BE 4337: Regenerative Medicine
Fall 2018 Syllabus

Class schedule: MWF 8:30 - 9:20am

Text book: Appropriate research and review papers will be provided for each class.

Instructor: Philip Jung (jjung1@lsu.edu)
Office hours: MW 9:30 - 10:00 or by appointment (167 E.B. Doran)

Course description: This course is designed to introduce technologies to regenerate tissues and organs utilizing stem cells and engineered biomaterials. Widely utilized and most advanced regenerative engineering technologies will be presented and discussed. Translational and clinical applications of engineered tissues will be discussed as well.

Course learning objectives: By the end of the course you should be able to do the following:

1. Understand the fundamental principles at the interface of biology and engineering
2. Define the gaps in knowledge in Regenerative Medicine by critically analyzing recent literatures
3. Work in multidisciplinary teams to communicate effectively with peers to prepare a microteaching (15 min + 5 min discussion)

Grading

1. Exams: Midterm 1 (20%), Midterm 2 (20%) and Final (30%)
2. Literature discussion and participation (15%) - one page written critique and summary needs to be submitted before each discussion.
3. Microteaching (5% instructor + 10% peer assessment)
   - Your group will decide a topic and submit a potential title by the 2nd midterm.
   - Each group presents their proposal in the last week of the semester.
4. The final course grade will be determined from the following scale:

letter grade	percentage	letter grade	percentage	letter grade	percentage
A+	97-100	B-	80-82	D	63-66
A	93-96	C+	77-79	D-	60-62
A-	90-92	C	73-76	F	0-59
B+	87-89	C-	70-72		
B	83-86	D+	67-69		

Attendance is mandatory. No makeup examinations will be administered, unless documented excuse for a missed exam is provided.

Date	Topics covered (provisional)
Week1	Course introduction
	Introduction to stem cell and regenerative medicine
	Embryonic stem cells (ESCs)
Week2	Human ESCs in regenerative medicine
	Current status of induced pluripotent stem cells (iPSCs)
	iPSCs (clinical applications)
Week3	MSCs (latest advances)
	Therapeutic applications of MSCs
	Stem cell bioengineering (PSC)
Week4	Stem cell bioengineering (MSC)
	Literature discussion (Stem cell and regenerative medicine)
	Review for Midterm 1
Week5	***Midterm 1***
	Extracellular microenvironments (ECM)
	Extracellular microenvironments (natural biomaterials)
Week6	Extracellular microenvironments (synthetic biomaterials)
	Extracellular microenvironments (composite biomaterials)
	Organ fabrication via decellularization
Week7	Tissue fabrication (2D planar and hollow organs)
	Organ fabrication (3D and 4D bioprinting)
	Literature discussion (solid organ fabrication)
Week8	Vascular tissue engineering (blood-contacting biomaterials)
	Vascular tissue engineering (functional blood vessels)
	Cardiac tissue engineering (approaches)
Week9	Cardiac tissue engineering (cardiac patches)
	Cardiac tissue engineering (maturation of differentiating cardiomyocytes)
	Use of large animal models and nonhuman primate models (CVTE)
Week10	***Literature discussion (cardiovascular tissue engineering)***
	Review for Midterm 2
	Midterm 2
Week11	Engineering cancer microenvironments (introduction)
	Engineering cancer microenvironments (cancer biomaterials)
	Introduction to immunology
Week12	Immunomodulation by biomaterials
	Immunobioengineering
	Literature discussion (cancer and immunobioengineering)
Week13	Ethical concerns on regenerative medicine research
	Ethical concerns on stem cell clinical trials
	Microteaching (team project)
Week14	***Microteaching (team project)***
	Microteaching (team project)