## SYSTEMS/SYNTHETIC/PHYS BIOLOGY (SSPB)

### SSPB 501 - PHYSICAL BIOLOGY

**Short Title:** PHYSICAL BIOLOGY  
**Department:** Systems/Synthetic/Phys Biology  
**Grade Mode:** Standard Letter  
**Course Type:** Lecture  
**Credit Hours:** 3  
**Restrictions:** Enrollment is limited to Graduate level students.  
**Course Level:** Graduate  
**Description:** Basic introduction to a biophysical view of living systems, from the subcellular to the multicellular scales. Topics include: biomolecular dynamics, cellular biomechanics, cell motility and cell division, calcium signaling, action potential propagation, and tissue organization. Cross-list: BIOE 502.

### SSPB 502 - INTRO COMPUTATIONAL SYSTEMS BIOLOGY: MODELING & DESIGN PRINCIPLES OF BIOCHEM NETWORKS

**Short Title:** INTRO SYSTEMS BIOLOGY MODELING  
**Department:** Systems/Synthetic/Phys Biology  
**Grade Mode:** Standard Letter  
**Course Type:** Lecture  
**Credit Hours:** 3  
**Restrictions:** Enrollment is limited to Graduate level students.  
**Course Level:** Graduate  
**Description:** The course summarizes techniques for quantitative analysis and simulations of basic circuits in genetic regulation, signal transduction and metabolism. We discuss engineering approaches adapted to computational systems biology and aim to formulate evolutionary design principles explaining organization of networks in terms of their physiological demands. We discuss biochemical simulation methodology and software as well as recent advances in the field. Topics include end-product inhibition in biosynthesis, optimality and robustness of the signaling networks and kinetic proofreading. More emphasis on recent advances in the field - paper reading and presentations. Cross-list: BIOE 552. Recommended Prerequisite(s): Basic knowledge of biochemistry, cell biology, linear algebra, and ordinary differential equations is expected.

### SSPB 503 - SYNTHETIC BIOLOGY

**Short Title:** SYNTHETIC BIOLOGY  
**Department:** Systems/Synthetic/Phys Biology  
**Grade Mode:** Standard Letter  
**Course Type:** Lecture  
**Credit Hours:** 3  
**Restrictions:** Enrollment is limited to Graduate level students.  
**Course Level:** Graduate  
**Description:** Design of biology at scales from molecules to multicellular organisms will be covered by lecture, primary literature, and student presentations. Students will write a research proposal at the end of the course. Cross-list: BIOE 508.

### SSPB 550 - GRADUATE SEMINAR

**Short Title:** GRADUATE SEMINAR  
**Department:** Systems/Synthetic/Phys Biology  
**Grade Mode:** Satisfactory/Unsatisfactory  
**Course Type:** Seminar  
**Credit Hour:** 1  
**Restrictions:** Enrollment is limited to students with a major in Systems/Synthetic/Phys Biology. Enrollment is limited to Graduate level students.  
**Course Level:** Graduate  
**Description:** Seminar course to introduce SSPB students to current research topics and activities in the systems, synthetic, and physical biology fields. Repeatable for Credit.

### SSPB 575 - INTRODUCTION TO RESEARCH

**Short Title:** INTRODUCTION TO RESEARCH  
**Department:** Systems/Synthetic/Phys Biology  
**Grade Mode:** Satisfactory/Unsatisfactory  
**Course Type:** Research  
**Credit Hours:** 2  
**Restrictions:** Enrollment is limited to students with a major in Systems/Synthetic/Phys Biology. Enrollment is limited to Graduate level students.  
**Course Level:** Graduate  
**Description:** Introduction of first-year graduate students to the research programs and laboratories of individual faculty members. Repeatable for Credit.

### SSPB 599 - GRADUATE TEACHING IN SSPB

**Short Title:** GRADUATE TEACHING IN SSPB  
**Department:** Systems/Synthetic/Phys Biology  
**Grade Mode:** Satisfactory/Unsatisfactory  
**Course Type:** Internship/Practicum  
**Credit Hour:** 1  
**Restrictions:** Enrollment is limited to Graduate level students.  
**Course Level:** Graduate  
**Description:** Supervised instruction in teaching systems, synthetic, and physical biology. Repeatable for Credit.

### SSPB 800 - GRADUATE RESEARCH

**Short Title:** GRADUATE RESEARCH  
**Department:** Systems/Synthetic/Phys Biology  
**Grade Mode:** Satisfactory/Unsatisfactory  
**Course Type:** Research  
**Credit Hours:** 1-15  
**Restrictions:** Enrollment is limited to students with a major in Systems/Synthetic/Phys Biology. Enrollment is limited to Graduate level students.  
**Course Level:** Graduate  
**Description:** Graduate students will conduct independent research/thesis project under the direction of their advisor. Repeatable for Credit.