TECHNISCHE HOCHSCHULE LÜBECK

Module: Human-Computer Interfaces

Level	Master	**Short Name**	HCI
Responsible Lecturers	Matthies, Denys, Prof. Dr.-Ing.		
Department, Facility	Electrical Engineering and Computer Science		
Course of Studies	Computer Science/Software Engineering for Distributed Systems, Master		
Compulsory/elective	Elective	**ECTS Credit Points**	5
Semester of Studies	(Unspecified)	**Semester Hours per Week**	4
Length (semesters)	1	**Workload (hours)**	150
Frequency	WiSe	**Presence Hours**	60
Teaching Language	English	**Self-Study Hours**	90

The following section is filled only if there is **exactly one** module-concluding exam.

Exam Type	Project Work	**Exam Language**	German/English
Exam Length (minutes)		**Exam Grading System**	One-third Grades
Learning Outcomes	The students get an overview of the interdisciplinary science of Human-Computer Interaction (HCI) and its central concepts, definitions, and research areas. They acquire knowledge regarding the History and Future Trends of HCI, Foundations of HCI (especially Psychology, Cognitive Sciences, Ergonomics), HCI Models and Interaction Concepts, Prototyping (Input & Feedback Interfaces), Human-Centered Machine Learning, Human Activity Recognition (HAR), Sensing Technologies for HAR, and typical Evaluation Methods in HCI. Participants learn that a User Interface (UI) goes beyond being a software interface, including physical interfaces, as they learn how to apply their acquired theoretical knowledge throughout the lectures to develop, analyze, and evaluate UIs. Furthermore, students practice their fabrication skills by independently building a hardware-based UI on the scope of their self-chosen HCI project. The examination includes the implementation, a written report, and an oral presentation of the project.		
Participation Prerequisites			

The previous section is filled only if there is **exactly one** module-concluding exam.

Consideration of Gender and Diversity Issues	✔ Use of gender-neutral language (THL standard) ✔ Target group specific adjustment of didactic methods ✔ Making subject diversity visible (female researchers, cultures etc.)
Applicability	
Remarks	

TECHNISCHE HOCHSCHULE LÜBECK

Module Course: Human-Computer Interfaces (Lecture)

(of Module: Human-Computer Interfaces)

Course Type	Lecture	**Form of Learning**	Presence
Mandatory Attendance	yes	**ECTS Credit Points**	2
Participation Limit		**Semester Hours per Week**	2
Group Size		**Workload (hours)**	60
Teaching Language	English	**Presence Hours**	30
Study Achievements ("Studienleistung", SL)		**Self-Study Hours**	30
SL Length (minutes)		**SL Grading System**	

The following section is filled only if there is a course-specific exam.

Exam Type		**Exam Language**	
Exam Length (minutes)		**Exam Grading System**	
Learning Outcomes			
Participation Prerequisites			

The previous section is filled only if there is a course-specific exam.

Contents

Introduction into HCI
- Basic Terms
- Interaction Paradigms
- Ubiquitous Computing

History & Future
- Computer & Networks
  - Automation and complex information systems
  - Network development
  - Development of graphical user interfaces
- Future Computing
  - HCI Visionaries
  - Assistive Augmentation

Foundations of HCI
- Human cognition and information processing
- Human behavior and errors
- Security-related behavior
- Stress and strain in sociotechnical systems

HCI Models & Interaction Concepts
- HCI Models
- Interaction Concepts
  - Focused Interaction
  - Peripheral Interaction
  - Implicit Interaction

- Reflexive Interaction

Prototyping Input & Feedback Interfaces
- Rapid Prototyping
- Prototyping Platforms
- Input Interfaces
- Feedback Interfaces

Human-Centered Machine Learning
- Overview
- Machine Learning
- Human-in-the-Loop

Human Activity Recognition
- Overview
- HAR Chain
- Examples

Sensing Technologies
- Inertial
  - Accelerometer
  - Gyroscope
  - Magnetometer
- Electric
  - Passive Capacitive / Electric Field Sensing
  - Active Capacitive Sensing
- Acoustic
  - Doppler Effect
  - Technological Developments
- Optical
  - Optical (Light) Sensors
  - Image (Camera) Sensors

Evaluation
- Study Design
- Standardized Test
  - Usability: SUS
  - User Experience: UEQ, meQUE
  - Load: NASA TLX, Burden Scale
- Data Acquisition
- Methods for Data Analysis

Literature

Carroll, J. M. (2003). HCI Models, Theories and Frameworks: Toward a Multidisciplinary Science. San Francisco u.a.: Morgan Kaufman.

Norman, D. (1988). The Psychology of Everyday Things. New York: Basic Books. (deutsch: Dinge des Alltags, Frankfurt: Campus)

Shneiderman, B., Plaisant, C. (2010). Designing the user interface. Strategies for effective human-computer interaction. Addison-Wesley. Boston, 5th edition.

ISO 9241: Ergonomics of Human-Computer Interaction. International Organization for Standardization.

Nielsen, J. (2009). Powers of 10: Time scales in user experience. Retrieved January, 5, 2015.

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O'Sullivan, D., & Igoe, T. (2004). Physical computing: sensing and controlling the physical world with computers. Course Technology Press. ISBN-13: 978-1592003464.

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Licklider, J. C. (1960). Man-computer symbiosis. IRE Trans. on Human Factors in Electronics, (1), 4-11.

Barber, P. (2015). Applied cognitive psychology: An information-processing framework. Routledge.

Nørretranders, T. (1998). The User Illusion: Cutting Consciousness Down to Size, trans. Jonathan Sydenham. New York: Viking Penguin.

Deetjen, P., Speckmann, E. J., & Hescheler, J. (2005). Repetitorium Physiologie. Urban & Fischer.

Bakker, S., Hausen, D., Selker, T. (2016). Peripheral Interaction: Challenges and Opportunities for HCI in the Periphery of Attention. Springer.

Matthies, D.J.C., Urban, B., Wolf, K., & Schmidt, A., (2019). Reflexive Interaction - Extending the concept of Peripheral Interaction. In Proceedings of the 31st Australian Conference On Human-Computer-Interaction (OzCHI 2019), Fremantle, Australia.

Gillies, M., Fiebrink, R., Tanaka, A., Garcia, J., Bevilacqua, F., Heloir, A., ... & Caramiaux, B. (2016). Human-centred machine learning. In Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems (pp. 3558-3565).

Ford, K. M., Hayes, P. J., Glymour, C., & Allen, J. (2015). Cognitive orthoses: toward human- centered AI. AI Magazine, 36(4), 5-8.

Riedl, M. O. (2019). Human-centered artificial intelligence and machine learning. Human Behavior and Emerging Technologies, 1(1), 33-36.

Dudley, J. J., & Kristensson, P. O. (2018). A review of user interface design for interactive machine learning. ACM Transactions on Interactive Intelligent Systems (TiiS), 8(2), 1-37.

Sowe, S. K., Simmon, E., Zettsu, K., de Vaulx, F., & Bojanova, I. (2016). Cyber-physical-human systems: Putting people in the loop. IT professional, 18(1), 10-13.

Remarks	

Module Course: Human-Computer Interfaces (Practical Training)

(of Module: Human-Computer Interfaces)

Course Type	Practical Training	**Form of Learning**	Presence
Mandatory Attendance	yes	**ECTS Credit Points**	3
Participation Limit		**Semester Hours per Week**	2
Group Size	12	**Workload (hours)**	90
Teaching Language	German/English	**Presence Hours**	30
Study Achievements ("Studienleistung", SL)		**Self-Study Hours**	60
SL Length (minutes)		**SL Grading System**	
The following section is filled only if there is a course-specific exam.			
Exam Type		**Exam Language**	
Exam Length (minutes)		**Exam Grading System**	
Learning Outcomes			
Participation Prerequisites			
The previous section is filled only if there is a course-specific exam.			
Contents	• Analyzing user requirements and technological requirements of information systems • Design and prototypical implementation of a User Interface • Practical evaluation using standardized or custom evaluation techniques		
Literature			
Remarks			