Molecular Physiology of Cell Communication (MPCC) (CBNP 5036Q)

Description: This 4-credit course is required for PhD students in the Cell Biology, Neuroscience and Physiology (CBNP) track and is open to interested students in other tracks and to MD/PhD students. The course focuses on inter- and intra-cellular communication in physiology. The course covers fundamental mechanisms underlying intercellular signaling and intracellular signal transduction pathways, with emphasis on the roles of these processes in nervous and cardiovascular systems. At the end of the course, it is expected that students will have a broad understanding of the proteins and molecular mechanisms involved in cell communication. Classes will be led by faculty with extensive expertise in the subject matter, so students are encouraged to contact individual faculty to discuss subject material in greater depth or for help in understanding the material covered in class. Students are expected to actively participate in class discussions. Classes will be given in person and attendance is required.

Meeting Time: Mondays and Wednesdays: 2:00 PM to 3:50 PM

Location: MSB H-609 conference room

Recommended Textbooks: There are no required textbooks, however, these two texts may be helpful:
Principles of Neural Science, Kandel, Schwartz and Jessell
Molecular Biology of the Cell, Alberts et al.

Grading:
First exam: 50%
Second exam: 50%

Points (out of 100)	Letter grade
85-100	A
80-85	B+
70-80	B
65-70	C+
55-65	C

Exams: There will be two written exams and two oral tests. For the oral tests, the students will receive ahead of time a list of potential questions that they will be tested on. During the test, the course director will pick one or two questions for each student to answer. The oral tests are pass/fail and students will need to pass them to complete the course. If they fail, they will need to try again until they pass.

Written exams will be in class and open book (notes), but no access to the internet. The first exam will cover membrane physiology, ion channels, nerves, and synapses. The second will focus on intracellular signaling mechanisms. At the end of the course, students will have 1-2 weeks for remediation of written exams and oral tests. Students are encouraged to review exam answers with faculty to better understand the material. Please DO NOT share exam questions with future generations of MPCC students (you will be asked to sign a written agreement on that).

Review Sessions: There will be two sessions for reviewing lecture material before each oral/written exam. The lecturers will conduct these review sessions (~30 min for each lecture). The students are expected to come to these sessions with prepared questions and requests for clarification, as needed. After each written exam, there will be another review session where the course director and students go over the exam questions and the expected answers.

Professional & Academic Standards: Students are expected to observe and support high standards of honesty, integrity, and professional conduct in all aspects of education and research, as described in the Student Handbook https://njms.rutgers.edu/sgs/current_students/docs/2014/PhDHandbook.pdf. Professional conduct includes "arriving" on time for class, respecting the opinions of classmates and professors, following through on commitments and positive verbal and non-verbal communication. Students are expected to be present for the entire class period for each session. In case of absence due to illness, the course organizers must be informed before the class starts.

Course Director

Ioana Carcea, MD/PhD

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Course TA

Paula Diaz Munoz
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Lab: MSB H-517

2025 MPCC Course Schedule

Class	Date	Topic	Instructor
1	1/7/2026 (W)	Overview of Cell Communication in Physiology	Ioana Carcea
2	1/12/2026 (M)	Membrane Permeability and Ions	Andrew Harris
3	1/14/2026 (W)	Action Potentials	Andrew Harris
	1/19/2026 (M)	NO CLASS: MLK Holiday	
4	1/21/2026 (W)	Ion Channels, Transporters and Pumps, part I	Roman Shirokov
5	1/26/2026 (M)	Ion Channels, Transporters and Pumps, part II	Roman Shirokov
6	1/28/2026 (W)	Neurotransmitters and Neuromodulators – Synthesis, Packaging, Release	Ioana Carcea
7	2/2/2026 (M)	Ligand Gated Ion Channels & Metabotropic Signaling	Ioana Carcea
8	2/4/2026 (W)	Post-synaptic Potentials and Electrical Summation	Vanessa Routh
9	2/9/2026 (M)	Synaptic Plasticity	Vanessa Routh
10	2/11/2026 (W)	TRP, Mechanosensitive and Thermosensitive Channels	Tibor Rohacs
11	2/16/2026 (M)	Review I	Harris, Shirokov, Carcea
12	2/18/2026 (W)	Review II	Routh, Rohacs
13	2/23/2026 (M)	Oral test (pass/fail)	Course director and TA
14	2/25/2026 (W)	**EXAM 1**	
15	3/2/2026 (M)	**Review Exam 1 answers**	Course director and TA
15	3/4/2026 (W)	Calcium Signaling Mechanisms	Tibor Rohacs
16	3/9/2026 (M)	Axonal Transport and Cytoskeleton	Virgil Muresan
17	3/11/2026 (W)	Skeletal, Cardiac and Smooth Muscle; Excitation-Contraction	Lai-Hua Xie
18	3/16/2026 (M)	Mitochondrial Structure and Function	Debkumar Pain-
19	3/18/2026 (W)	Pharmacology Fundamentals & G Protein-Coupled Receptors	Paula Bartlett
20	3/23/2026 (M)	Receptor Tyrosine Kinases and Nuclear Receptors	Paula Bartlett
21	3/25/2026 (W)	Intercellular Signaling in Neuroinflammation	Stella Elkabes
22	3/30/2026 (M)	Intra- and Inter-cellular Signaling Mechanisms	Annie Beuve
23	4/1/2026 (W)	Review III	Rohacs, Muresan, Xie, Pain
24	4/6/2026 (M)	Review IV	Bartlett, Beuve, Elkabes
25	4/8/2026 (W)	Oral test (pass/fail)	Course director and TA
26	4/13/2026 (M)	**EXAM 2**	
27	4/15/2026 (W)	**Review Exam 2 answers**	Course director and TA
28	4/20/2026 (M)	**Oral test/Exam remediation**	
29	4/22/2026 (W)	**Oral test/Exam remediation**	
30	4/27/2026 (M)	**Oral test/Exam remediation**	
31	4/29/2026 (W)	**Oral test/Exam remediation**	

Course Faculty

Dr. Paula Bartlett (paula.bartlett@rutgers.edu)
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