University of Applied Sciences St. Pölten

ICT Module

Winter Semester 2025/26

Language of Instruction: English

Last Update: 28 March 2025

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EUDRES

Please find a list of all eligible courses below. Course descriptions can be found on our MCR[1], MIR[2] and EFH[3] websites. Please note that the list might be subject to alterations.

Subject Code	Study Programme	Semester	Subject	ECTS credits
28224	MIR	1	IM-Artificial Intelligence	5
28224 **Or** 25941	MIR	1 3	Methods of Research and Innovation** **or** IT Protection**	5 5
28227 **or** tba	MIR	1 3	Design Thinking** **or** Elective I**	5 5
25932 **or** 25942	MIR	1 3	Entrepreneurship** **or** Data Driven Innovation**	5 5
29645	MIR	1	Foundations of Research and Digital Ethics	5
21808 **or** 27853 **or**	MCR	1 3	Information Security Management** **or** Specialization II-O: Governance	5 5

21916		 3	Risk & Compliance** **or** Specialization II-T: Siem/CDC**	5 5
21807 **or** 21827	MCR	1 3	Privacy & Cryptography** **or** Presentation II**	5 1
21813 **or** 21826	MCR	1	Data Science** **or** Cloud Computing Security**	5 4
21812 21811	MCR	1	Agile Project Management **+** Software Security*	1 **+** 4
21810 21809	MCR	1	Cyber Risk and Resilience Management **+** Presentation I*	4 **+** 1
24488 **or** 24491	EFH	1	German 1 **or** German 2	3 3
24496	EFH	1	Scouting Austrian Culture	3

* Please note that these two subjects can only be taken together

** Please note that these subjects take place at the same time, therefore you can only take one of those subjects

[1]**MCR = Master Cyber Security and Resilience.** For further information and course descriptions, please visit:

https://www.ustp.at/en/academic-studies-continuing-education/computer-science-security/cyber- security-and-resilience/course-contents#/

[2]**MIR = Master Digital Innovation and Research.** For further information and course descriptions, please visit: https://www.ustp.at/en/academic-studies-continuing-education/computer-science- security/digital-innovation-and-research/course-contents#/

[3]**EFH = German Language and Austrian Culture**. For further information and course descriptions, please visit https://www.ustp.at/en/international/incoming-students/german- language-classes
Teaching days for German Language: Tuesdays in the afternoon/evening
Teaching days für Austrian Culture: blocked workshop sessions on Saturdays

All study programmes at the Department of Computer Science and Security teach in a blocked system. There is always one course at a time for 2-3 weeks and then the next course will start (e.g., 3 weeks Artificial Intelligence then two weeks Design Thinking). Classes are usually held from 8:50 to 15:30 with a lunch break. Every study programme has fixed teaching days:

MIR: Monday and Tuesday

MCR: Wednesday, Thursday and Friday

Please see all course descriptions below.

Course Descriptions

Artificial Intelligence (MIR)

Learning outcomes

- Students can explain limitations, advantages and disadvantages of artificial intelligence
- Students can generate usable data from disordered, erroneous, incomplete, and redundant data through data preprocessing
- They know common quality measures and can make realistic assessments regarding the result quality
- Students can explain, select and apply concepts of data analysis (correlation, regression, prediction, classification, clustering)
- Students are familiar with common software libraries and know how to use them
- Students know typical methods of following up, evaluating and documenting the results of the analysis
- Students are able to apply the pattern recognition process with methods of supervised and unsupervised learning

Course Content

- Data cleaning, outlier detection, missing values
- Exploratory data analysis (statistics)
- First visualizations
- Correlation, regression vs. classification: generative models, discriminative models, probabilistic and non-probabilistic models, non-parametric models, clustering, text mining, sentiment analysis, anomaly detection, neural networks

Methods of Research and Innovation (MIR)

Learning outcomes

- Students are able to independently search for literature and evaluate it with regard to quality and suitability
- Students can cite correctly and explain important terms (e.g. hypothesis, systematic literature research, plagiarism, ...)
- Students can write a survey paper on a chosen topic in the style of the ACM CSUR on the basis of original papers
- Students can use LaTex to correctly format a paper
- Students have the ability to plan, carry out and evaluate practical experiments
- Students have the ability to apply their theoretical knowledge independently and successfully in practice

Course Content

- Literature research: Methods and Digital Tools
- Citation methods and rules, Plagiarisms
- LaTex / BibTeX
- Desk Research
- Planning, execution and evaluation of experiments
- Basics of technical statistics
- Experiment planning process
- Systematic observation, Questionnaires
- Experimental design and Hyothesis Tests

IT Protection (MIR) 5 ECTS

Learning outcomes

- Upon completion of the course, students are able to describe and apply important concepts of IT security and risk management.
- Students are able to define security requirements for applications and information system based on risk and are also able to interpret and apply important security standards.
- The students have the knowledge to plan and test security requirements for radio networks.
- Students are able to analyze Cloud System for its suitability for given problems

Course Content

- Identity and Access Management
- Information Security Policies, Guidelines, Standards, Procedures
- Intern Control Systems
- WLAN: basic mechanisms (congestion avoidance, virtual carrier sensing, 802.11n, 802.11ac, bridging, hotspot solutions,...)
- Difference between security requirements and LANs
- Cloud technologies (public/private cloud)
- Security aspects in the cloud also from a management point of view (SLAs, law ...),
- Development of applications for the cloud (web services).

Design Thinking (MIR)

Learning outcomes

- Students can explain the theoretical basics of user-centric requirements analysis and the design process and apply them in practice with a case study
- Students can use the Design Thinking Process as an example of a design process to question complex problems more closely and find original and innovative solutions

Course Content

- The Design Thinking Process model as an example of a design process
- Design Thinking Mindset and Principles
- Characteristics, objectives and results of the individual Design Thinking phases
    - Getting to know the context of the problem
    - Finding out the needs of users through empathy
    - Defining viewpoint
    - Generating and developing ideas
    - Implementing ideas as prototypes
    - Testing prototypes to develop ideas
- Students also get to know the most important terms, concepts and methods from the following basic areas of requirements management:
    - Requirements analysis, creation of requirements documents, development of a cost estimate, communication with the customer, preparation of quotations.
    - Current tools and best practices in the field

Entrepreneurship (MIR)

Learning outcomes

- Students are able to identify opportunities for innovation and new business start-ups and to develop business models/business plans
- Students can explain basic implementation issues such as lean start-up and corporate finance
- Students are able to apply evaluation criteria of innovation and venture opportunities
- Students can explain the importance of the theory of inventive problem solving and apply selected methods.

Course Content

The course provides an introduction to entrepreneurship and innovation. The different aspects and facets of innovation management and basic definitions and conceptual frameworks of innovation and entrepreneurship (e.g. the entrepreneur personality, the concept of innovation capacity) will be covered. In addition, students should develop an understanding of the reasons that lead to innovation resistance and also get to know the topic of stakeholder analysis.

Furthermore, methods for identifying innovation opportunities, planning new venture opportunities and evaluating business ideas and concepts will be discussed.

Students learn about the types of business models and key elements of business plans and develop skills to assess the market and technology potential of innovations. Basic knowledge about the financing of a start-up company should also be imparted.

Data Driven Innovation (MIR)

Learning outcomes

- Students will be able to discover user and/or customer needs and match them with identified data opportunities.
- Students will become familiar with the necessary steps along the data value chain.
- They will acquire skills to outline data-driven business models and position new offerings in the corresponding ecosystem/network.

Course Content

This course will discuss and apply methods to

- understand the nature and characteristics of data-driven innovation
- investigate and explore the needs of users in a particular customer segment
- understand the systematic collection and management of data sources
- explore the data value chain, which includes the range of data processing steps required
- gain practical insights for the development of business models

Foundations of Research and Digital Ethics (MIR)

Learning outcomes

Students will be able to

- describe and classify central concepts, approaches and problems of philosophy of science (e.g. deductive / inductive)
- know central elements of scientific knowledge and can e.g. explain epistemological basics
- formulate a research question/hypothesis, to support it with literature and to select possible suitable methods
- Students are able to explain most important terms and ethical principles
- Students know classic moral dilemmas and can explain them
- Students can explain and analyse the origins and forms of ethical discourse in economic and technological contexts
- Students can explain the consequences of technology using selected examples and analyse the effects of technology on society using case studies

Course Content

- Philosophy of science
- Social science, natural science and medical research methods
- Introduction to ethics, basic concepts of ethics
- Ethical thinking and its importance for IT, special problems of modern information ethics, hacker ethics, ...
- Ethics and research, examples from science
- Human rights as an anchor of ethics, intersection of ethics and law

Information Security Management (MCR)

Learning outcomes

- The students have an understanding of the principles of information security.
- The students are familiar with basic structures and considerations of management systems, in particular information security, and can explain them.
- The students are able to create guidelines (e.g.: guidelines, controls ...) for the management of information security
- The students know relevant standards and best practices in the field of information security management (ISO 2700x, BSI GSHB, CSC, NIST SP800-53 ...) and can interpret them in a company context.

Course Content

- Basics of management systems according to ISO 27001, ISO 20000, ISO Annex SL
- Integrated Management Systems (e.g. ISMS, DSMS)
- Important norms, standards and best practices:
- ISO 2700x, BSI GSHB, CSC, COBIT NIST SP800-53, Austrian Security Manual
- Important legal fundamentals for GRC (e.g.: DSGVO, DSG, NISG, ...)
- Information Security Policies, Guidelines, Standards, Procedures
- Internal control systems

Privacy and Cryptography (MCR)

Learning outcomes

- Students can identify and evaluate privacy risks and plan countermeasures to protect privacy.
- Students can explain common methods and algorithms of symmetric and asymmetric cryptography as well as key management.
- The students are able to apply cryptography.
- Students understand the IT protection goals of integrity, confidentiality and authenticity and know which IT security problems can be solved by cryptography. They are also able to select the most suitable methods and algorithms.

Course Content

General introduction to privacy and motivation for privacy, including the following Privacy Enhancing Technologies (PETSs):

- Online anonymity: Mixes, DC-Nets, onion routing
- Structure and functionality of the Tor network
- Internet censorship and possible technical solutions
- Web Privacy: Web Tracking, Fingerprinting
- Current technologies for the protection of privacy
- Privacy Impact Assessments

Introduction to Cryptography

- Fundamentals of symmetric and asymmetric cryptography
- Encryption modes (ECB, CBC, CTR, OFB, CFB, GCM)

- Encryption procedures: DES, 3DES, AES, RSA, ElGamal with discrete logarithm and elliptic curves
- Hash functions, MAC,
- Digital Signature: Basics, Methods (RSA, DSA, ECDSA), Blind Signature
- Linear and differential cryptanalysis
- Key management: generation, storage, destruction, distribution, Diffie-Hellman key agreement
- Cryptography standards (ISO, PKCS#)

Presentation II (MCR)

Learning outcomes

- The students are able to process a topic and present results in a target group-oriented way
- Students can present complex topics in an understandable way
- Students can explain important success factors of a good presentation and analyse presentations according to these criteria

Course Content

- Based on Presentation I, the knowledge of presentation techniques will be improved.
- In addition, special reference is made to presentations to decision-makers.
- Analysis of presentations
- Storytelling Techniques

Data Science (MCR)

Learning outcomes

- Students can generate usable data from disordered, erroneous, incomplete and redundant data through data pre-processing
- The students know common result quality measures and can realistically assess the result quality
- Students can explain concepts of data analysis (correlation, regression, prediction, classification, clustering), and select and apply them
- Students know common software libraries and can use them
- Students know typical methods to prepare, evaluate and document the results of the analysis
- Students are able to apply the pattern recognition process

Course Content

- Sample design, planning of statistical data collection, data selection
- Data types, measurement scales, dissimilarity measures, similarity measures,sequence relations, text relations
- Understanding data and data quality (+metadata),
- Metadata management, knowledge modelling, knowledge representation
- feature generation
- error types, normalization, filtering, transformation, consolidation
- Correlation, Regression vs. Classification: Generative Models, Discriminative
- models, Probabilistic and Non-Probabilistic Models, Non- Parametric Models,Clustering, Text Mining, Sentiment Analysis, Anomaly Detection

Cloud Computing Security (MCR)

Learning outcomes

- Students can explain concepts of Cloud Computing
- The students know Cloud Security Services and can apply them
- Students will be able to evaluate and securely implement public/private cloud solutions.

Course Content

- Cloud technologies (public/private cloud)
- Security aspects in the cloud also from a management point of view (SLAs, law ...),
- Development of applications for the cloud (web services).
- Practical implementation of the content takes place in a large exercise at the end of the LV. The tasks will cover all areas of the LV and represent a fictitious company that implements the cloud area anew.

Agile Project Management (MCR)

Learning outcomes

- Students are able to explain important terms of agile project management methods (e.g. Kanban, SCRUM, Product Owner, SCRUM Master, ...)
- Students can explain and take on the roles of agile project management methods
- Students can plan projects with agile methods and continuously improve their project management through Sprint Reviews and Retrospectives

Course Content

- Principles of agile project management methods
- Different agile project management methods, application areas and their differences (SCRUM, KANBAN, XP)
- Good practices for agile project management
- Tools and techniques (e.g.: SCRUM/KANBAN Boards, SCRUM Poker, AzureDevOps, Jira ...)

Software Security (MCR)

Learning outcomes

- Students are able to apply important techniques for secure software development
- The students can explain common software vulnerabilities (e.g. SQL injections, cross site scripting ...) and know countermeasures
- The students have an overview of current software security patterns and can explain and apply them.
- Students can analyze source code with static and dynamic methods

Course Content

- Platform-independent introduction to the creation of secure software.
- Software Security Risks
- Software Security Tactics
- Common Security Patterns (e.g.: Authentication, Intercepting Validator, ...)
- Error handling, distributed systems, validation.
- Vulnerability Management Strategies
- Privacy by Design and Default
- Security by Design and Default
- Common errors and anti-patterns in security-related aspects of software.

Cyber Risk and Resilience Management (MCR)

Learning outcomes

- Students can explain basic concepts of risk management and contingency management.
- Students can create and perform risk analyses to identify and assess risks
- Students are able to identify critical activities and resources with the help of business impact analyses and derive recovery times and resumption times.
- The students have the necessary knowledge to elaborate contingency plans and to test the effectiveness through exercises (e.g.: Table Top Exercises).
- Students can use Cyber Resilience Frameworks

Course Content

- Basic concepts of risk management and contingency management:
  - Risk, disruption, emergency, crisis, catastrophe, ...
  - Risk assessment, business impact analysis, ...
  - Residual risk, border risk, risk appetite, ...
  - MTPD, MAO, MTTR, RPO, RTO, ...
- Safety and fault tolerant systems (Safety Integrated Level - SIL, standards, software diversity, cluster implementations)
- Risk management process:
  - Identification
  - Analysis

    - Communication
    - Monitoring and control
- Strategies (acceptance, transfer, reduction, avoidance)
- Risk profiles (risk indicators, ...)
- Contingency management
    - Analysis (Business Impact Analysis, Risk Assessment)
    - Emergency management strategy
    - Contingency plans
    - Emergency exercises and tests
- MITRE Cyber Resiliency Framework and Principles

Presentation I (MCR)

Learning outcomes

- The students are able to present a topic or results in a target-group oriented way
- Students can structure a topic for a presentation
- Students can explain important success factors of a good presentation and analyse presentations according to these criteria

Course Content

- Planning, organization and realization of presentations
- Fundamentals of presentation techniques (presentation types, target audiences, structuring, visuals)
- Frequent errors
- Analysis of presentations