Course Title: Principles of Biomedical Engineering
Course Code: ETEG 321
Credit Hours: 3

Course Description:
This course provides an introductory understanding of the principles of signal transduction between biological entity and electronic systems.

Course Contents:

Unit 1: Introduction of bioelectronics and common biomedical devices
Overview of electrophysiology and bioelectronics; Introduction of wearable devices, Implantable devices, neural computer interfaces, human machine interfaces; Introduction of Electro-cardio-graphy (ECG), Electro-encephalo-graphy (EEG), Electro-myo-graphy (EMG)

Unit 2: Introduction of biosensors transducer
Types of transducers, principles and applications: Calorimetric, Optical, Acoustic, Potentiometric / Amperometric, Conductometric / Resistometric, Piezoelectric, Semiconductor; Impedimetric, Chemiluminiscene - based Biosensors; Application of biosensors in industry, healthcare, agriculture and environmental monitoring

Unit 3: Fundamental of biomedical signal processing and medical imaging system
Introduction of biomedical signal processing, digital filtering for biomedical application, Evoked potential estimation, elements of computer assisted biofeedback signal processing; Introduction of medical imaging systems

Unit 4: Electrical factor and safety consideration for bioelectronics devices and systems
Electrical factors: Uninterrupted power supply management techniques for intensive care units, elements of computerized real-time monitoring units, safety precautions and safety standard codes; Interference analysis, protection, grounding of ECG, EEG, EMG and therapeutic equipments.

Unit 5: Photo biology and laser technology for medical applications
Properties of laser, classification, basic concept, types, interaction with tissues, Introduction of photocoagulation, photo thermal ablation, photochemical ablation, photo disruption, Introduction of lasers technology used for medical applications: CO2, Ruby, Nd,YAG, Ar, Kr, He, Ne.

Unit 6: Telemetry
Radio telemetry, pneumatic transmission, syncro-position repeater system, data storage, an alternative to data transmission, telemedicine system for remote monitoring and diagnosis

Case study: Electrical properties of biomedical equipments and safety measures.

References:
1. Ruth Shinar and Joseph Shinar, *Organics Electronics in Sensors and Biotechnology*, Mc Graw Hill Education-Europe, 2009

2. Tompkins Wills J, *Biomedical digital signal processing*, Prentice Hall of India Pvt.Ltd. New Delhi.
3. Brian R Eggins, *Biosensors an Introduction* , First edition, John Wiley & Sons Publishers, 1996.
4. Khandpur R.S, *Handbook of Biomedical Instrumentation*, Tata McGraw, New Delhi,2004
5. Triphati K. N, *Optoelectronics, An introduction*, B.S. Publications.
6. Churchill, Baxter G. David, *Therapeutic laser, theory and practice*, Livingstone.

Evaluation:
In-Semester Evaluation: 50%
End-Semester Evaluation: 50%