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

Modulverantwortliche/r: Martin Christian Vielreicher, Liliana Liverani

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

Startsemester: SS 2022

Dauer: 1 Semester

Turnus: jährlich (SS)

Präsenzzeit: 60 Std.

Eigenstudium: 165 Std.

Sprache: Englisch

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 2022, Vorlesung, 3 SWS, Michael Haug et al.)

Praktikum zu Technology of Tissue Engineering (SS 2022, Praktikum, 3 SWS, Paul Ritter)

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

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))

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 2022, 1. Wdh.: WS 2022/2023

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 2022, 1. Wdh.: WS 2022/2023

1. Prüfer: Oliver Friedrich