

Name of Module: Introduction to Physiological Computing		Credit Points (according to ECTS): 6	code designation 0343-L912,L914,L916
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Module Description			

1. Qualification Aims

The general idea of this module is to give an introduction to approaches that use properties or processes of the human body as an input to obtain information which is otherwise difficult to get in the context of human-computer-interaction (HCI). This includes emotions as well as biometric features for identification.

- Basic understanding of neuronal processes and the relation of body regulation, emotion, cognition, and behavior.
- Knowledge of current approaches in (evolutionary) psychology and neuroscience to emotions/affects.
- Basic understanding of relevant physiological indicators of psychic processes
- Expertise to assess existing and future approaches
 - to utilize bio/body signals in HCI and usability research
 - to collect and analyze information about the user's current emotional state
 - to manipulate the user's mood
 - to identify and verify users
- Knowledge of current technical approaches to classify biometrical features
- Ability to do critical (online) literature research
- Presentation skills
- Hands-on experience in an independent student research project

The course is **principally** designed to impart
technical skills 40% method skills 40 % system skills 10% social skills 10%

2. Content

SE Affective Computing (0343-L912)

The main subject of this seminar is the deployment of affective/physiological processes in the context of human-computer-interaction (HCI). Topics addressed are:

Overview structure and function of the human nervous system and neuronal information processing; basic assumptions of evolutionary psychology; theories on emotion; current findings of emotion research with an emphasis on positive emotions; methods to induce emotions; measurement of *feeling* / subjective measurements; overview of related terms/buzzwords like *user experience*, *joy of use* etc.

Recording and analysis of biosignals like facial muscle activity, heartbeat and eye movements; existing sensors and research to measure these signals during HCI; attempts to manipulate user affect in HCI

SE Biometric Identification and Verification (0343-916)

This seminar deals with current methods of person identification using biometric measures. Topics include: Foundations of feature extraction and classification, identification and verification; speaker recognition/identification; face recognition/identification; activity-based verification; finger-print verification; 'exotic' verification

SP Neuro-Usability (0343-L914)

Based on the Seminar Affective Computing and ongoing research at the Deutsche Telekom Laboratories, the participants will set up an own study project to investigate the role of affective processes in HCI or alternatively deploy psychophysiological measures for usability evaluation.

3. Module Components

Course Name	Course type	Weekly hours per semester	CPs (according to ECTS)	Compulsory(C) / Compulsory Elective (CE)	Semester (WS / SS)
Affective Computing	SE	2	3	C	WiSe
Biometric Identification and Verification	SE	2	3	CE	SoSe
Neuro-Usability	SP	2	3	CE	SoSe

4. Description of Teaching and Learning Methods

Seminars: Lectures with in-class presentations held by participants
 Student Project: project teamwork (own study/project + final report)

5. Prerequisites for Participation

SE Affective Computing

Mandatory: completed Bachelor/Vordiplom in computer science, computer engineering, electrical engineering
 Desirable: Basic signal processing skills and/or usability engineering knowledge

SE Biometric Identification and Verification

Mandatory: successful participation in the preceding seminar Affective Computing
 Desirable: Basic signal processing skills and/or usability engineering knowledge

SP Neuro-Usability

Mandatory: successful participation in the preceding seminar Affective Computing
 Desirable: Basic signal processing skills and/or usability engineering knowledge

6. Target Group of Module

- Diploma Study Course Computer Science ("Informatik"): Study domain „Technical-scientific applications“ (Studienggebiet „Technisch-naturwissenschaftliche Anwendungen“)
- Diploma Study Course Computer Engineering ("Technische Informatik"): Main study period (Hauptstudium), course catalogue 1 „Technical Applications“ (Fächerkatalog 1 „Technische Anwendungen“)
- Diploma Study Course Electrical Engineering ("Elektrotechnik"): Main study period (Hauptstudium), course catalogue (Fächerkatalog 1)
- Master Computer Science ("Informatik"): Specialized studies "Computer Science", course specialisation "Communication Technology" (Fachstudium "Informatik", Studienschwerpunkt "Kommunikationstechnik")
- Master Computer Engineering ("Technische Informatik"): Specialized studies „Technical Applications“ (Fachstudium „Technische Anwendungen“)
- Master Electrical Engineering ("Elektrotechnik"): Specialized studies „Erweiterungskatalog“ (Fachstudium "Erweiterungskatalog")

7. Work Requirements and Credit Points

Seminars	Calculation Factor	Hours
Presence lecture	15*2	30
Post-processing / computer exercise	15*1	15
Preparation of oral presentation	1*20	40
Preparation of written version/handout	1*5	5
Sum		90
Student Project		
Presence project meetings	10*1	10
Project work	1*50	50
Writing the report	1*30	30
Sum		90

8. Module Examination and Grading Procedures

Seminar Affective Computing

The cumulative grade for this module is the result form the following individual performances during the courses and other academic activities:

Presence lectures + oral presentation + written version (handout) + written test at end of semester
= 10% + 20% + 10% + 10% = 50 %

Study project Neuro-Usability

The cumulative grade for this module is the result form the following individual performances during the courses and other academic activities:

Presence project work + project work + written report + short written test at end of semester
= 10% + 20% + 20% = 50 %

Seminar Biometric Identification and Verification

presence lectures + oral presentation + written version + homework
= 10% + 20% + 10% + 10% = 50 %

9. Duration of Module

The module can be completed in two semesters.

10. Number of Participants

30

11. Enrollment Procedures

No prior registration required.

12. Recommended Reading, Lecture Notes

Lecture notes available in paper form? yes no **X**
Lecture notes available in electronic form? yes **X** no

Recommended Reading: [German texts in brackets]

General:

Picard, R. W. (1997). *Affective Computing*. Cambridge, MA: MIT Press.

Emotions

Ekman, P. (2003). *Emotions revealed*. New York, NY: Henry Holt & Company.

[Janke, W., Schmidt-Daffy, M., & Debus, G. (2008). *Experimentelle Emotionspsychologie*. Lengerich: Pabst Science Publishers (einzelne Kapitel)]

Lazarus, R. S. (2006). *Stress and Emotion: A New Synthesis*. New York City, NY: Springer Publishing Company Ltd.

[Schleicher, R. (2009). *Emotionen und Peripherphysiologie*. Lengerich: Pabst Science Publishers.]

Strongmann, K. T. (2003). *The psychology of emotion : from everyday life to theory* (5 ed.). Hoboken, NJ: John Wiley & Sons

advanced: Damasio, *Descartes' Error*, Panksepp, *Affective Neuroscience*; Rolls, *Emotion explained*

User Experience (UX)

Blythe, M. A., Overbeeke, K., Monk, A. F., & Wright, P. C. (Eds.). (2004). *Funology. From Usability to Enjoyment*. Dordrecht: Kluwer Academic Publishers. (selected chapters)

Hassenzahl, M. (2010). *Experience Design. Technology for all the Right Reasons*: Morgan&Claypool Publishers.

Psychophysiology/Signal Processing

Cacioppo, J. T., Tassinari, L. G., & Berntson, G. G. (Eds.). (2000). *Handbook of Psychophysiology*. New York, NY: Cambridge University Press.

[Schandry, R. (1998). *Lehrbuch Psychophysiologie*. Weinheim: Beltz.]

Holmqvist, K., Nyström, M., Andersson, R., Dewhurst, R., Jarodzka, H., & Van de Weijer, J. (2011). *Eye Tracking - A Comprehensive Guide to Methods and Measures*. New York City, NY: Oxford University Press.

for physiology basics see Carlson, Physiology of Behavior or Pinel, Biopsychology (more info in lecture)

13. Other Information

The topics of the module can serve as a starting point for a diploma or master thesis in the area.