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**Modulbezeichnung:** Technology of Tissue Engineering (TTE) 7.5 ECTS  
 (Technology of Tissue Engineering)

Modulverantwortliche/r: Martin Christian Vielreicher, Liliana Liverani

Lehrende: Aldo R. Boccaccini, Liliana Liverani, Martin Christian Vielreicher, Michael Haug, Oliver Friedrich

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Startsemester: SS 2021

Dauer: 1 Semester

Turnus: jährlich (SS)

Präsenzzeit: 60 Std.

Eigenstudium: 165 Std.

Sprache: Englisch

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### Lehrveranstaltungen:

Details zu den einzelnen Terminen der Vorlesung sind im StudOn Kurs "Schedule & TOC TTE WPF MA" als Datei abgelegt

Technology of Tissue Engineering (SS 2021, Vorlesung, 3 SWS, Martin Christian Vielreicher et al.)

Praktikum zu Technology of Tissue Engineering (SS 2021, Praktikum, 3 SWS, Michael Haug et al.)

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### Inhalt:

- Biomaterials for scaffolds
- Biodegradable polymers, composites and bioactive ceramics/glasses
- Technologies for the processing of tissue scaffolds
- 3D Bioprinting and electrospinning methods
- High-resolution deep scaffold imaging: 2-photon imaging, Second Harmonic Generation imaging, light sheet imaging, examples from TE using biomaterials
- Top-down TE, decellularization/recellularization - common concepts, challenges, different protocols and chemical processing, optical clearing of bio-scaffolds for 2-photon imaging
- Selected decell-/reconstituted systems: lung, heart, kidney and required bio-reactor technologies
- Challenges in skeletal muscle TE and MyoBio bioreactor technology (related to prac class)

#### Prac class:

- Decellularization of a whole skeletal muscle organ in a custom-engineered bioreactor system with optical and environmental continuous monitoring (MyoBio)

### Lernziele und Kompetenzen:

Students

- understand the importance of different concepts in tissue engineering (TE)
- know the materials most commonly used in biomaterials, as well as their production and characterization
- are familiar with the processing and use of different types of materials such as metals, ceramics and polymers as scaffold structures in TE
- conceive the relevance of biomaterials in Tissue Engineering and Regenerative Medicine
- are competent to distinguish between the advantages of named biomaterials over others in tissue reconstruction according to the physico-chemical requirements and the cellular seeding prerequisites
- apply the different approaches of bottom-up and top-down TE according to respective research questions and applications in Medicine and Industry
- are able to choose appropriate optical readout and sensor technologies to monitor the maturation and remodelling of scaffolds by seeded/printed cells
- are able to conceptualise bioreactors for tissue maturation according to the target tissue biophysical, physico-chemical and physiological needs
- are able to critically evaluate scientific publications on the lecture topics in the accompanying exercise classes ("Übung") and present study contents and analyses in an oral presentation to the class

### Literatur:

- Boccaccini, et al. (eds.): Tissue engineering using ceramics and polymers; Elsevier Woodhead, Cambridge, 2014

- Polak, Mantalaris, Harding (eds.): Advances in Tissue Engineering; Oxford u.a., 2010
- Hench, Jones (eds.): Biomaterials, artificial organs and tissue engineering; Oxford, 2005
- Reviews on organ decell-/recell, e.g. Scarritt et al. (2015) A review of cellularization strategies for tissue engineering of whole organs. Front Bioeng Biotechnol 3:43

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

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

#### [1] Life Science Engineering (Master of Science)

(Po-Vers. 2019w | TechFak | Life Science Engineering (Master of Science) | Gesamtkonto | Wahlpflichtmodule mit Praktikum | Technology of Tissue Engineering (TechTE))

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### Studien-/Prüfungsleistungen:

Technology of Tissue Engineering (TechTE) (Prüfungsnummer: 44761)

(englische Bezeichnung: Technology of Tissue Engineering)

Prüfungsleistung, Klausur, Dauer (in Minuten): 120

Anteil an der Berechnung der Modulnote: 66.6666666666667% Prüfungssprache: Deutsch

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

1. Prüfer: Boccaccini/Friedrich (T10052)

Praktikum Technology of Tissue Engineering (Prüfungsnummer: 44762)

Prüfungsleistung, Praktikumsleistung

Anteil an der Berechnung der Modulnote: 33.3333333333333%

weitere Erläuterungen:

Unbenotete Studienleistung über Abgabe eines Protokolls.

Prüfungssprache: Deutsch

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

1. Prüfer: Oliver Friedrich