

Mathematical and Systems Modeling suggested curriculum

List of recommended courses fulfilling the Biomathematics program requirements. Some courses may not be offered in all years. Elective courses in Quantitative Reasoning and Biomedical Sciences can be satisfied with previous coursework. Please consult with Prof Tom Chou and Prof Van Savage.

Core Courses (16 units from the following):

BIOMATH 201 - Deterministic Models in Biology
BIOMATH 202 - Biological Systems: Structure, Function, Evolution
BIOMATH 203 - Stochastic Models in Biology
BIOMATH 204 - Biomedical Data Analysis

Math 134 - Systems of Equations
Math 151AB - Numerical Analysis
Math 170A/B/E/S - Probability and Statistics
Math 142 - Mathematical modeling OR CaSB 150: Biological Modeling OR Math 168: Introduction to Networks OR Math 136 PDEs
Math 266A- Applied Differential Equations OR Physics 231A: Math Methods in Physics

LS 7A-C (3 courses but only count towards 2 requirements)*
MCDB 144: Molecular Biology OR MCDB 165: Cell Biology OR Chem 153B: DNA, RNA, Proteins OR Chem 153C: Biosyn, Metabolism, Regulation OR MCDB 138: Developmental Biology OR MCDB 140: Cancer Cell Biology

*Opt out with undergraduate course equivalents

Quantitative Reasoning (24 units from following):

Mathematical modeling

BIOMATH 205 - Top Computational Algorithm
BIOMATH 206 - Introduction to Mathematical Oncology
BIOMATH 208 - Geometric Methods in Medical Imaging
BIOMATH 210 - Optimization Methods in Biology

Theoretical and Computational Courses:

Math 238AB - Dynamical Systems
Math 266A - Applied Ordinary Differential Equations
Math 266BC - Applied Partial Differential Equations
Math 266DE - Applied Differential Equations
Math 274BC - Perturbation Methods

Math 274A - Asymptotic Methods
231B - Methods of Mathematical Physics
231C - Methods of Mathematical Physics
259 - Theory of Applied Mathematics for Chemical Engineers

Math 270A: Mathematical Aspects of Sci. Computing: Techniques of Sci. Computing
Math 270BC: Mathematical Aspects of Sci. Computing: Comp. Linear Algebra
Math 273: Optimization, Calculus of Variations, and Control Theory
222A. Stochastic Modeling and Simulation of Chemical Processes
222B. Stochastic Optimization and Control
283C. Analysis and Control of Infinite Dimensional Systems

Stat 200A
Stat 200B
Math 275AB: Probability Theory
Math 275C: Stochastic Processes
Math 275E: Stochastic Particle Systems
215A. Statistical Physics
215B. Advanced Statistical Mechanics
M215D. Nonequilibrium Statistical Mechanics and Molecular Biophysics

M243L. Condensed Matter Physics of Cells
243M. Statistical Mechanics of Living Systems from Active Matter to Immune System
C286. Neurophysics: Brain-Mind Problem
C287A. Biological Physics I: Life at Rest
C287B. Biological Physics II: Life in Motion
201. Methods of Molecular Simulation
220. Advanced Mass Transfer
C246. Systems Biology: Intracellular Network Identification and Analysis
270. Principles of Reaction and Transport Phenomena

Biomedical Sciences (24 units from following)

215. Molecular and Cellular Foundations of Physiology
M229. Molecular Mechanisms of Host/Pathogen Interaction
261. Molecular and Cellular Immunology
C285. Immunology
224. Molecular Basis of Vascular Biology
228. Prokaryotic and Eukaryotic Gene Systems
M230B. Structural Molecular Biology
M234. Genetic Control of Development
C239. Molecular Basis of Plant Differentiation and Development
242. Topics in Neurobiology
M272. Stem Cell Biology and Regenerative Medicine
M202. Cellular Neurophysiology
M210. Molecular and Cellular Mechanisms of Neural Integration
215. Molecular and Cellular Foundations of Physiology
CM223. Neurobiology of Sleep

C226. Biological Clocks
C227. Neuroendocrinology of Reproduction
241. Neural Plasticity and Repair
C244. Neural Control of Physiological Systems
245. Neural Mechanisms Controlling Movement
270A. Modern Concepts in Physiology
270B. Modern Concepts in Physiology
CM259. Mechanisms of Gene Regulation
262. Biochemistry and Molecular Biology of Protein Translocation Systems
EEB 200B: Ecology
EEB C119A. Mathematical and Computational Modeling in Ecology
EEB C235. Population Genetics
EEB 168. Global Change Ecology
EEB 170. Animal Environmental Physiology