ECE 56000 - Body Sensors and Body Communications Networks

Type of Course
Graduate Course

Catalog Description
Principles of the acquisition, communication, and processing of in-body and on-body signals. Design and implementation of Body sensors. Path-Loss modeling for on-body and in-body communications. Body sensor networks and topologies. Related communication protocols and Standards. Low Power sensors and signal processing. Multi-Sensor Fusion.

Credits
3

Contact Hours
1

Prerequisite Courses
ECE 302 Probabilistic Methods and ECE 362 Microprocessor Systems and Interfacing, OR equivalent courses, OR instructor approval

Textbook
No textbook. The course material is composed of a series of online slides and articles drawn from the scientific literature

Course Objectives
To learn a basic knowledge of body sensors, body path-loss models for wireless communications, body sensor networks, and the processing of signals generated by the human body.

Course Outcomes

Students who successfully complete this course will have demonstrated
1. Understanding of power, time, and frequency characteristics of signals present in the human body [1]
2. Understanding the design and interfacing of body sensors [1]
3. Understanding the electromagnetic propagation characteristics present in- and on-body communication paths [1]
4. Ability to compute path-losses for different scenarios [1]
5. Ability to carry out simple designs of antennas for in- and on- body transmission of signals [2]
6. Understanding of network topologies [1]

7. Understanding of IEEE standards applicable to body sensor networks [1]
8. Understanding the power consumption of body sensors [1]
9. Understanding the algorithms and software used to process signals collected by body sensors [1]
10. Ability to design and implement signal processing algorithms [1]

Lecture Topics
1. Characteristics of the human body as a signal generator and transmission medium
2. Design and implementation of on-body and in-body sensors
3. Body path-Loss characteristics and modeling for wireless communications
4. Body Area Networks
5. Communication Protocols
6. IEEE 802.15.1, IEE 802.15.3, IEEE 802.15.4, IEEE 802.15.6
7. Energy Scavenging
8. Low-Power sensors and Signal Processing
9. Multi-Sensor Fusion
10. Dimensionality Reduction and Feature Selection
11. Computer Usage
12. Medium

Laboratory Experience
None

Design Experience
Medium

Coordinator
Guoping Wang

Date
September 30, 2018