**BIOE 498/598 ST1 and STO - Surgical Technologies**

**Fall 2025 (8/20/2025)**

**Shuming Nie**

**Department of Bioengineering, University of Illinois at Urbana-Champaign**

**Office: Everitt Room 2116**

**Phone: 217-300-1044, email:** [**nies@illinois.edu**](mailto:nies@illinois.edu)

**In-Person Classroom: Everitt 2233**

**Synchronous Zoom:**

Zoom Lectures: BIOE498/598 ST1 and STO - Surgical Technologies

Time: Tue and Thu, 11:00 PM – 12:20 PM Central Time (US and Canada)

Join Zoom Meeting

https://illinois.zoom.us/j/81972032457?pwd=gbm62axDqbcCOFnk2wP6HVspZpsbzZ.1

Meeting ID: 819 7203 2457

Password: 233003

**Description:**

This is an in-depth elective course open to undergrad and grad students in the emerging areas of surgical and robotic technologies. It will cover a broad range of engineering principles, basic surgical techniques, as well as cutting-edge technologies for traditional, minimally invasive (laparoscopic), and robotic-assisted surgery. Key technologies will include intraoperative molecular imaging, medical robotics, artificial intelligence (AI), augmented reality (AR), and virtual reality (VR). Major clinical applications will include surgical oncology, thoracic surgery, and neurosurgery. For graduate and undergraduate students registered for the in-person ST1 sections, this course will further provide hands-on instructions and experiences (called hands-on sessions) for surgical incision, resection, suturing, laparoscopic surgery, image-guided detection and resection of phantom tumors, as well as the use of AI and AR technologies for surgery.

**Objectives**:

After completing this course, students will gain new knowledge and insights in the following areas: (1) integration of engineering principles and medical applications; (2) basic surgical techniques and practices; (3) cutting-edge technologies for image-guided, minimally invasive, and robotic surgery; (4) medical device regulations and clinical trials.

**Organization:**

1. **Basic Lectures**:  Background and fundamentals: in-person lectures, synchronous Zoom lectures, and recorded lectures/videos for asynchronous viewing.
2. **Invited Lectures**: Zoom or in-person lectures delivered by guest speakers (engineers, clinicians/surgeons, and industrial experts).
3. **Project Reports:** Small-group or individual projects for in-depth studies of major surgical procedures (such as mastectomy and lumpectomy) or cutting-edge technologies (such as robotic and image-guided surgery.

**Graduate students registered for 4 credit hours (BIOE 598 ST1 and STO) will be required to do more work and submit more advanced project reports, in comparison with BIOE498 undergraduate students (3 credit hours). Detailed instructions and requirements will be distributed in late November.**

**Detailed Course Outline:**

(1) Fundamentals of anatomy, physiology and pathology.

(2) Introduction to surgery: past, present, and future.

(3) Basic surgical techniques and current practices.

(4) Cutting-edge surgical technologies:

- Minimally invasive surgery (including laparoscopic surgery, endoscopic surgery, etc).

- Image guided surgery

- Robotic surgery

- Computer vision, 3D visualization, and surgical simulation.

1. Clinical practices – general and GI surgery, surgical oncology, thoracic surgery, and neurosurgery.
2. **Hands-on Sessions – There will be three hands-on sessions as follows:**

* **Hands-on Session #1: Surgical Incision, Suturing, and Stapling.**
* **Hands-on Session #2: Laparoscopic Surgery Training.**
* **Hands-on Session #3: Image-Guided Detection and Resection of Phantom Tumors.**
* **Hands-on Session #4: AR and VR Technologies for Surgery (tentative).**

Students registered for the in-person ST1 section are required to complete these hands-on training sessions and submit individual written reports. Online STO students do not need to complete these sessions, and do not need to submit reports. However, all students (ST1 and STO) are required to read and learn the materials posted on Canvas. The midterm quiz and the final exam will cover the hands-on session topics (such as surgical incision, suturing, stapling, laparoscopic surgery, and image-guided cancer surgery).

**Hours and Credits**: Two Lectures (1.5 hours each) per Week (Tue and Thu), 3-4 Credits.

**Classroom Location**: Everitt Room 2233

**Time:** 11:00 – 12:20 pm, Tue and Thu.

**Office Hour**: Everitt Room 2116, by individual appointments (Zoom or in-person)

**Course Materials:**

1. **Textbooks (Optional)**:

[**Surgical Technology – Principles and Practice,** 8th Edition, Saunders, 2021,](https://www.amazon.com/Surgical-Technology-Joanna-Kotcher-BSN/dp/0323394736/ref=sr_1_1?crid=30V1UHWSWM6IN&keywords=978-0323394734&qid=1680209531&s=books&sprefix=978-0323394734+%2Cstripbooks%2C65&sr=1-1) Author: J. K. Fuller, ISBN: **978-0323680189.**

**Surgical Technology for the Surgical Technologist: A Positive Care Approach**, Fifth Edition, AST, Cengage Learning, 2018.

1. **Reading Assignments and Online Videos** – Historical accounts, review articles, online videos of surgical procedures, and other special items of interests.
2. **Lecture Notes and Handouts** – In-class and electronic distribution.

**Online Learning Platforms:**

1. **Zoom –** for synchronous and pre-recorded lectures.
2. **Canvas will be the main online platform** for electronic distribution of lecture materials (including lecture notes, announcements, homework, video lectures, etc).
3. **Gradescope –** for submission of homework assignments, written exams, project reports, etc.

**Attendance:** In-person or synchronous online attendance is encouraged, but not required.

**Policy on ChatGPT and AI:** Follow university AI and academic integrity policies.

**Grading**: Homework, hands-on sessions, and related assignments (25%), final project reports (15%), mid-term quiz (20%), final written exam (40%).

**Final Grades**: Based on total weighted scores, not curved.