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 providing a biomedicai 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
intestinal therapies, 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 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 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.