

Fall 2022 Course Syllabus: Biol432

Course Title:	Introduction to Computational Neuroscience
Textbook:	“An Introductory Course in Computational Neuroscience” by P. Miller – MIT Press (2018), 1 st edition, ISBN: 978-0262038256
Recommended Books:	<p>“Mathematical Foundations of Neuroscience” by G. B. Ermentrout & D. H. Terman – Springer (2010), 1st edition - ISBN: 978-0-387-87707-5.</p> <p>“Foundations of Cellular Neurophysiology” by D. Johnston & S. Wu – The MIT Press (1995) - ISBN: 0-262-100053-3.</p> <p>“Dynamical Systems in Neuroscience: The Geometry of Excitability and Bursting” by E. M. Izhikevich – The MIT Press (2007), 1st edition – ISBN: 0-262-09043-8.</p> <p>“Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems” by P. Dayan & L. Abbott – The MIT Press (2001) , 1st edition– ISBN: 0-262-04199-5.</p> <p>“Biophysics of Computation: Information Processing in Single Neurons” by C. Koch – Oxford University Press (1999) – ISBN: 0-19-510491-9</p>
Prerequisites:	NJIT Catalog or Permission by instructor
Website:	http://web.njit.edu/~horacio/IntroCompNeuro/IntroCompNeuroF22.html

Week	Topic	Assignment
1	Introduction to Mathematical and Computational Neuroscience Passive membrane properties – The passive membrane equation	See course website
2	Ordinary differential equations (ODEs): Review of analytical methods Ordinary differential equations (ODEs): Review of numerical methods and Matlab	“
3	Dynamics of the passive membrane The passive membrane equation	“
4	Integrate-and-fire models The Hodgkin-Huxley model	“
5	Hodgkin-Huxley type models with additional ionic currents The cable equation	“
6	Introduction to dynamical system methods for neural models Reduced one- and two-dimensional neural model	“
7	One-dimensional neural models: Phase-space analysis	“

8	Two-dimensional neural models: Phase-space analysis I	“
9	Two-dimensional neural models: Phase-space analysis II	“
10	Sub-threshold oscillations: Two and Three dimensional models Bursting	“
11	Synaptic dynamics	
12	Overview on network dynamics	“
13	Student Presentations	“
14	Student Presentations	“
15	Student Presentations	

IMPORTANT DATES	
FIRST DAY OF SEMESTER	Sep 6, 2022
LAST DAY TO ADD/DROP	Sep 12, 2022
THANKSGIVING RECESS	Nov 24-25, 2022
LAST DAY TO WITHDRAW	Nov 14, 2022
LAST DAY OF CLASSES	December 14, 2022
FINAL EXAM PERIOD	December 16-22, 2021

Grading Policy (tentative)

Assignment Weighting	
Homework, Quizzes, Mini Projects & Class Participation	40
Midterm Exam / Project	30
Final Project / Presentation	30

Tentative Grading Scale	
A	90 -- 100
B+	85 – 89
B	80 – 84
C+	75 – 79
C	70 – 74
D	60 – 69
F	0 -- 59

Course Policies: See course website

Prepared by Prof. Horacio G. Rotstein, May 12, 2022