School	
Major	Masters of Science in Electronic Engineering-Biomedical Engineering

Core Requirements			
Code	**Title**	**Credits**	**Description**
EENG554	Biomaterials and Artificial Organs	3	The goal of this course is to thought technologies that will maintain, improve or even restore the function of diseased organs. The growing need for these technologies is substantial. Improved health care has resulted in an increased life span for the general population and, when coupled with a growing shortage of donor organs, makes it clear that organ assistance and substitution devices will play a larger role in managing patients with end-stage disease by providing a bridge to recovery or transplantation.
EENG504	Biomechanics	3	This course provides a short introduction to the constitutive equations and stress-strain relationships. The definitions of Newtonian and non-Newtonian fluids and viscoelasticity are given. Certain rheological models are derived. The rheometers used to determine the rheological properties of blood are described. The rheological properties of blood are then analyzed in terms of aggregation and deformation of red blood cells. The cardiovascular system is also treated, including the biomechanics of vessels and heart. Finally, the mechanical properties of certain biomaterials are studied.
EENG564	Robotics and Telemedicine	3	This course will introduce students to the applied aspects of medical Robotics and Telemedicine. The Robotics part covers the design and control of robots and robotic systems used in medical fields. Students will be introduced to applications of medical robotics related to medical surgery, and rehabilitative assistive technology tools. As a term project, students will demonstrate their acquired knowledge of medical robotics by designing a virtual robotic surgery using Matlab. Telemedicine and telehealth are rapidly expanding fields dedicated to providing health care and educational services over distance using technology. This course will also introduce students to information technology in healthcare, technologies in medical image processing, and technologies for safeguarding medical data and privacy.
ENGG515	Advanced Engineering Mathematics	3	This course covers core mathematical theories required by upper undergraduate and graduate engineering students. The course covers topics in operations research, graph theory, statistics and statistical inference that have a direct application to engineering applications

Major Requirements			
Code	**Title**	**Credits**	**Description**
EENG694A	Master Thesis Project(Part I)	3	The master thesis project is a six credits research and application course that spans over two semesters. Students are expected to develop a theoretical or an applied model in their respective field of specialization. Students should write a thesis describing the research methodology, implementation and results. The developed model might be a valid numerical simulation, a well-functioning prototype or a well-supported mathematical or scientific model.
EENG664	Clinical Engineering	3	The purpose of this course is to provide knowledge enabling a biomedical engineer to work in the complex environment of modern hospitals. It emphasizes on the role of the biomedical engineer in the contribution to long-term quality enhancement. It also deals with safety and efficacy of medical devices, management of healthcare technology, quality management, professionalism, professionalism and ethics, and information systems.

EENG634	Image Processing for Medicine	3	This course introduces image processing methods in medicine and biology. It is intended for students and researchers in biomedical engineering, computer and electrical engineering, physics and other engineering disciplines as well as medical professionals and students who would like attain a basis understanding of medical image processing. The course is intended to provide the basic understanding of both the image formation and relevant image processing techniques. The course will introduce briefly the physics and will discuss into details the phenomenology of image formation for variety of image modalities that include X-ray, computer tomography (CT), magnetic resonance imaging (MRI), nuclear imaging (PET, SPECT) and ultrasound. Subsequently, students will be introduced to the techniques for image representation, processing and analysis, including image reconstruction, image enhancement, segmentation, registration, characterization, pattern recognition interpretation and visualization. The course will also briefly address issues related to image-based diagnosis, intervention and therapy. This is a three-credit course that includes three hours of lecture per week, home-works, journal article review sessions and a final project (Matlab application).
EENG674L	Medical Laboratory Instrumentation Lab	1	This laboratory course introduces the students to the medical laboratory and enables them to distinguish the different departments of a medical laboratory, the medical devices used there, and the various tests performed on human samples. Along to discussing the different components of each machine and the way those parts function, the students will be to recognize the basic quality control processes that are done on those machines to ensure reliable results. Moreover, the students will be able to analyze the results and relate them to specific diseases.
EENG674	Medical Laboratory Instrumentation	3	This course introduces students to the medical laboratory working environment which includes medical devices, different laboratory sections, and laboratory staff. It explains the various principles behind the medical laboratory instrumentation. Safe work practices, quality assurance features and the analytical principles of common clinical laboratory methods are also examined. Finally, this course provides students with background knowledge to communicate with medical laboratory professionals.
EENG634L	Image Processing for Medicine Lab	1	This lab is intended to allow the students to gain the basic skills in the formation and the processing medical images using MATLAB. It introduces the fundamental concepts, notation, and terminology associated with image representation and basic image processing operations. A broad range of image enhancement techniques will be introduced and various skills in manipulating digital images will be acquired by the students.
EENG624	Biomedical Optics	3	This course is meant to provide students with a working knowledge of the theoretical and experimental principles underlying the applications of optical technology in medicine. It covers the physical and biophysical principles underlying the methodology and technology for the medical uses of light including diagnostic, monitoring and therapeutic applications. Specific areas will include: instrumentation which involves light detection and analysis, light spectroscopy which involves photodynamic therapy and diffuse optical tomography and optical imaging.
EENG534L	Signal Processing for Medicine I Lab	1	This is a lab course in signal processing. It covers the use and application of signal processing techniques, including an introduction to MATLAB, function creation, digital signal processing techniques, and digital filters. These techniques are implemented in MATLAB.

EENG574L	Medical Instrumentation II Lab	1	This lab is a natural extension to the medical instrumentation I lab. The skills developed in this previous lab will be used in order to formulate additional expertise in more complex and advanced medical devices. In addition, a detailed discussion of the block and flow diagrams of the different medical devices and an extensive discovering of the parts that develop those machines is conducted.
EENG574	Medical Instrumentation II	3	This course introduces developed diagnosis and therapeutic biomedical systems. At first, surgery instruments, defibrillators and oximeters will be treated. Lasers and its applications constitute a large part of the course. Other instruments such as lithotripters, anesthesia machine, incubators, automated drug delivery systems and autoclave will be covered.
EENG524	Medical Imaging II	3	This course provides a short introduction about the different imaging techniques in the medical domain. It introduces a detailed study about nuclear medicine techniques such as PET and SPECT as well as magnetic resonance imaging MRI. Image reconstruction techniques specific to CT, nuclear medicine techniques and MRI are also explained in this course.
EENG514	Computer Simulations and Modeling for Medicine	3	This course introduces mathematical tools and algorithms needed to simulate dynamic medical processes. The course provides an introduction to MATLAB in order to enable practical applications using computer programming. A basic understanding of physical laws that represent the basis for constructing a model of a system will be provided. The course also deals with physiological mechanisms of biological organs. It includes studies of motion, mass transfer, gas exchange and current transmission. Modeling applications include the cardiovascular, resparatory, musculoskeletal and kidney functions.
EENG534	Signal Processing for Medicine I	3	This is an introductory course to Discrete Signal Processing. It covers the basic concepts and techniques for processing discrete-time signal on a computer. The course also emphasizes the understanding and implementations of theoretical concepts, methods and algorithms.
EENG694B	Master Thesis Project(Part II)	3	The master thesis project is a six credits research and application course that spans over two semesters. Students are expected to develop a theoretical or an applied model in their respective field of specialization. Students should write a thesis describing the research methodology, implementation and results. The developed model might be a valid numerical simulation, a well-functioning prototype or a well-supported mathematical or scientific model.