Spring 2025 Course Syllabus: Biol436

Course Title:	Advanced Neuroscience Modeling
Textbook:	"Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems" by P. Dayan & L. Abbott – The MIT Press (2001) – ISBN: 0- 262-04199-5. "Introduction to Modeling Cognitive Process", by Tom Verguts – The MIT Press (2022) – ISBN 9780262045360
Recommended Books:	"An Introductory Course in Computational Neuroscience" by P. Miller – MIT Press (2018), 1 st edition, ISBN: 978-0262038256
	"An Introduction to Modeling Neuronal Dynamics" by C. Borgers - Springer (2017), 1st edition - ISBN 978-3-319-51171-9
	"Dynamical Systems in Neuroscience: The Geometry of Excitability and Bursting" by E. M. Izhikevich – The MIT Press (2007), 1 st edition – ISBN: 0-262- 09043-8.
	"Mathematical Foundations of Neuroscience" by G. B. Ermentrout & D. H. Terman – Springer (2010), 1 st edition - ISBN: 978-0-387-87707-5.
Prerequisites:	Biol635 or Permission by instructor
Website:	http://web.njit.edu/~horacio/Biol636/AdvancedCompNeuroS25.html

Week	Торіс	Assignment
1	Review of biophysical models of single neurons	See course website
2	Data analysis and spike-train statistics	
3	Biophysical (conductance-based) models of synapses and networks / Cognitive Models	"
4	Firing rate models of neuronal networks	"
5	Response of neurons to periodic inputs: resonance and entrainment / Synchronization / Central Pattern Generators	
6	Parameter estimation, model testing	
7	Synaptic plasticity and Homeostasis	<u> </u>
8	Learning	"
9	Memory	"
10	Decision making	
11	Reinforcement learning, unsupervised learning, Bayesian models	
12	Project development/presentations	"

13	Project development/presentations	۲۴
14	Project development/presentations	"
15	Project development/presentations	

IMPORTANT DATES			
FIRST DAY OF SEMESTER	Jan 21, 2025		
LAST DAY TO ADD/DROP	Jan 27, 2025		
SPRING RECESS	March 16-22, 2025		
LAST DAY TO WITHDRAW	April 7, 2025		
LAST DAY OF CLASSES	May 7, 2025		
FINAL EXAM PERIOD	May 10-16, 2025		

Grading Policy (tentative)

Assignment Weighting		
Class Projects	40	
Class Participation	20	
Final Project / Presentation	40	

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

Course Policies: See course website

Important Departmental and University Policies

- <u>Academic Integrity Code is Strictly Enforced</u>
- <u>Prerequisites Requirements are Enforced</u>
- <u>Attendance is Required in Lower-Division Courses</u>
- Exam Policies (No Make Up Exams and More)
- <u>Cell Phone and Pager Use Prohibited in Class</u>
- Drop Date is Strictly Observed
- <u>Complete DMS Course Policies (math.njit.edu/students/undergraduate/policies_math)</u>