BSE 2004 – Introduction to Biological Systems Engineering

Credit / contact hours: 2 credits, 4 contact hours

Course instructor: Leigh-Anne Krometis (Fall); Graduate Teaching Scholar (Spring)

Textbook / materials: None (selected articles/chapters available on course canvas site)

Catalog description: Introduction to the fundamental concepts of Biological Systems Engineering, including statistics, heat and mass balances, protein separation, microbial metabolism, and enzyme kinetics. Engineering design process, engineering problem-solving tools and techniques, development of oral and written communication skills, and the importance of teamwork and ethics in Biological Systems Engineering.

Co-requisites: NA

Pre-requisites: ENGE1024 OR ENGE 1215 OR ENGE 1414

Course type: required

Specific outcomes of instruction:

- Apply the engineering code of ethics to resolve ethical dilemmas;
- Apply engineering principles and concepts to biological systems;
- Apply the engineering design procedure to solve problems in biological systems;
- Demonstrate effective teamwork skills; and,
- Demonstrate improved technical communication skills.

Student outcomes addressed by course:

- Outcome 1: an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- Outcome 2: an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- Outcome 3: an ability to communicate effectively with a range of audiences
- Outcome 4: an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
• Outcome 5: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

• Outcome 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

List of topics covered:

Professional Development
• Career Planning
• BSE research/career areas
• Engineering code of ethics

Experimental process
• Laboratory safety & best practices
• Scientific method
• Systematic vs random error
• Basic descriptive statistics

Technical writing/communication
• Written communication
• Team management
• Data management
• Use of tables, figures

Mass Balance
• Theoretical and experimental calculations
• % Recovery
• Energy balance

Engineering design
• Design process
• Design principles
• Constraints vs criteria