BS in Computational Biology – Curriculum Map EY 2019

1. Apply mathematical principles from calculus, discrete math, matrix algebra and probability and statistics to construct models of biological systems, analyze the efficiency and correctness of computational solutions and predict the inherent limitations of any computing system.
2. Apply the fundamentals of modern biology, chemistry and physics to biological systems on the cellular and molecular level and apply the principles of inheritance to the molecular and genomic level of these systems.
3. Produce sound, stable, well-organized computer programs that scale well, and design algorithms based on efficient data structures to a variety of computational contexts in order to meet specified goals.
4. Process biological, genomic and medical data by using machine learning techniques and computational tools on biological databases.
5. Construct mathematical/computational models of biological systems at differing scales, analyzing the strengths and weaknesses of these models, and explain the importance of computational modeling for driving biological experimentation.
6. Learn the fundamental laboratory techniques used in modern cell and molecular biology and the influence of computational methods on experimental design.
7. Acquire a skillset of canonical algorithms applied in modern biological research, demonstrate fluency in contemporary biomedical research topics and interpret primary research results in computational biology.
8. Identify the role of computational biology in biotechnology, pharmaceutical development, and medicine.
9. Communicate technical material effectively to technical and non-technical audiences.
10. Work both individually and in teams.
11. Recognize the social impact of computing and the attendant responsibility to consider the legal, moral and ethical implications of computing technologies.

OBJECTIVES / Program Requirements	1	2	3	4	5	6	7	8	9	10	11
07-128 First Year Immigration								•			
21-122 Integration & Approx.	•										
15-151 Math Foundations	•										
36-218 Probability for CS	•										
21-241/242 Matrix Algebra	•										
15-122 Imperative Computation	•		•								
15-251 Great Ideas in CS	•										
15-351 Algorithms & Adv Data Structs	•		•								
10-315 Machine Learning	•		•	•							
02-251 Great Ideas in CB	•		•	•			•	•			
02-261 Quant Cell and Molecular Bio Lab			•		•	•	•		•	•	
02-402 Comp Bio Seminar							•	•			
02-510 Comp Genomics	•	•	•	•			•	•			
02-512 Comp Methods for Bio Model/Simul	•	•	•		•		•	•			
2 Comp Biology Electives	•	•	•	•	•		•	•			
2 SCS Electives*	•	•	•	•							
09-105 Intro Mod. Chem. I		•							•		
33-121 Physics I		•							•		
03-121 Modern Biology		•							•		
03-221 Genome/Evolution/Disease	•	•									
03-232 Biochemistry I		•									
03-320 Cell Biology		•									
Biology Elective*		•		•			•				
First Year Writing									•		
Cognition,Choice,Behavior									•		•
Econ., Polit. & Social Inst.									•		•
Cultural Analysis									•		•
3 Humanities/Arts Elec.									•	•	•
Computing @ Carnegie Mellon											•

Color Key - General Education Requirements:
HUMANITIES/ARTS SCIENCE/ENGINEERING CMU
***Program Outcome coverage depends on selection of courses.**