

Modulbezeichnung: **Molecular Communications (MolCom)** **5 ECTS**
(Molecular Communications)

Modulverantwortliche/r: Robert Schober
Lehrende: Robert Schober

Startsemester: WS 2020/2021	Dauer: 1 Semester	Turnus: jährlich (WS)
Präsenzzeit: 60 Std.	Eigenstudium: 90 Std.	Sprache: Englisch

Lehrveranstaltungen:

Molecular Communications (WS 2020/2021, Vorlesung, 4 SWS, Robert Schober)
Tutorial for Molecular Communications (WS 2020/2021, Übung, Sebastian Lotter)

Inhalt:

Conventional communication systems employ electromagnetic waves for information transmission. This approach is suitable for typical macroscopic applications such as mobile communication. However, newly emerging applications in biology, nanotechnology, and medicine require communication between so-called nano-machines (e.g. nano-robots and nano-sensors) with sizes on the order of nano- and micro-meter. For such device sizes electromagnetic waves cannot be used for efficient information transmission. Instead Molecular Communication, an approach that is also widely used in natural biological systems, has to be applied. In Molecular Communication, transmitter and receiver communicate by exchanging information-carrying molecules. The design of molecular communication systems requires a basic understanding of relevant biological processes and systems as well as their communication-theoretical modelling and analysis. The course is structured as follows: 1) Introduction to Molecular Communication; 2) Biological Nano-Machines; 3) Molecular Communication in Biological Systems; 4) Synthetic Molecular Communication Systems; 5) Mathematical Modelling and Simulation; 6) Communication and Information Theory for Molecular Communication; 7) Design of Molecular Communication Systems; 8) Applications for Molecular Communication Systems.

Lernziele und Kompetenzen:

The students learn how to design synthetic molecular communication systems. They develop an understanding of natural communication processes in biological systems and how to harness these natural processes for the construction of man-made molecular communication systems. The students also learn how to analyse, model, and simulate molecular communication systems.

Verwendbarkeit des Moduls / Einpassung in den Musterstudienplan:

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

[1] Medizintechnik (Master of Science)

(Po-Vers. 2019w | TechFak | Medizintechnik (Master of Science) | Modulgruppen spezifisch nach Studienrichtungen | Studienrichtung Medizinische Bild- und Datenverarbeitung | M5 Medizintechnische Vertiefungsmodule (BDV) | Molecular Communications)

[2] Medizintechnik (Master of Science)

(Po-Vers. 2019w | TechFak | Medizintechnik (Master of Science) | Modulgruppen spezifisch nach Studienrichtungen | Studienrichtung Medizinelektronik | M5 Medizintechnische Vertiefungsmodule (MEL) | Molecular Communications)

[3] Medizintechnik (Master of Science)

(Po-Vers. 2019w | TechFak | Medizintechnik (Master of Science) | Modulgruppen spezifisch nach Studienrichtungen | Studienrichtung Medizinische Produktionstechnik, Gerätetechnik und Prothetik | M5 Medizintechnische Vertiefungsmodule (GPP) | Molecular Communications)

[4] Medizintechnik (Master of Science)

(Po-Vers. 2019w | TechFak | Medizintechnik (Master of Science) | Modulgruppen spezifisch nach Studienrichtungen | Study Field Health and Medical Data Analytics | M5 Medical Engineering specialisation modules (HMDA) | Molecular Communications)

Dieses Modul ist daneben auch in den Studienfächern "Advanced Signal Processing & Communications Engineering (Master of Science)", "Communications and Multimedia Engineering (Master of Science)", "Elektrotechnik, Elektronik und Informationstechnik (Master of Science)", "Information and Communication Technology (Master of Science)", "Informations- und Kommunikationstechnik (Master of Science)", "Wirtschaftsingenieur-

wesen (Master of Science)" verwendbar.

Studien-/Prüfungsleistungen:

Molecular Communications (Prüfungsnummer: 454183)

(englische Bezeichnung: Molecular Communications)

Prüfungsleistung, mündliche Prüfung, Dauer (in Minuten): 30

Anteil an der Berechnung der Modulnote: 100% Prüfungssprache: Englisch

Erstablingung: WS 2020/2021, 1. Wdh.: SS 2021

1. Prüfer: Robert Schober
