Computational Neuroscience Track worksheet

(14 courses required or 15 for Honors)

Math and Statistics (3 courses)

- ☐ **1.** *Multivariable Calculus:* ***Math 19a****, Math 21a, 22a, 23b, 25b, 55b, Applied Math 21a, or 22b
- ☐ **2.** *Linear Algebra:* Math ***18/19b****, 21b, 22b, 23a, 25a, 55a, Applied Math 21b, or 22a
- ☐ **3.** Statistics 110

*** Not recommended** for students planning to take additional Math/Applied Math courses (or Modeling/Analysis electives with higher math pre-reqs).

Computer Science (2 courses)

- ☐ **4.** CS 50
- ☐ **5.** CS 51 or 61

Foundational Biology (2 courses)

- ☐ **6.** Any one of the following (courses with labs are underlined):

LS 1a or LPSA Chemistry, Molecular/Cell Bio, **LS 1b** Genetics, Genomics, Evolution **LS 2** Evolutionary Human Physiology and Anatomy, **HEB 1420** Human Anatomy **MCB 60** Cell Biology, **MCB 63** Biochemistry, **MCB 64** Cell Biology, **MCB 65** Physical Biochemistry, **MCB 68** Cell Bio & Microscopy **OEB 50** Population Genetics, **OEB 53** Evolutionary Biology **SCRB 50** Building a Body

- ☐ **7.** One approved 100-level HEB, MCB, OEB, or SCRB course (or any second course from the box above)

Neurobiology (5 courses)

- ☐ **8. Neuro 80: Neurobiology of Behavior**
- ☐ **9. Neuro 105, Neuro 115, Neuro 120, or Psych 1401**
- ☐ **10. Additional Quantitative Elective:**

APMTH 226: Neural Computation, **BME 130** Neural Control of Movement **BME 131:** Neuroengineering, **BME 129:** Intro to Bioelectronics **Neuro 105** Systems Neuroscience, **Neuro 115** Cellular Basis of Neuronal Function, **Neuro 120** Introductory Computational Neuroscience, **Neuro 130** Visual Recognition **MCB 131** Computational Neuroscience, **Neuro 140** Artificial and Biological Intelligence, **Neuro 141** Physics of Sensory Systems, **Psych 1401** Cognitive Computational Neuro **Psych 1406** Biological and Artificial Visual Systems, **Psych 1451** Debugging the brain

- ☐ **11. Advanced Neurobiology Course #1 –** Tutorial or Adv. Neuro. Elective: _____
- ☐ **12. Advanced Neurobiology Course #2 –** Adv. Neuro. Elective*:* _____

Modeling and Analysis (2 courses) Any two courses from our approved list**:**
https://www.mcb.harvard.edu/undergraduate/neuroscience/neuro-courses/?course-button=compneurotrack

- ☐ **13.** _____
- ☐ **14.** _____

Honors – optional

- ☐ **15. Neuro 91** Laboratory Research **or LS100** Experimental Research **or completion of a senior thesis**

Computational Track Electives: The following list of classes count as modeling/analysis electives for students on the Computational Neuroscience Track. Additional courses may be petitioned for approval.

APM 50: Intro to Applied Mathematics
APM 104: Series Expansions and Complex Analysis
APM 105: Ordinary and Partial Differential Equations
APM 107: Graph Theory and Combinatorics
APM 108: Nonlinear Dynamical Systems
APM 111: Intro Scientific Computing
APM 120: Applied Linear Algebra and Big Data
APM 232: Learning, estimation and control of Dynamical Systems

BME 110: Physiological Systems Analysis

CS 108: Intelligent Systems: Design and Ethical Challenges
CS 109: Intro to Data Science
CS 121: Intro to Theory of Computation
CS 124: Data Structures and Algorithms
CS 143: Computer Networks
CS 181: Machine Learning
CS 182: Artificial Intelligence
CS 187: Computational Linguistics

ENG-SCI/APM 115: Mathematical Modeling
ENG-SCI/APM 121: Intro to Optimization
ENG-SCI 155: Systems and Control
ENG-SCI 157: Biological Signal Processing

MCB 111: Mathematics in Biology
MCB 112: Biological Data Analysis
MCB 198: Advanced Math Techniques for Modern Biology
MCB 199: Statistical Thermodynamics and Quantitative Biology

Psych 2030: Bayesian Data Analysis

Stat 108: Computing Software
Stat 111: Theoretical Inference
Stat 115: Intro Computational Biology
Stat 117: Data Analysis in Modern Biostatistics
Stat 120: Introduction to Bayesian Inference and Applications
Stat 121: Data Science
Stat 131: Time Series
Stat 139: Linear Models
Stat 149: Generalized Linear Models
Stat 171: Stochastic Processes
Stat 185: Introduction to Dimension Reduction
Stat 195: Statistical Machine Learning
Stat 220: Bayesian Data Analysis