: Courses	<ul style="list-style-type: none"> - AUM American University of Malta: MSc in Cybersecurity. European Credit Transfer System (ECTS): 96. Focus: System security, network security, component security, SW security.
Student Intake	NA
Source(s)	https://www.cyberwiser.eu/malta-mt

Table 16: the Netherlands

Country	the Netherlands
Institutions: Courses	<ul style="list-style-type: none"> - University of Amsterdam: Master Degree in Security and Network Engineering. Year established: 2003. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security. 50 students intake - University of Twente and TU Delft: 4TU Cybersecurity Master Specialization. Year established: 2015. Student Intake: 55. European

	<p>Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security.</p> <ul style="list-style-type: none"> - Eindhoven University of Technology: Master Degree in Secure Development. Year established: 2015. Student Intake: 50. European Credit Transfer System (ECTS): 120. - Leiden University: <ul style="list-style-type: none"> o Master in Cybersecurity Governance o Master in Crisis and Security Management o Cyber Security Academy o NCSC: Cooperation with Leiden University, Delft University of Technology and the Hague University of Applied Sciences.
Student Intake	155+
Source(s)	https://www.cyberwiser.eu/netherlands-nl https://www.enisa.europa.eu/topics/cybersecurity-education/education-map/education-courses?country=Netherlands

Table 17: Norway

Country	Norway
Institutions: Courses	<ul style="list-style-type: none"> - University of Agder: Master in Cybersecurity. Year established: 2019. Student Intake: 45. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. - Noroff School of Technology and Digital Media: Bachelor Degree in Cybersecurity. European Credit Transfer System (ECTS): 180. Focus: System security, network security, component security, SW security. - NTNU, Faculty of Information Technology and Electrical Engineering: <ul style="list-style-type: none"> o Bachelor Degree in Digital Infrastructure and Cybersecurity. European Credit Transfer System (ECTS): 180. Focus: System security, network security, component security, SW security. o Master Degree in Information Security. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. o Master Degree in Communication Technology. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. o Master Degree in Experienced-based Information Security. European Credit Transfer System (ECTS): 90. Focus: Law, ethics, policy, privacy, cybercrime disciplines with some modules on information security. o Master Degree in Security and Cloud Computing. This is an Erasmus Mundus double degree programme. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. o Master Degree in Communication Technology and Digital Security. European Credit Transfer System (ECTS): 300. Focus: System security, network security, component security, SW security. o PhD in Information Security. European Credit Transfer System (ECTS): 180. Focus: System security, network security, component security, SW security. o PhD in Information Security and Communication Technology. Focus: System security, network security,

	component security, SW security.
Student Intake	NA
Source(s)	https://www.cyberwiser.eu/norway-no https://www.enisa.europa.eu/topics/cybersecurity-education/education-map/education-courses?country=Norway

Table 18: Poland

Country	Poland
Institutions: Courses	<ul style="list-style-type: none"> - Warsaw University of Technology: Bachelor Degree in Cybersecurity. Year established: 2019. Student Intake: 60. European Credit Transfer System (ECTS): 210. Focus: Cross-cutting across IT system security, legal and ethical issues, risk management and internships. - AGH University of Science and Technology: Bachelor Degree in Cybersecurity. Year established: 2019. Student Intake: 55. European Credit Transfer System (ECTS): 210. Focus: Cross-cutting across IT system security, legal and ethical issues, risk management and internships. - Czestochowa University of Technology: Computer Science: Master Degree in Cybersecurity. Year established: 2019. Student Intake: 70. European Credit Transfer System (ECTS): 90. Focus: System security, network security, component security, SW security. - <i>(National Cybersecurity Strategy Aim for Safe Use of Cyberspace: Encouraging higher education institutions to develop interdisciplinary specialisations covering inter alia information security management, assessment and evaluation of ICT system safeguards, protection of personal data, protection of intellectual property on the internet and issues related to new technologies and new challenges).</i>
Student Intake	Approx. 185
Source(s)	https://www.cyberwiser.eu/poland-pl

Table 19: Portugal

Country	Portugal
Institutions: Courses	<ul style="list-style-type: none"> - School of Management and Technology - Polytechnic of Porto: Bachelor Degree in Computer Networks Security. Year established: 2010. Student Intake: 30. European Credit Transfer System (ECTS): 180. Focus: Some modules cover system security. - School of Technology and Management of Polytechnic of Leiria: Master Degree in Cybersecurity and Digital Forensics. Year established: 2017. Student Intake: 40. European Credit Transfer System (ECTS): 120. Focus: Combines modules on system security with legal, privacy and organisational disciplines. - Universidade de Lisboa, Escola Naval: Master Degree in Information Security and Cyberspace Law. Year established: 2014. Student Intake: 25. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. - University of Lisbon: Master Programme in Information Security. Year established: 2009. Student Intake: 15. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. - University of Aveiro: Master Degree in Cybersecurity. Year

	<p>established: 2020. Student Intake: 25. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security with other modules included.</p> <ul style="list-style-type: none"> - Faculdade de Ciências da Universidade do Porto: Master Degree in Information Security. Year established: 2014. Student Intake: 26. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. - Instituto Politécnico de Viana do Castelo: Master in Cybersecurity. Student Intake: 30. European Credit Transfer System (ECTS): 120.
Student Intake	Approx. 190
Source(s)	https://www.cyberwiser.eu/portugal-pt

Table 20: Spain

Country	Spain
Institutions: Courses	<ul style="list-style-type: none"> - Universidad Rey Juan Carlos: Bachelor Degree in Grado en Ingeniería de la Ciberseguridad. Year established: 2018. Student Intake: 60. European Credit Transfer System (ECTS): 240 in four years. Focus: System security, network security, component security, SW security. - CISDE: International Master in Cybersecurity and Defence. Year established: 2015. Student Intake: 25. European Credit Transfer System (ECTS): 60. Focus: Organisational, risk management, business, compliance disciplines; system security, network security, component security, SW security. - Universidad de Leòn: Master in Research in Cybersecurity. Year established: 2016. Student Intake: 30. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. - Universidad Pontificia Comillas: Master in Cybersecurity. Year established: 2019. Student Intake: 30. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security. - La Salle Campus Barcelona, Ramon Llull Universidad: Master in Cybersecurity. Year established: 2015. Student Intake: 25. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security. - EICYC: High Specialisation Master in IT Forensics and Cybercrime. Year established: 2006. Student Intake: 250. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security. - Universidad Politécnica de Madrid: Master in Cybersecurity. Year established: 2017. Student Intake: 30. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security; Organisational, risk management, business, compliance disciplines. - Universidad de Vigo: Master in Cybersecurity. Year established: 2018. Student Intake: 400. European Credit Transfer System (ECTS): 90. Focus: System security, network security, component security, SW security. - Universidad de Leòn: Master of Research in Cybersecurity (Online). Year established: 2016. Student Intake: 30. European Credit Transfer System (ECTS): 120. Some modules taught by INCIBE. - EICYC: International Master on Cybercrime Analysis. Year established: 2018. Student Intake: 50. European Credit Transfer

- System (ECTS): 60. Focus: System security, network security, component security, SW security.
- [OBS Business School: Master in Cybersecurity](#). Year established: 2015. Student Intake: 30 (7 women graduates in 2019). European Credit Transfer System (ECTS): 60. Focus: Organisational, risk management, business, compliance disciplines; system security, network security, component security, SW security.
 - [Universidad de Jaén: Master in IT Security](#). Year established: 2017. Student Intake: 30. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security.
 - [University of Malaga: Master in Computer Science \(cybersecurity\)](#). Year established: 2014. Student Intake: 35. European Credit Transfer System (ECTS): 90.
 - [University of Alcala: Master in Cybersecurity](#). Year established: 2019. Student Intake: 25. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security.
 - [University of Granada: Master in Cybersecurity](#). Year established: 2015. Student Intake: 20 (3 women in 2019). European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security.
 - [IMF Business School: Master in Cybersecurity](#) (in collaboration with Deloitte). Year established: 2015. Student Intake: 400 (40 women graduates in 2019). European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security.
 - ENITT Business School:
 - o [Master in Offensive Security](#). Year established: 2020. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security.
 - o [Master in Cryptography](#). Year established: 2019. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security.
 - o [Master in Cyber Law](#). Year established: 2018. European Credit Transfer System (ECTS): 60.
 - o [Master in Cyber Intelligence](#). Year established: 2019. European Credit Transfer System (ECTS): 60. Focus: Organisational, risk management, business, compliance disciplines.
 - o [Master in IT Forensics and Judicial IT Expertise](#). Year established: 2018. European Credit Transfer System (ECTS): 60. Focus: Law, ethics, policy, privacy, cybercrime disciplines.
 - o [Master in Cybersecurity](#). Year established: 2016. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security.
 - o [Master in Reversing, Malware Analysis and Bug Hunting](#). Year established: 2020. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security.
 - [Universitat Rovira I Virgili: Master in Computer Security and Artificial Intelligence](#). European Credit Transfer System (ECTS): 60.
 - [Universidad de La Laguna: Master in Cybersecurity and Data Intelligence](#). European Credit Transfer System (ECTS): 60.

	<ul style="list-style-type: none"> - DCNC Sciences: Master in Data, Complex Networks and Cybersecurity Sciences. Year established: 2018. Student Intake: 50. European Credit Transfer System (ECTS): 60. Focus: system security, network security, component security, SW security; organisational, risk management, business, compliance disciplines."
Student Intake	1500+
Source(s)	https://www.cyberwiser.eu/spain-es

Table 21: Sweden

Country	Sweden
Institutions: Courses	<ul style="list-style-type: none"> - Luleå University of Technology: Master Programme in Information Security (Master Degree). Year established: 2007. Student Intake: 40. European Credit Transfer System: 120. Focus: System security, network security, component security, SW security. - Halmstad University: Master's Programme in Network Forensics. Year established: 2017. Student Intake: 40. European Credit Transfer System: 60. Focus: System security, network security, component security, SW security. - University of Skövde: Privacy, Information and Cyber Security - Master's Programme, Established in 2019, 120 ECTS - University of Skövde: Networks and Systems Administration, 180 ECTS, Established in 2004 - KTH Royal Institute of Technology: MSc in Cyber Security (Master degree), Year established 2021, Student intake: 80, European credit transfer system: 120 ECTS, Focus: system security, network security, forensics, software security
Student Intake	Approx. 200
Source(s)	https://www.cyberwiser.eu/sweden-se https://www.kth.se/en/studies/master/cybersecurity/msc-cybersecurity-1.1076022

Table 22: Switzerland

Country	Switzerland
Institutions: Courses	<ul style="list-style-type: none"> - Lucerne University of Applied Sciences and Arts: <ul style="list-style-type: none"> o Bachelor Degree in Information & Cyber Security. Year established: 2018. European Credit Transfer System (ECTS): 180. o Master Degree in Information & Cyber Security. Year established: 2015. Student Intake: 40. European Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security; Organisational, risk management, business, compliance disciplines. o Master Degree in Information Security & Privacy. Year established: 2019. Student Intake: 24. European Credit Transfer System (ECTS): 60. Focus: Organisational, risk management, business, compliance disciplines; system security, network security, component security, SW security. - Berner Fachhochschule: Master of Advanced Studies in Cybersecurity. Year established: 2019. Student Intake: 24. European

	<p>Credit Transfer System (ECTS): 60. Focus: System security, network security, component security, SW security.</p> <ul style="list-style-type: none"> - ETH Zurich: Master in Cyber Security. Year established: 2018. European Credit Transfer System (ECTS): 120. Focus: System security, network security, component security, SW security. - Bern University of Applied Science: Master in Advanced Studies on Digital Forensics & Cyber Investigation. Year established: 2018. European Credit Transfer System (ECTS): 60.
Student Intake	88+
Source(s)	https://www.cyberwiser.eu/switzerland-ch

2.2. STAKEHOLDERS' FEEDBACK

The collected information, covering most of the countries in the Council of Europe, may differ from country to country in terms of details. To this extent, the partners have selected the most relevant practices in terms of Cybersecurity-related Higher Education courses currently existing; as above, they have been grouped per country and shared with a list of stakeholders in order to collect, in accordance with the shared approach, the relevance and the potential transferability of the courses. The courses have been described and links have been also shared as above.

An online form has been prepared and shared via email with the stakeholders. The accompanying letter mentioned that:

“Considering your expertise and know-how on the issues related to Cybersecurity, we kindly ask your participation in this survey, that which aims to understand which of the best practices selected by REWIRE Partners are the most relevant and transferable at national and European levels (i.e., can be implemented by organisations/institutions that are currently working on Cybersecurity fields).

The results from this survey will be used for the development of the next REWIRE Fiches, hence your participation is highly valued! Thus, we kindly ask you to reply to complete this survey no later than November 7th, 2023.

Your participation in this survey is completely voluntary. No personal identifiable information will be collected; therefore, your responses are unable to be tied to your identity. You can read the privacy policy of the REWIRE project [here](#).

Thank you for participating!”

For each national group of courses, after the main description and the links to collect further information, an evaluation of **relevance for Cybersecurity awareness enhancement** and transferability **to other areas of Cybersecurity field** was asked to the stakeholders, following in both cases a Likert scale:

Table 23: Likert Scale for stakeholder's assessment

Relevance	Transferability
1. Not relevant	1. Not transferable
2. Slightly relevant	2. Slightly transferable
3. Relevant	3. Transferable
4. Fairly relevant	4. Fairly transferable
5. Highly relevant	5. Highly transferable

Based on this methodology, the following national provisions of higher education courses in cybersecurity have been analysed by the stakeholders. The main results are included in the following tables.

Table 24: Main indicators and results

Country	Relevance		Transferability	
	Average	Mode	Average	Mode
Belgium	3.67	4	3.75	3
Poland	3.25	3	3.50	3
Portugal	3.50	3	3.75	4
Spain	3.58	4	3.33	3
Luxembourg	3.92	4	3.75	4
Estonia	3.92	5	3.83	5
Austria	3.67	4	3.67	4

About the practices proposed for the collection of feedback, stakeholders are generally positive in terms of both relevance and transferability. All the cases get average results statistically higher than 3.25 (relevance) and 3.33 (transferability), and never below 3 in the case of the mode. The Estonian proposal of higher-education courses gets the highest consideration among the stakeholders. Interesting, in the case of Luxembourg, the comment reported by the partners that:

“Individual coaching and courses are taught in small groups, internationally renowned professors, multidisciplinary approach promoting knowledge sharing and exchange of experiences, Participation in the Information Security Education Day (ISED), Programme supported by two professional associations: CLUSIL and CPSI. Programming, networking, operating systems, databases etc, before spending two years specialising in a variety of cybersecurity topics including network security analytics, secure programming, pen testing, computer/network forensics, business continuity”.

3. CONCLUSIONS

Since after completing its first year of implementation, REWIRE partners have been identifying and documenting the most relevant practices at regional, national and European/International levels aimed at addressing cybersecurity skills shortages and mismatches.

This current fiche aims at pointing out relevant and significant best practices in terms of Cybersecurity-related Higher Education courses. At this level, initiatives have become more and more common. This category includes bachelor’s and master’s degrees, among which students will have not only a theoretical part, but also a practical one through internships done at the end of the different degrees.

This report summarizes then the work of mapping and analysis of Cybersecurity-related Higher Education courses, which brought to point out a total of 24 groups of practices from different countries which have been furtherly skimmed to be proposed to the REWIRE list of stakeholders for their evaluation in terms of relevance and transferability.

In the report, after the presentation of the practices, organized in 24 different tables, results of the stakeholders' analysis have been outlined, pointing out the positive feedback on the overall sample.

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