PKU Globex Julmester®

The Tissue Engineer's Toolkit: Design and Evaluation of Regenerative Therapies (3 Credits)

CHN:

Instructor	Ken Webb, Bioengineering Department, Clemson University (kwebb@clemson.edu)
Synopsis	Tissue engineering/regenerative medicine requires the capability to regulate cellular behaviors such as proliferation, migration, and differentiation. This course will introduce engineering students to 1) the therapeutic tools we have available for this purpose, including soluble growth factors, insoluble adhesion ligands, scaffold topographic features, and externally applied mechanical forces and 2) the experimental tools to evaluate cellular and tissue responses to therapeutic treatment including high throughput genomic analysis, quantitative real time polymerase chain reaction, ELISA, Western blotting, immunohistochemical staining, and loss of function techniques to confirm therapeutic mechanisms.
Offering	2018 July Semester (Julmester)
Audience	Year 3 &4 Undergraduates and Graduate Students
Classroom	Room 301, Teaching Bldg. No. 3, Peking University
Schedule	Class: 8-11 AM, M-F, July 2–20, 2018; Final Exam: 8-11 AM, Sat, July 21, 2018; Total Contact Hours: 45
Objective	At the end of the course, students will be able to design biomaterial scaffolds using a wide range of tissue engineering tools and design experiments with appropriate controls to assess their efficacy.
Topics	1. Introduction-the motivation and conceptual framework of tissue engineering / regenerative medicine. 2. Soluble cues-growth factor activity, receptors, intracellular signaling, and the promise and challenge of therapeutic application. 3. Substrate cues-adhesion ligands and scaffold structural features 4. Mechanical cues-mechanobiology, substrate stiffness, and external loads 5. Cell therapy-choices, benefits, and challenges 6. High throughput transcriptional profiling 7. Quantitative real time polymerase chain reaction-theory, experimental design, and quantitative analysis. 8. Protein analysis-antibodies, Western blotting, ELISA, immunohistochemistry. 9. Mechanistic tools-function-blocking antibodies, chemical inhibitors, and RNA interference.
References	Course handouts and selected articles from peer-reviewed literature provided by the instructor.
Grading	Four Quizzes 20% (Wed 7/4, Mon 7/9, Mon 7/16, Thur 7/19) Midterm Exam 25% (Wed 7/18) Proposal 15% (Due: Fri 7/20) Final Exam 30% (Sat 7/21) Attendance and Participation 10% **Total 100%**