<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>4800:522</td>
<td>Physiological Control Systems</td>
<td>3</td>
<td>3100:202 and 3450:335. The basic techniques employed in control theory, systems analysis, and model identification as they apply to physiological systems.</td>
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<tr>
<td>4800:530</td>
<td>Design of Medical Imaging Systems</td>
<td>3</td>
<td>3100:200; 3650:292; 4400:343; 4800:353; 4800:305; or by permission of instructor. Physical principles and engineering design of medical imaging systems, with emphasis on digital radiography, computed tomography, nuclear medicine, ultrasound and magnetic resonance.</td>
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<tr>
<td>4800:647</td>
<td>Kinematics of the Human Body</td>
<td>3</td>
<td>3100:561 or equivalent; 4300:407 or equivalent; Analytical methods used to model and quantify human body motion. Three-dimensional kinematics, joint coordinate systems, functional anatomy, segment center of mass and joint centers.</td>
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<tr>
<td>4800:530</td>
<td>Cardiovascular Dynamics</td>
<td>3</td>
<td>Analysis of blood pumping action, pressure/flow waveforms and transmission through circulation and blood rheology factors. Use of various modeling and measurement techniques. Clinical implications related to disease.</td>
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<tr>
<td>4800:651</td>
<td>Biometry</td>
<td>3</td>
<td>Application of lightwave principles and optical fibers on the engineering design and development of instrumentation, techniques, and applications for medical diagnostic imaging, and treatment of disease.</td>
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<tr>
<td>4800:645</td>
<td>Mechanics in Physiology &amp; Medicine</td>
<td>3</td>
<td>Application of lightwave principles and optical fibers on the engineering design and development of instrumentation, techniques, and applications for medical diagnostic imaging, and treatment of disease.</td>
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<td>Microfluidics in Biotechnology</td>
<td>3</td>
<td>4800:605 or permission of instructor.</td>
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**Course Descriptions**

- **4800:522 Physiological Control Systems (3 Credits)**
- **4800:530 Design of Medical Imaging Systems (3 Credits)**
- **4800:560 Experimental Techniques in Biomechanics (3 Credits)**
- **4800:647 Kinematics of the Human Body (3 Credits)**
- **4800:530 Cardiovascular Dynamics (3 Credits)**
- **4800:645 Mechanics in Physiology & Medicine (3 Credits)**
- **4800:647 Kinematics of the Human Body (3 Credits)**
- **4800:650 Cardiovascular Dynamics (3 Credits)**
- **4800:653 Transport Phenomena in Biology & Medicine (3 Credits)**
- **4800:654 Microfluidics in Biotechnology (3 Credits)**
4800:655 Rehabilitation Engineering (3 Credits)
Prerequisites: graduate standing in engineering, mathematics, or science; or permission of the instructor. Devices for rehabilitation, interfacing the motor and/or sensory impaired, quantitative assessment techniques, prosthetics and orthotics, bedsore mechanics, emerging technologies.

4800:660 Biomaterials & Laboratory (4 Credits)
Corequisite: Biomaterials Laboratory. Material uses in biological applications. Effect of physiological environment and sterilization on materials. Controlled and uncontrolled degradation. Effect of materials on soft tissue, hard tissue and blood. Laboratory experiments using materials designed for biomedical use and demonstrations of biological/materials interactions.

4800:661 Advanced Biomaterials (3 Credits)
Prerequisite: 4800:660 or permission of instructor. The objective of this course is to provide the fundamental understanding of the host responses when exposed to various implantable devices and biomaterials. Methods for testing biocompatibility will be analyzed.

4800:662 Tissue Engineering & Regenerative Medicine (3 Credits)
Prerequisites: 4800:661 or permission. This course will cover topics including basic developmental biology, quantitative description of biological processes, and integration of cells with materials to regenerate tissue.

4800:663 Artificial Organs (3 Credits)
Prerequisites: graduate standing in the College of Engineering or permission of instructor. Study of the rationale for the engineering and clinical aspects required for the design and variety of artificial organs, with emphasis on the artificial heart and artificial kidney.

4800:665 Biomaterials and Tissue Engineering Methods (3 Credits)
Prerequisite: 4800:660; Corequisite: 4800:661; or permission of the instructor. This course is designed to equip students with knowledge and skills to evaluate biomaterials and to design scaffolds for tissue engineering. Analytical techniques include principles of microscopy, cell culture techniques, and biocompatibility testing.

4800:670 Mathematical Modeling in Biology & Medicine (3 Credits)
Prerequisites: graduate standing in engineering, mathematics, or physics; or permission of instructor. Modeling of pharmacokinetic, cardiovascular, neuromuscular, and immune systems, and artificial organ interactions. Deterministic and stochastic approaches.

4800:685 Medical Devices & Artificial Organs (3 Credits)
Prerequisites: graduate standing in engineering, mathematics, or science; or permission of instructor. Design of medical devices and artificial organs, requirements, safety considerations, tissue constraints, optimization techniques, government regulations, and legal liability.

4800:697 Special Topics: Biomedical Engineering (1-4 Credits)
(May be repeated.) Specialized areas of study as defined by the instructor.

4800:698 Masters Research (1-6 Credits)
Prerequisite: Permission of advisor. (May be repeated.) Research on a suitable topic in biomedical engineering culminating in a master’s thesis.

4800:699 Masters Thesis in Biomedical Engineering (1-6 Credits)
Prerequisite: permission of advisor. (May be repeated) Supervised research in a specific area of biomedical engineering.

4800:898 Preliminary Research (1-15 Credits)
(May be repeated) Prerequisite: Approval of the dissertation director. Preliminary investigations prior to the submission of a dissertation proposal to the Interdisciplinary Doctoral Committee.