Biomedical Engineering Department

BMD_ENG 348 Applications of Regenerative Engineering

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Time     Spring quarter
11:00 – 12:20 Tuesdays and Thursdays

Prerequisites   BIOL_SCI 215 Genetics and Molecular Biology or BIOL_SCI 219 Cell Biology

Course Description
Mechanisms of human disease; application of molecular, cellular, and tissue-level regenerative engineering strategies to selected human disorders, including neurodegenerative disorders, stroke, coronary heart disease, cystic fibrosis, cirrhosis, diabetes, muscular dystrophy.

Course Objectives
Understand the pathogenic mechanisms and pathophysiology of selected human disorders.

Apply regenerative engineering strategies to human disorders.

Formulate hypotheses, design research projects, and solve problems in regenerative medicine and engineering.

Course Outcomes
Enable students to: (1) understand the pathogenic mechanisms of selected human disorders; (2) integrate regenerative engineering concepts and technologies to regenerative medicine to treat human disorders; and (3) solve regenerative engineering research problems.


Grading    Homework: 30%
Research project: 20%
Weekly quizzes: 10%
Midterm: 20%
Final: 20%

Lecture topics
Part I   Introduction to regenerative engineering
Part II   Fundamentals of human disease and regenerative engineering
Concepts of pathogenesis, pathology, and pathophysiology
Mechanisms of disease

Environmental insults as pathogenic factors
  Microorganisms
  Chemical factors
  Physical factors
  Psychosocial stress
  Overnutrition

Genetic mutations as pathogenic factors
  Chromosomal defects
  Autosomal dominant gene mutations
  Autosomal recessive gene mutations
  X-linked gene mutations
  Multiple gene dysfunctions

Senescence

Overview of regenerative engineering technologies
  Molecular regenerative engineering
  Cellular regenerative engineering
  Tissue-level regenerative engineering

Part III  Application of regenerative engineering to human disease

Traumatic brain injury
Spinal cord injury
Ischemic stroke
Alzheimer’s disease
Parkinson’s disease
Coronary heart disease
Cystic fibrosis
Hepatitis and cirrhosis
Diabetes
Muscular dystrophy

Part IV  Research design