

STRUCTURAL AND COMPUTATIONAL BIOPHYSICS (SCB), CERTIFICATE

(Programs of Biology, Chemistry, Computer Science, Mathematics and Statistics, Molecular and Cellular Biosciences, and Physics)

Overview

This certificate is designed to meet the need for scientists and educators with broad, interdisciplinary training in the quantitative biological, biochemical, and biomedical sciences. Students who successfully complete the certificate and degree requirements will receive a certificate in Structural and Computational Biophysics, as well as the degree in the program in which they matriculate. The program is a collaboration among the programs of Biology, Chemistry, Computer Science, Mathematics and Statistics, Molecular and Cellular Biosciences and Physics.

Following matriculation and at least one semester of coursework in a participating program (currently Biology, Chemistry, Computer Science, Mathematics and Statistics, Molecular and Cellular Biosciences and Physics), students can apply for admission to this certificate program. Admission is initiated by meeting with the SCB program director. The student will then submit a letter of intent and a graduate transcript to their department representative or to their program director. The letter of intent should express the students interest in the program, a proposed plan of study, and how the program meets the students career and academic goals. Following favorable evaluation, applicants may be recommended for admission by the program director, with final approval determined by the Graduate School.

Students have access to state-of-the-art equipment and facilities in multiple departments, including the Wake Forest Structural Biology Facility (csb.wfu.edu (<http://csb.wfu.edu>)), the DEAC Linux cluster (deac.wfu.edu (<http://deac.wfu.edu>)), and well-equipped research laboratories in biophysics, biochemistry, and biomedical engineering.

The interdisciplinary certificate program in Structural and Computational Biophysics began in 2005. Information on the program and links to faculty research interests can be accessed at scb.wfu.edu.

Course Requirements

Students will follow the curriculum for the Graduate Program in which they are seeking a degree. Master degree students must be pursuing a thesis option. Fifteen hours in SCB-related courses including two hours in each of three areas below, one hour of discussion group for credit and two hours of journal club (the other six hours are in the students area of specialty). Coursework is deliberately flexible, and courses will be approved by program director. Students will successfully complete a course in scientific ethics (GRD 713/ GRD 714 recommended).

Student dissertation/thesis committee must have members from three different SCB associated departments. The dissertation/thesis must involve original, interdisciplinary research in the area of structural and computational biophysics or computational biology; broadly defined.

Courses of Instruction

Approved courses are listed below. Additional courses or substitutions may be approved by the program director. Course descriptions can be found under the department which administers the course.

SCB-Specific Courses

SCB 701. Structural and Computational Biophysics Journal Club. (1 h)

Seminal and current publications in structural and computational biophysics are read and discussed. P-Admission to the SCB graduate certificate program or POI.

SCB 710. Research Topics in Structural and Computational Biophysics. (1 h)

Lectures and discussions on research topics in the field of structural and computational biophysics and biology. Topics depend on the specialty of the instructors in a given semester. P-Admission to the SCB graduate certificate program or POI.

Curriculum Area 1. Chemistry/Biochemistry

General prerequisites: Two semesters of undergraduate chemistry and one semester of undergraduate biochemistry or molecular biology. Additional prerequisites may be required by course.

Code	Title	Hours
BIO 670	Biochemistry: Macromolecules and Metabolism	3
BIO 672	Advanced Molecular Biology	3
BIO 775	Microscopy for the Biological Sciences	4
BIO 779	Molecular Techniques in Evolution and Systematics	4
CHM 624	Medicinal Chemistry	3
CHM 641	Physical Chemistry	3
CHM 673	Biochemistry Protein and Nucleic Acid Structure and Function	3
CHM 676	Biophysical Chemistry	3
CHM 751	Biochemistry of Nucleic Acids	1.5-3
CHM 752	Protein Chemistry	1.5-3
CHM 753	Chemical Biology	3
CHM 755	Biomolecular Mass Spectrometry: Fundamentals and Applications	1.5-3
CHM 756	Biomolecular NMR	1.5
CHM 757	Macromolecular Crystallography	1.5
MCB 700	Analytical Skills	1
MCB 701	Molecular&Cellular Biosciences	1-6
MCB 711	Biological Systems&Structures	2

Curriculum Area 2. Physics

General prerequisites: Two semesters of undergraduate physics. Additional prerequisites may be required by course.

Code	Title	Hours
PHY 607	Biophysics	3
PHY 620	Physics of Macromolecules	3
PHY 625	Biophysical Methods Lab	1
PHY 685	Bioinformatics	3

Curriculum Area 3. Computer Science/Mathematics/Statistics

General computer science prerequisites: Programming in a high-level language. Additional prerequisites may be required by course.

Code	Title	Hours
CSC 621	Database Management Systems	3
CSC 631	Software Engineering	3
CSC 646	Parallel Computation	3
CSC 652	Numerical Linear Algebra	3
CSC/MST 655	Introduction to Numerical Methods	3
CSC 671	Artificial Intelligence	3
CSC 685	Bioinformatics	3
CSC 687	Computational Systems Biology	3
CSC 721	Theory of Algorithms	3
CSC/MST 753	Nonlinear Optimization	3
CSC/MST 754	Numerical Methods for Partial Differential Equations	3
CSC 775	Neural Networks	3
MST 605	Applied Multivariable Mathematics	3
MST 606	Advanced Mathematics for the Physical Sciences	3
MST 626	Numerical Linear Algebra	3
MST 652	Partial Differential Equations	3
MST 654	Discrete Dynamical System	3
MST 757	Stochastic Processes and Applications	3
PHY 635	Computational Physics	3
STA 611	Statistical Inference	3
STA 612	Linear Models	3
STA 652	Networks: Models and Analysis	3
STA 662	Multivariate Statistics	3
STA 663	Introduction to Statistical Learning	3

Faculty

Program Director Freddie R. Salsbury Jr

Professors Rebecca Alexander, Edward E. Allen, Ulrich Bierbach, Keith D. Bonin, James F. Curran, Larry W. Daniel, Martin Guthold, Thomas J. Hollis, David J. John, W. Todd Lowther, Daniel B. Kim-Shapiro, S. Bruce King, Douglas S. Lyles, Jed C. Macosko, Gloria K. Muday, James Norris, Fred W. Perrino, Leslie B. Poole, Freddie R. Salsbury Jr., Peter Santago, Stan J. Thomas

Associate Professors Paul Pauca, Brian W. Tague, William H. Turkett Jr.

Assistant Professors Adam Hall, Derek Parsonage