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