

| PROTOCOL ENGINEERING (EMaCS-02-08) | | | | |
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| DEGREE PROGRAM: | | Master in Computer Science for the Human-Centric and Sustainable Industry | | |
| SEMESTER: Second | TYPE: Elective | CREDITS: 5 ECTS | WORKLOAD: 125 hours | MENTORING: 1 hours/week |
| LANGUAGE: English | | | | |

| OBJECTIVES | |
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| General | The students are familiar with application-specific access points to optimized network stacks. Additionally, the focus is on designing and implementing their own optimizations. |
| Specific | <ul style="list-style-type: none"> • New network interfaces, interface extensions, and concepts for application integration. • Discussion of established mechanisms and their practical applications. • Selected algorithms for improving robustness, availability, or efficiency. • Interactions between mechanisms and policies. • Implementation using simulated and/or emulated systems. • Performance analysis of modern internet protocols. • Alternative approaches in the context of protocol design. • Additional topics based on current relevance. |
| SUSTAINABILITY | |
| <p>The Protocol Engineering course plays a crucial role in promoting sustainability within the digital landscape. By familiarizing students with application-specific access points and optimized network stacks, the course enables them to design and implement optimizations, addressing the efficiency and environmental impact of network protocols. The emphasis on new network interfaces, extensions, and innovative mechanisms aligns with sustainability goals by providing students with the knowledge and skills to enhance network performance and establish new services. Furthermore, the proactive and innovative attitude cultivated in students encourages the exploration of optimization techniques that contribute to sustainable network design. The ethical and responsible approach emphasized in the course ensures that students consider the broader environmental implications of their decisions, supporting a sustainable and responsible evolution of network protocols.</p> | |
| RESILIENCE AND HUMAN-CENTRIC DEVELOPMENT | |
| <p>The Protocol Engineering course significantly contributes to resilience and human-centric development by focusing on mechanisms and algorithms for improving robustness, availability, and efficiency in network stacks. Students gain practical skills in implementing optimization techniques, fostering their ability to enhance the resilience of network services. The exploration of interactions between mechanisms and policies equips students to design protocols that prioritize user-centric values. Through the implementation and analysis of modern internet protocols, students develop a deep understanding of the performance factors influencing user experience. The course's emphasis on alternative approaches in protocol design encourages students to think critically and creatively, promoting resilience in the face of evolving technological challenges. The ethical considerations integrated into the curriculum ensure that students prioritize human-centric values and societal well-being in their protocol engineering endeavours.</p> | |
| SUBJECT MATTER | |
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| COMPETENCES | |
| <p>C4. INTEGRATING AND RE-ELABORATING INFORMATION and DIGITAL CONTENT C5. PROGRAMMING C6. USING MACHINE LEARNING AND A.I. TECHNIQUES C7. PROTECTING PERSONAL DATA AND PRIVACY C9. REFLECTING ON ETHICAL OUTCOMES C10. EXPLORATORY AND CRITICAL THINKING C13. CREATIVELY USING DIGITAL TECHNOLOGIES</p> | |

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| C15. MANAGING SYSTEMS and/or PROJECTS C16. WORKING WITH OTHERS C18. COLLABORATING THROUGH DIGITAL TECHNOLOGIES | |
| LEARNING OUTCOMES | |
| Knowledge | <ul style="list-style-type: none"> • Know about relevant algorithms and mechanisms used in network stacks, their functionalities, and applications in various contexts. • Know about optimization opportunities and innovative mechanisms for improving network performance and establishing new services. • Know about the interactions between different mechanisms and their implications for existing network services. |
| Skills | <ul style="list-style-type: none"> • Develop the practical skills to implement optimization techniques in selected examples, especially for internet application scenarios. • Gain proficiency in designing and conducting experiments using tools to analyse network performance and behaviour. • Acquire the ability to apply methods for determining statistical characteristics and interpreting the results. |
| Attitudes/values | <ul style="list-style-type: none"> • Cultivate a proactive and innovative attitude towards exploring and implementing optimization techniques in network stacks and protocols. • Value the importance of continuous experimentation and evaluation in understanding the behaviour and performance of network systems. • Recognize the significance of efficiency, robustness, and availability in network design and protocols, prioritizing their role in enhancing network services. • Foster an ethical and responsible approach to network design, considering the implications of their decisions on end-users and the internet ecosystem as a whole. |
| TEACHING METHODS | |
| <ul style="list-style-type: none"> • Seminar-style teaching methods: Work in small groups, board work, multimedia presentations, voluntary exercise tasks, academic work with publications, application-oriented work using online materials and current tools. • Practical work: Task processing in small groups with a concluding acceptance discussion, presentations, and written assignments. | |
| EVALUATION | |
| <ul style="list-style-type: none"> • Regular examination format: Graded written exam. • Alternative examination formats: Graded oral examination or graded presentation. <p>In cases where multiple examination formats are possible for the module, the responsible lecturer will announce the required format at the beginning of the course.</p> <p>Prerequisite (PVL): Successful completion of the exercise tasks.</p> | |
| PRECONDITIONS | |
| None | |
| DEPARTMENT | Computer Science |
| LECTURERS | Zhen Ru Dai Thomas C. Schmidt: https://inet.haw-hamburg.de/members/schmidt Thomas Lehmann: https://users.informatik.haw-hamburg.de/~infwse322/ Bettina Buth: https://www.researchgate.net/profile/Bettina-Buth |
| LITERATURE | State of the art scientific papers |