376-0021-00L Materials and Mechanics in Medicine
Autumn Semester 2019, Department of Health Sciences and Technology

Objectives:
The objectives of this course are to understand physical and technical principles in biomaterials, tissue engineering and biomechanics as well as the history of medicine. Mathematical description and problem solving are emphasized as is biomedical applications in research and clinical practice.

Tuesday	Lecture	13:15 – 15:00 h	HG G3	
	Exercises	15:15 – 16:00 h	HG E 1.1	Last Names **A - D**
			HG G26.5	Last Names **E - I**
			ML H41.1	Last Names **J - M**
			ML J 34.1	Last Names **N - S**
			ML J 37.1	Last Names **T - Z**

Date	***Topic***	***Lecturer***	***Paper***
17.09.	Introduction / Historical Perspective	M. Zenobi-Wong	
24.09.	Biomaterials I	M. Zenobi-Wong	
01.10.	Biomaterials II	M. Zenobi-Wong	
08.10.	Tissue Engineering I	M. Zenobi-Wong	*Quiz 1*
15.10.	Tissue Engineering II	M Zenobi-Wong/M. Rottmar	
22.10.	Additive Manufacturing	M. Zenobi-Wong/C. Leinenbach	
29.10.	Biofabrication	M. Zenobi-Wong	*Quiz 2*
05.11.	Mechanobiology	J. Snedeker	
12.11.	Tissue Viscoelasticity	J. Snedeker	
19.11.	Bone & Cartilage (Connective Tissues)	J. Snedeker	*Quiz 3*
26.11.	Muscle & Cardiovascular Tissues	J. Snedeker	
03.12.	Mechanics of Human Movement	J. Snedeker	
10.12.	Functional Anatomy and Joint Biomechanics	J. Snedeker	*Quiz 4*
17.12.	Mechanics in Orthopedic Implant Design	J. Snedeker	

Course Information: Each weekly topic will be introduced in two 45 min lectures followed directly by a 45 min exercise session where topical problems and papers will be discussed with the help of a teaching assistant. All lecture and exercise materials will be uploaded to the Moodle course website on https://moodle-app2.let.ethz.ch/course/view.php?id=11051. Students will be divided into different exercise sessions by alphabetical order. Attendance at the exercises is optional, but highly recommended. Four of the exercise sessions will be a discussion of a research paper. Following the exercise a moodle quiz will be opened with 5 questions on the topic of the paper. If you get at least 16/20 questions correct, 0.25 points will be added to your final grade.

The final examination counts for 100% of the grade and will be given on a computer. The exam includes standard Moodle questions including multiple choice, kPrime, short answer and calculations. All lectures and the examination will be held in English. No aids are allowed at the exam, with the exception of an English/German dictionary.

Papers:

Paper 1 for October 8, 2019: Particle Hydrogels Based on Hyaluronic Acid Building Blocks, Sideris et al, ACS Biomater. Sci. Eng. (2016), 2, 2034−2041, DOI: 10.1021/acsbiomaterials.6b00444

Paper 2 for October 29, 2019: 3D bioprinting of collagen to rebuild components of the human heart, Lee et al., Science 365, 482–487 (2019) 2 August 2019, DOI: 10.1126/science.aav9051.

Paper 3 for November 5, 2019: Touch, Tension, and Transduction – The Function and Regulation of Piezo Ion Channels, Wu et al, Trends in Biochemical Sciences, (2017) 42:1
http://dx.doi.org/10.1016/j.tibs.2016.09.004

Paper 4 for December 3, 2019: A Joint Coordinate System for the Clinical Description of Three-Dimensional Motions: Application to the Knee, Grood and Suntay, J Biomech Eng, (1983) 105(2)
https://doi.org/10.1115/1.3138397

Lecturers:

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