Systems, Synthetic and Physical Biology (SSPB) is a new discipline that draws upon principles from physics, chemistry, engineering, and mathematics and integrates experimental biochemical, cell biological, and molecular genetics approaches with computational design, simulation, and modeling to anticipate the properties of complex and multiscale biological systems. The Graduate Program in SSPB represents a cooperative effort by faculty in the schools of Natural Sciences and the Engineering to provide training in this highly interdisciplinary field. This program is overseen by the Institute of Biosciences and Bioengineering (IBB) and overseen by an executive committee composed of members from any of the participating departments.

The interdisciplinary nature of the SSPB program allows students to achieve their graduate degree requirements by taking select classes from any of the participating departments and performing their dissertation research under supervision of any faculty associated with the program.

Systems, Synthetic, and Physical Biology does not currently offer an academic program at the undergraduate level.

**Master's Program**
- Master of Science (MS) Degree in the field of Systems, Synthetic, and Physical Biology*  

**Doctoral Program**
- Doctor of Philosophy (PhD) Degree in the field of Systems, Synthetic, and Physical Biology (ga.rice.edu/programs-study/departments:programs/engineering/systems-synthetic-physical-biology/systems-synthetic-physical-biology-phd)

*Although students are not normally admitted to a Master of Science (MS) degree program, graduate students may earn the MS as they work towards the PhD.

**Director**
Jonathan J. Silberg, BioSciences

**Professors**
Pedro J.J. Alvarez, Civil and Environmental Engineering
Gang Bao, Bioengineering
George N. Bennett, BioSciences
Cecilia Clementi, Chemistry
Michael W. Deem, Bioengineering
Lydia Kavraki, Computer Science
Marek Kimmel, Statistics
Anatoly B. Kolomeisky, Chemistry
Christy F. Landes, Chemistry
Herbert Levine, Bioengineering
Jianpeng Ma, Bioengineering
Frederick C. MacKintosh, Chemical and Biomolecular Engineering
Luay K. Nakhleh, Computer Science
Jose Nelson Onuchic, Physics and Astronomy
George Phillips, BioSciences
Ka-Yiu San, Bioengineering
Yousif Shamoo, Bioengineering
Peter G. Wolynes, Chemistry

**Associate Professors**
Matthew Bennett, BioSciences
Michael Diehl, Bioengineering
Ido Golding, Bioengineering
Oleg A. Igoshin, Bioengineering
Ching-Hwa Kiang, Physics and Astronomy
Michael H. Kohn, BioSciences
Robert M. Raphael, Bioengineering
Laura Segatori, Chemical and Biomolecular Engineering
Junghae Suh, Bioengineering
Jeffrey J. Tabor, Bioengineering

**Assistant Professors**
Caleb Bashor, Bioengineering
James Chappell, BioSciences
Xue Gao, Chemical and Biomolecular Engineering
Isaac Hilton, Bioengineering
Natasha Kirienko, BioSciences
Xaq Pitkow, Electrical and Computer Engineering
Jacob Robinson, Electrical and Computer Engineering
Lauren Stadler, Civil and Environmental Engineering
François St-Pierre, Electrical and Computer Engineering
Aryeh Warmflash, BioSciences
Han Xiao, Chemistry
David Zhang, Bioengineering

**Adjunct Professors**
Ramon Gonzalez, Chemical and Biomolecular Engineering
Amina A. Qutub, Bioengineering
Susan M. Rosenberg, Biochemistry & Cell Biology

For Rice University degree-granting programs:
To view the list of official course offerings, please see Rice's Course Catalog (https://courses.rice.edu/admweb/ISWKSCAT.cat?p_action=cata)
To view the most recent semester's course schedule, please see Rice's Course Schedule (https://courses.rice.edu/admweb/ISWKSCAT.cat)
**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.  
*Description:* Graduate course. Cross-list: BIOE 508. Students will write a research proposal at the end of the course.  

**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.  
*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 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.  
*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 504 - SYSTEMS BIOLOGY MODELING**
*Short Title:* 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.  
*Description:* Graduate course. Cross-list: BIOE 504. Recommended Prerequisite(s): Basic knowledge of biochemistry, cell biology, linear algebra, and ordinary differential equations is expected.

**SSPB 505 - 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.  
*Description:* Introduction of first-year graduate students to the research programs and laboratories of individual faculty members. Repeatable for Credit.

**SSPB 506 - 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.  
*Description:* Graduate students will conduct independent research/thesis project under the direction of their advisor. Repeatable for Credit.
Description and Code Legend

Note: Internally, the university uses the following descriptions, codes, and abbreviations for this academic program. The following is a quick reference:

Course Catalog/Schedule
- Course offerings/subject codes: Courses from various subjects may apply toward this program

Program Description and Code
- Systems, Synthetic, and Physical Biology: SSPB

Graduate Degree Descriptions and Codes
- Master of Science degree: MS
- Doctor of Philosophy degree: PhD

Graduate Degree Program Description and Code
- Degree Program in Systems, Synthetic and Physical Biology: SSPB

CIP Code and Description
- SSPB Major/Program: CIP Code/Title: 30.0101 - Biological and Physical Sciences

Classification of Instructional Programs (CIP) 2010 Codes and Descriptions from the National Center for Education Statistics: https://nces.ed.gov/ipeds/cipcode/