BMEM - Biomedical Engineering

Courses

BMEM 601. Biomedical Innovation and Clinical Translation I. 3 Hours.
This lecture and team-based project focused course will provide a detailed overview of the device design process and focus on important issues to be considered for successful translation of preliminary designs into viable clinical products. This course will include a final team-based project focused on a providing a biomedical device for a hypothetical problem selected by the group.

BMEM 602. Biomedical Innovation and Clinical Translation II. 3 Hours.
This lecture and team-based project will be a continuation of BME-M 601. The business and commercialization aspects of a marketable design will be explored. This course will focus on the important business issues to be considered for successful translation of preliminary designs into viable clinical products. This course will include a final team-based presentation (with an accompanying report) to obtain funding from investors.

BMEM 603. Regulatory, Legal and Ethical Perspectives. 3 Hours.
This lecture and team-based project will be a continuation of BME-M 602. The regulatory, legal, and ethical aspects of a marketable design will be explored; specifically how this will modify the final marketable design. This course will include a final team-based oral and written presentation (accompanying report) to include information necessary for an FDA submission as well as an updated commercialization plan to give to investors.

BMEM 610. Design and Regulation of Stem Cell and Tissue Engineered Products. 3 Hours.
The overall objective of this course is to provide a broad introduction to regenerative and therapeutic strategies enabled using stem cells and tissue engineering. This course will provide an overview of the different types of stem cells, discuss their potential for regenerative medicine and cellular therapeutics, introduce basic concepts in tissue engineering, and discuss regulatory and ethical issues associated with the use of stem cells and tissue-engineered products.

BMEM 611. Biomedical Device Design. 3 Hours.
This design course focuses on the development of solutions to clinical problems that require the use of implants and medical devices. Topics covered include a detailed overview of the design process of implants and biomedical devices including the role of stress analysis in the design process; anatomic fit, shape and size of implants; selection of bio-materials; instrumentation for surgical implantation procedures; pre-clinical testing for safety and efficacy, risk assessment evaluation of clinical performance and design of clinical trials.

BMEM 612. Lab-on-a-chip and Point-of-Care Diagnostic Technologies. 3 Hours.
This course will introduce lab-on-a-chip (LOC) technologies used for point-of-care (POC) diagnostics. Specifically, this course will detail design considerations, fabrication techniques, current advances in sensing and detection, data acquisition and analysis, and quality control. This course will also provide an overview of regulatory challenges associated with the development and approval of these technologies for use in patients. Finally, this course will provide examples of point-of-care technologies classified based on clinical use and clinical setting.

BMEM 613. Implantable Devices and Biomaterials. 3 Hours.
The overall objective of this course is to provide a comprehensive review of tissue-material interactions to guide the design on biomedical devices for in-vivo transplantation. Specific topics will include an overview of commonly used bio-materials, their interactions with blood and the immune system and strategies to prevent unwanted tissue responses and promote beneficial responses.

BMEM 614. Wearable Device Technologies. 3 Hours.
The overall objective of this course is to provide a comprehensive overview of currently used wearable devices, provide a basic understanding of the current technologies, their advantages for continuous patient monitoring and current limitations. This course will also provide a broad overview of potential new markets and opportunities for wearable devices over the next decade.

BMEM 615. Design and Use of Tissue Chips, Organ Chips & Microphysiological Systems. 3 Hours.
The overall objective of this course is to provide a an introduction to human tissue chips and microphysiological systems that are poised to replace animal based drug testing with human in-vitro model based approaches. This course will outline the basics of tissue chips and complex microphysiological systems, provide an overview of current state of the field, outline limitations and challenges and discuss potential opportunities for disease modeling, drug discovery and drug toxicity testing.

BMEM 616. Direct Reprogramming 101. 3 Hours.
Dysfunction or degradation of cells in our body leads to devastating human disorders. The discovery of direct reprogramming opens the avenue to (re)generate the desired cell types for both research purposes and disease treatment. This course will cover the history and biological basis of direct reprogramming, outline direct reprogramming achieved in different cell types, and their implications in answering basic biomedical questions and treating human diseases. We will also overview the current state of the field and discuss the obstacles and potential opportunities to be applied with other bioengineering technologies.

BMEM 617. Pain Management. 3 Hours.
The overall objective of this course is to provide a an introduction to human disease with pain. Pain management is an aspect of medicine and health care involving relief of pain in various dimensions, from acute and simple to chronic and challenging. Effective pain management does not always mean total eradication of all pain. Rather, it often means achieving adequate quality of life in the presence of pain, through any combination of lessening the pain and/or better understanding it and being able to live happily despite it.