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**Modulbezeichnung:** **Wearable and Implantable Computing (WIC)** **5 ECTS**  
(Wearable and Implantable Computing)

Modulverantwortliche/r: Oliver Amft

Lehrende: Oliver Amft, und Mitarbeiter/innen

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Startsemester: WS 2021/2022	Dauer: 1 Semester	Turnus: halbjährlich (WS+SS)
Präsenzzeit: 60 Std.	Eigenstudium: 90 Std.	Sprache: Englisch

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**Lehrveranstaltungen:**

WPF MT-MA-BDV ab 1 WPF MT-MA-MEL ab 1 WPF MT-MA-GPP ab 1 WPF MT-BA ab 5 WPF-DS-MA ab 1. FS  
Wearable and Implantable Computing (WS 2021/2022, Vorlesung mit Übung, 4 SWS, Anwesenheitspflicht, Oliver Amft et al.)

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**Empfohlene Voraussetzungen:**

- Ability to apply sensors, analyse signals, basic signal processing methods.
- Ability to write scripts in Matlab, Python, or similar.

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**Inhalt:**

The course provides an overview on the system design of wearable computing systems and implantable systems. Electronic design topics will be addressed, including bioelectronics, flexible electronics, electronics textile integration, multiprocess additive manufacturing. On the system functional level, frequent sensor and actuators and their designs for on-body and implantable systems are discussed. Powering and energy management concepts will be detailed, including processing and task scheduling, sparse sampling and sparse sample signal processing. Energy harvesting methods for wearable and implantable systems are analysed. Principles of biocompatibility and system validation for remote health monitoring are covered. Concrete design problems related to context awareness, energy-efficient context recognition, and mechanical design in medical applications are demonstrated, prototypes realised and discussed in mini-projects.

Submitting reports for all exercises is compulsory to be accepted for the oral exam.

**Lernziele und Kompetenzen:**

*Fachkompetenz*

*Verstehen*

- Gain overview on context awareness, sensors and actuators for context management in digital health.
- Understand design concepts and apply/analyse wearable and implantable system design methods for accessories, smart textiles, skin-attachables using soft substrates, and encapsulation.

*Analysieren*

- Analyse the electrical and physical principles, select and optimise on-body energy harvesting and power management techniques.

*Evaluiere (Beurteilen)*

- Apply system evaluation methods, assess and design for biocompatibility.

*Erschaffen*

- Create continuous context recognition and energy-efficient processing using sparse sampling, related signal and pattern processing methods.
- Create digital models of wearable systems.

**Literatur:**

Literature references will be provided during the lecture.

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**Verwendbarkeit des Moduls / Einpassung in den Musterstudienplan:**

Das Modul ist im Kontext der folgenden Studienfächer/Vertiefungsrichtungen verwendbar:

[1] **Data Science (Master of Science)**

(Po-Vers. 2021w | Gesamtkonto | Anwendungsfach | Medical Data Science | Wearable and Implantable Computing)

Dieses Modul ist daneben auch in den Studienfächern "Information and Communication Technology (Master of Science)", "Informations- und Kommunikationstechnik (Master of Science)", "Medizintechnik (Bachelor of Science)", "Medizintechnik (Master of Science)" verwendbar.

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### **Studien-/Prüfungsleistungen:**

Wearable and Implantable Computing (Prüfungsnummer: 403776)

(englische Bezeichnung: Wearable and Implantable Computing)

Prüfungsleistung, Klausur, Dauer (in Minuten): 60

Anteil an der Berechnung der Modulnote: 100%

weitere Erläuterungen:

Abgabe von Berichten zu allen Übungsaufgaben ist Voraussetzung für die Zulassung zur Prüfung. Die Klausur findet als Fernprüfung statt.

Submitting reports for all exercises is compulsory to be accepted for the exam. The exam will be carried out as a remote exam.

Prüfungssprache: Englisch

Erstablingung: WS 2021/2022, 1. Wdh.: WS 2021/2022

1. Prüfer: Oliver Amft

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