CLINICAL ENGINEERING PROGRAM CURRICULUM

PLAN B - CORE COURSES

Program for Year 1 or 2 students in academic years beginning with even numbers (e.g. Sept. 2016-May 2017)

**Fall Semester**
- BME 5020 Clinical Engineering Fundamentals
- One other University graduate level course

**Spring Semester**
- BME 5050 Engineering Problems in the Hospital
- BME 5060 (1st yr) Clinical Rotations or BME 5061 (2nd yr) Clinical Rotations

Program for Year 1 or 2 students in academic years beginning with odd numbers (e.g. Sept. 2015 – May 2016)

**Fall Semester**
- BME 5030 Human Error & Med Device Accidents
- BME 6086 Clinical Systems Engineering

**Spring Semester**
- BME 5040 Medical Instrumentation in the Hospital
- BME 5060 (1st yr) Clinical Rotations or BME 5061 (2nd yr) Clinical Rotations

All courses are three credits

**BME 5020 - Clinical Engineering Fundamentals** (fall semester, even years)

Provides the fundamental concepts involved in managing medical technology, establishing and operating a clinical engineering department, and the role of the clinical engineering designing facilities used in patient care. Topics covered include managing safety programs, technology assessment, technology acquisition, the design of clinical facilities, personnel management, budgeting and ethical issues of concern to the clinical engineer.

**BME 5050 – Engineering Problems in the Hospital** (spring semester, odd years)

This course will cover engineering solutions to problems that are found in the healthcare environment. This includes a wide variety of topics such as electrical power quality and electrical supply systems in hospitals; electrical safety in the patient care environment; electromagnetic compatibility of various medical devices and electromagnetic interference; radiation shielding and radiation protection; medical gas systems, medical ventilation systems and indoor air quality; fire protection systems required in the hospital, telemedicine and medical image transmission; project management techniques and finally, hospital architecture and the design of patient care facilities.

**BME 5030 – Human Error and Medical Device Accidents** (fall semester, odd years)

This course teaches the basic principles needed to analyze medical devices, medical device users, medical device environments and medical device accidents. It particularly focuses on human factors engineering as an important step to minimizing human error. Medical device manufacturers, medical device regulators and medical device owners will be examined to identify their role in reducing medical device use errors and medical device accidents. The nature and types of human error and well as a taxonomy of medical device accidents will also be presented. Investigative techniques involving “root cause analysis” and “failure modes and effects analysis” will be taught and applied to industrial and medical device accidents. Operating room fires, electrosurgical and laser burns, anesthesia injuries, infusion device accidents, catheters and electrode failures and tissue injury in the medical environment will be discussed in detail.
BME 5040 - Medical Instrumentation in the Hospital  (spring semester, even years)
This course will examine 8-10 current major technologies in use by healthcare practitioners. It will review the physiological principles behind each technology, the principles of operation, major features, methods for testing and evaluating each technology and will highlight available versions of the devices on the market today. Technologies to be covered will be selected from anesthesia equipment, surgical and ophthalmic lasers, cardiac assist devices, surgical & endoscopic video systems, radiographic and fluoroscopic devices, CT, MRI, ultrasound imaging equipment, radiation therapy, nuclear medicine, clinical chemistry analyzers, spectrophotometers and hematology analyzers. Several classes will involve site visits to observe and examine the equipment being discussed.

BME 6086 – Clinical Systems Engineering  (fall semester, odd years)
Primarily covers medical device connectivity and interoperability. This includes connecting medical devices to the hospital network to pass data to the patient medical record and connecting one medical device to another for the purpose of feedback and control. It will cover basic networking concepts, medical systems security and risk management, the role of middleware, HL7 and DICOM standards, moving data on the network, clinical information systems, digital imaging and image storage systems, and a medical device integration project walk-thru.

BME 5060 Clinical Engineering Rotations I  (spring semester, all years)
This course is related to the clinical engineering rotations that interns experience in hospitals observing the technology / patient / clinician interface such as in surgery, CT, MRI, ICU, clinical laboratory and physical therapy.

BME 5061 Clinical Engineering Rotations II  (spring semester, all years)
This course is related to the clinical engineering rotations that interns experience in hospitals observing the technology / patient / clinician interface such as in surgery, CT, MRI, ICU, clinical laboratory and physical therapy.