Course Profile: Biomedical Engineering Program

COURSE #: BIOMEDE 211	**COURSE TITLE:** CIRCUITS AND SYSTEMS FOR BIOMEDICAL ENGINEERING
TERMS OFFERED: Fall	**PREREQUISITES:** Math 214 or Math 216, Physics 240
TEXTBOOKS/REQUIRED MATERIAL: R. Dorf and J. Svoboda, "Introduction to Electrical Circuits", 6th Edition (2004)	**COGNIZANT FACULTY:** C. Cain, D. Noll **DATE OF PREPARATION:** 9/1/2004
INSTRUCTOR (S): C. Cain	**SCIENCE/DESIGN:** 3/1
CATALOG DESCRIPTION: Students will learn circuits and linear systems concepts necessary for analysis and design of biomedical systems. Theory will be motivated by examples from biomedical engineering. Topics covered include electrical circuit fundamentals, operational amplifiers, frequency response, electrical transients, impulse response, transfer functions, and convolution, all motivated by circuit and biomedical examples. Elements of continuous time domain-frequency domain analytical techniques will be developed.	**COURSE TOPICS:** 1. Electrical circuit fundamentals 2. Circuit analysis techniques and theorems 3. Electrical transients 4. Operational amplifiers 5. Biomedical instrumentation amplifiers 6. Laplace and Fourier transforms 7. Singularity functions 8. Impulse response, transfer functions, and convolution 9. Biomedical and circuit examples of linear system characterization

COURSE OBJECTIVES	Links shown in brackets are to the departmental educational objectives. 1. To generate physical understanding of fundamental circuit and systems concepts. [1,11] 2. To relate classroom material to real-world applications including selected biomedical systems. [1,8] 3. To teach students basic circuit and linear systems including transient, frequency response, impulse response, and transfer functions. [1,5] 4. To introduce mathematical concepts necessary to accomplish the above including convolution, Laplace transforms, and Fourier transforms. [1,5] 5. To use circuit and biomedical examples to motivate linear systems concepts. [1,11]
COURSE OUTCOMES	Links shown in brackets are to the course objectives. 1. Learn basic circuit and systems techniques necessary for understanding biomedical instrumentation systems, bioelectrical systems, and medical imaging systems. [1,3,5] 2. Develop an insight into systems analysis techniques motivated by development of electrical circuits concepts. [1-5] 3. Develop an insight into operational amplifier analysis and design techniques as motivated by a series of practical biomedical amplifier designs. [1,3,4] 4. Understand mathematical tools necessary for linear systems and circuit analysis and design. [1,3,4]

ASSESSMENT TOOLS	Links shown in brackets are to the course outcomes. 1. Closed book exams [1-4] 2. Comprehensive weekly homework assignments [1-4] 3. Classroom discussion and participation [1-4]