

2025-2026 MCB Area of Interest Course Information

Neuroscience

Please check the University of Washington Time Schedule for the most updated course information.

Area Directors

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NOTE: To address the inter-disciplinary nature of Neuroscience and broad trainee backgrounds, curricula is categorized into three “Paths” (broad neuroscience training, disease focused, specialized courses). Each trainee is advised to review suggested elective courses across all paths to tailor their curricula.

I. Neuroscience Path One *(relevant for all trainees in neuroscience)*

I-A. FOUNDATIONAL COURSES

Foundational Course One:

Course Number: NEURO 501

Course Title: Introduction to Neurobiology

Instructor (s): Steven Carlson

Location (e.g., UW, FH, SLU): UW

Credits: 3.0

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-10. *Will be offered Autumn 2025.*

Schedule for 2025-26: Mon, Wed, Fri. 9:30-10:20 a.m.

Attributes (e.g., graded, lecture-based): Lecture-based

Sub Area (if applicable):

Synopsis: Survey of molecular, cellular, and developmental neuroscience, including gene regulation, the cytoskeleton, protein sorting in the secretory pathway, growth factors, and neurotransmitter receptors. Includes lecture discussion of original literature.

Instructions: Must email instructor for approval.

Foundational Course Two:

Course Number: NEURO 504 (offered jointly with P BIO 504)

Course Title: Biophysics of Nerve, Muscle, and Synapse

Instructor (s): Jane Sullivan

Location: UW

Credits: 3.0

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-10. *Will be offered Autumn 2025.*

Schedule for 2025-26: Mon, Wed, Fri. 10:30-11:20 a.m.

Attributes: Lecture-based

Sub Area (if applicable): Cell signaling

Synopsis: Introduces biophysical properties of nerve and muscle cells. Topics include intrinsic electrical properties of neurons, ion channels, receptor signaling, calcium signaling, contraction of muscles, and synaptic function.

OR

Course Number: NEURO 548 (offered jointly with P BIO 548)

Course Title: Molecular Mechanisms of Synaptic Plasticity

Instructor (s): TBD

Location: UW

Credits: 2.0

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-5, even years. *Will be offered in Spring 2026.*

Schedule for 2025-26: TBD

Attributes: Literature review, discussion

Sub Area (if applicable):

Synopsis: Discusses recent primary literature on the molecular mechanisms underlying structural and functional changes of dendritic spines and synapses in the mammalian brain as result of synaptic activity and experience.

I-B. ELECTIVE COURSES

Elective Course One:

Course Number: BIOEN 563

Course Title: Optogenetics

Instructor(s): Andre Berndt

Location: UW

Credits: 3.0

Quarter, Weeks, and Frequency: Winter, weeks 1-10. *Will be offered in Winter 2026.*

Schedule for 2025-26: Tues, Thurs. 8:30-8:50 a.m.

Attributes:

Sub Area (if applicable):

Synopsis: Overview of optogenetics, which utilizes light-activated ion channels and fluorescent proteins to control and monitor neuronal activity through remote light stimulation in intact brain tissue. Includes (1) molecular basis, (2) tools and instrumentation, (3) experimental design, and (4) application range of optogenetic

approaches. Builds a robust foundation for designing contemporary optogenetic experiments.

Elective Course Two:

Course Number: BIOL 519

Course Title: Data Science for Biologists

Instructor(s): N/A

Location: N/A

Credits: 4.0

Quarter, Weeks and frequency: Winter, weeks 1-10. ***Not currently offered.***

Schedule for 2025-26: N/A

Attributes:

Sub Area (if applicable):

Synopsis: Explores, analyzes, and visualizes biological data sets using scientific computing software. Focuses on the foundations of data wrangling, data analysis, and statistics, particularly the development of automated techniques that are reproducible and scalable to large data sets.

Elective Course Three:

Course Number: B STR 584

Course Title: Seminar in Neurogenesis

Instructor(s): Olivia Bermingham-McDonogh, Ajay Dhaka

Location: UW

Credits: 1.0

Quarter, Weeks, and Frequency: Autumn, weeks 5-10. *Will be offered in Autumn 2025.*

Schedule for 2025-26: Fri. 10:30-11:50 a.m.

Attributes:

Sub Area (if applicable):

Synopsis: Current research on process by which neurons are generated in the nervous system.

Instructions: Must email instructor for approval.

Elective Course Four:

Course Number: NEURO 503

Course Title: Cognitive And Integrative Neurobiology

Instructor (s): N/A

Location: N/A

Credits: 4.0

Quarter, Weeks, and Frequency course is offered: Dependent on department availability. ***Not currently offered.***

Schedule for 2025-26: N/A

Attributes: Lecture, Literature review, discussion

Sub Area (if applicable):

Synopsis: Discussion of higher neural processes like learning, memory, and decision making. Lecture and discussion of original literature, exercises in data analysis and quantitative reasoning.

Instructions: Must email instructor for approval.

Elective Course Five:

Course Number: NEURO 511

Course Title: Seminar in Advanced Neurobiology

Instructor (s): Paul Phillips, Garret Stuber

Location: UW

Credits: 2.0

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-10. *Will be offered in Autumn 2025.*

Schedule for 2025-26: Tues. 2:00-3:50 p.m.

Attributes: Literature review, discussion-based

Sub Area (if applicable):

Synopsis: Weekly faculty lectures, student presentations, and discussions of past and current scientific literature in neurobiology and behavior.

Instructions: Email neurogrd@uw.edu for add code.

Elective Course Six:

Course Number: NEURO 527

Course Title: Current Topics in Neuroscience

Instructor (s): Nikolai Dembrow

Location: UW

Credits: 1.0

Quarter, Weeks, and Frequency course is offered: Autumn, Winter, weeks 1-10. *Will be offered in Winter 2026.*

Schedule for 2025-26: Mon. 2:00-3:20 p.m.

Attributes: Literature review, discussion-based

Sub Area (if applicable):

Synopsis: Presentation and critical discussion of classic and contemporary impactful neuroscience research articles.

Instructions: Must email instructor for approval.

Elective Course Seven:

Course Number: PHCOL 531

Course Title: Genetic Analysis of Signaling Systems

Instructor(s): N/A

Location: N/A

Credits: 3.0

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-10, odd years.
Likely to be offered in Spring 2027.

Attributes: Lecture-based with literature review

Sub Area (if applicable):

Synopsis: Introduction to classic model organisms including plants, yeast, slime mold, flies, worms, fish, mice, and humans and a discussion of their use in current signal transduction research. A major focus will also be on developing a research grant proposal culminating in a mock study section in which student proposals are evaluated by their peers.

Instructions: Must email instructor for approval.

Elective Course Eight:

Course Number: PHCOL 573

Course Title: Signaling Systems Linked to Neuroinflammation

Instructor (s): Nephi Stella

Location: UW

Credits: 1.0

Quarter, Weeks, and Frequency course is offered: Autumn, Winter, weeks 1-10.
Will be offered in Winter 2026.

Schedule for 2025-26: TBD

Attributes: Literature review, discussion-based

Sub Area (if applicable):

Synopsis: Discussion of research strategies, methodologies, and literature related to neuroinflammation, microglial cell activation, and the cannabinoid signaling pathway. Emphasis on solving practical problem, data analysis, and presentation.

Instructions: Must email instructor for approval.

Elective Course Nine:

Course Number: PHCOL 583

Course Title: Kinase Signaling in Neurodevelopment and Disease

Instructor (s): Smita Yadav

Location: UW

Credits: 1.0

Quarter, Weeks, and Frequency course is offered: Autumn, Winter, weeks 1-10.
Will be offered in Winter 2026.

Schedule for 2025-26: TBD

Attributes: Literature review, discussion-based

Sub Area (if applicable):

Synopsis: Explores fundamental concepts in kinase mediated signaling pathways and their regulation of neuronal structure and function during development and disease. Current genetic and proteomic approaches to investigate kinase pathways will be examined. Principles of experimental design, data interpretation and analysis

will be discussed as graduate students present key findings of their individual research projects.

Instructions: Must email instructor for approval.

II. Neuroscience Path Two *(disease-focused courses)*

II-A. FOUNDATIONAL COURSES

Foundational Course One:

Course Number: NEURO 559

Course Title: Neurobiology of Disease

Instructor(s): N/A

Location: N/A

Credits: 3.0

Quarter, Weeks, and Frequency: *Not currently offered.*

Schedule for 2025-26: N/A

Attributes:

Sub Area (if applicable):

Synopsis: Introduces medically important neurological and psychiatric diseases and experimental approaches to understanding the basis for diseases and their treatments. Covers stroke, epilepsy, autoimmune diseases of the CNS, neurodegenerative diseases, autism, psychosis, anxiety disorders, and mood disorders.

II-B. ELECTIVE COURSES

Elective Course One:

Course Number: CONJ 556

Course Title: Drug Addiction: Mechanisms, Prevention, and Treatment

Instructor (s): Susan Ferguson

Location: UW

Credits: 2.0

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10, even years. *Will be offered in Winter 2026.*

Schedule for 2025-26: Thurs. 3:30-5:20 p.m.

Attributes: Literature and discussion based

Sub Area (if applicable):

Synopsis: Key advances, insights, methods, and challenges for our understanding of drug addiction from psychological, pharmacological, psychiatric, community prevention, legal, and neurodevelopmental perspectives. Enhances familiarity with the multidisciplinary approaches required to understand addiction as a disease.

Elective Course Two:

Course Number: PATH 513

Course Title: Mechanisms of Neurodegeneration

Instructor(s): Martin Darvas, Caitlin Latimer

Location: Harborview

Credits: 1.5

Quarter, Weeks, and Frequency: Autumn, weeks 5-10. *Will be offered in Autumn 2025.*

Schedule for 2025-26: Tues, Thurs. 9:00-10:20 a.m.

Attributes:

Sub Area (if applicable):

Synopsis: Introduction to the cellular and molecular mechanisms that underlie neurodegenerative diseases, including introduction to the normal development and anatomy of the central nervous system, a review of epidemiologic, genetic, and clinical research tools used in the investigation of these diseases, and a systematic review of the major neurodegenerative diseases.

Elective Course Three:

Course Number: PHCOL 505

Course Title: Endocrine Pharmacology

Instructor (s): Stanley McKnight, Yasemin Sancak

Location: TBD

Credits: 2.0

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-5, every year. *Will be offered in Spring 2026.*

Schedule for 2025-26: TBD

Attributes: Graded, Lecture

Sub Area (if applicable):

Synopsis: Consideration of the pharmacology of endocrine systems including the hypothalamic/pituitary regulatory peptides, glycoprotein hormones/growth factors, peptide and steroid hormones. Lecture, group discussion, and analysis of recent research.

Prerequisite: Organic chemistry, biochemistry, and introductory anatomy and physiology.

Elective Course Four:

Course Number: PHCOL 534

Course Title: Molecular Basis of Addictive Drug Action

Instructor (s): N/A

Location: N/A

Credits: 2.0

Quarter, Weeks, and Frequency course is offered: Autumn, 1-10, even years. *Likely to be offered in Autumn 2026.*

Schedule for 2025-26: N/A

Attributes: Literature, discussion-based

Sub Area (if applicable):

Synopsis: Advanced consideration and discussion of current research literature addressing the basis of opioid, psychostimulant, and cannabinoid effects on signal transduction events, electrical activity of neurons, and drug-motivated behaviors in animal models of human substance use disorder.

Prerequisite: PHCOL 512 or permission of instructor.

III. Neuroscience Path Three *(specialized courses)*

III-A. FOUNDATIONAL COURSES

Foundational Course One:

Course Number: PBIO 545 (offered jointly with NEURO 545)

Course Title: Quantitative Methods in Neuroscience

Instructor (s): Fred Rieke, Anitha Pasupathy, Wyeth Bair

Location: UW

Credits: 3.0

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10. *Will be offered in Winter 2026.*

Schedule for 2025-26: Mon, Thurs. 12:30-1:50 p.m. (Mon), 11:30 a.m. – 12:50 p.m. (Thurs)

Attributes: Literature review, computer exercises

Sub Area (if applicable): Biophysics, Neuroscience

Synopsis: Discusses quantitative methods applicable to the study of the nervous system. Revolves around computer exercises/discussion of journal papers. May include linear systems theory, Fourier analysis, ordinary differential equations, stochastic processes, signal detection, and information theory.

III.B. ELECTIVE COURSES

Elective Course One:

Course Number: CONJ 531

Course Title: Signaling Mechanisms in Excitable Cells

Instructor (s): William Zagotta

Location: UW

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-5. *Will be offered in Autumn 2025.*

Schedule for 2025-26: Mon, Wed, Fri. 10:30-11:20 a.m.

Attributes: Lecture-based

Sub Area (if applicable):

Synopsis: Mechanisms of cellular signaling, particularly in nerve and muscle. Electrical, chemical, and mechanical signaling in the cell that lead to processes such as electrical excitability, action potentials, and muscle contraction.

Prerequisite: Comprehensive undergraduate course in general biochemistry and molecular biology, or permission of instructor.

Elective Course Two:

Course Number: CONJ 532 (offered jointly with PHCOL 502)

Course Title: Signal Transduction from the Cell Membrane to the Nucleus

Instructor (s): Shao-En Ong

Location: UW

Credits: 2.0

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 6-10. *Will be offered in Autumn 2025.*

Schedule for 2025-26: Mon, Tues, Wed, Fri. 9:30-10:20 a.m.

Attributes: Lecture-based

Sub Area (if applicable):

Synopsis: Intracellular signaling pathways leading from cell membrane receptors to nucleus. Pathways activated by seven transmembrane receptors and G-proteins, insulin/PI3 kinase, MAPKs, and WNTs and mechanisms of signal termination. Cytokine/Jak/Stat signaling and role of subcellular localization in signal transduction.

Elective Course Three:

Course Number: CONJ 544

Course Title: Protein Structure, Modification and Regulation

Instructor (s): Barry Stoddard

Location: FH

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-5, every year. *Will be offered in Winter 2026.*

Schedule for 2025-26: Tues, Thurs. 1:30-2:50 p.m.

Attributes: Lecture, literature review, methods

Sub Area (if applicable): Structure

Synopsis: Overview of general principles of protein structure, including forces that contribute to folding and stabilization, followed by an extended coverage of the means by which protein structure and function are modified and regulated. Examples from recent developments in protein folding, processing, and allosteric regulation.

Prerequisite: Introductory biochemistry and cell biology.

Instructions: Contact graduateeducation@fredhutch.org for add code.

Elective Course Four:

Course Number: MCB 536

Course Title: Tools for Computational Biology

Instructor (s): Arvind "Rasi" Subramaniam

Location: FH

Credits: 3.0

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-10, every year. *Will be offered in Autumn 2025.*

Schedule for 2025-26: Tues, Thurs. 3:30-4:50 p.m.

Attributes: Graded, lecture, hands-on computational work

Sub Area (if applicable): Computational

Synopsis: Introduction to established best practices in computational biology. Learn to organize unstructured data into standard formats, transform data for statistical analyses, and visualize the transformed data. Learn workflows for reproducible research such as version control, project organization, and code documentation. Gain basic experience with Linux command line tools and the Python and R programming languages. Classes will involve hands-on learning through coding exercises, collaborative problem solving, and extensive use of online learning resources.

Instructions: Contact graduateeducation@fredhutch.org for add code.

Elective Course Five:

Course Number: PABIO 536 (offered jointly with PHG 536)

Course Title: Bioinformatics and Gene Sequence Analysis

Instructor(s): N/A

Location: N/A

Credits: 3.0

Quarter, Weeks and frequency: Spring, weeks 1-10. ***Not currently offered.***

Schedule for 2025-26: N/A

Attributes:

Sub Area (if applicable):

Synopsis: Nature and relevance of molecular sequence information, computer-based protein, and DNA sequence analysis, molecular sequence and genomic databases, and methods for database accession and interrogation.

Elective Course Six:

Course Number: PATH 558 (offered jointly MOLDMED 558)

Course Title: Integrative Omics

Instructor(s): N/A

Location: N/A

Credits: 1.5

Quarter, Weeks, and Frequency: Spring, weeks 1-10. ***Not currently offered.***

Schedule for 2025-26: N/A

Attributes:

Sub Area (if applicable):

Synopsis: Explores how to integrate genomic, transcriptomic, and proteomic approaches with state-of-the-art genetic engineering strategies to uncover a systems-level understanding of pathway interactions that regulate disease pathogenesis and complex phenotypes.

Elective Course Seven:

Course Number: PHCOL 505

Course Title: Endocrine Pharmacology

Instructor (s): Stanley McKnight, Yasemin Sancak

Location: TBD

Credits: 2.0

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-5, every year.

Will be offered in Spring 2026.

Schedule for 2025-26: TBD

Attributes: Graded, Lecture

Sub Area (if applicable):

Synopsis: Consideration of the pharmacology of endocrine systems including the hypothalamic/pituitary regulatory peptides, glycoprotein hormones/growth factors, peptide and steroid hormones. Lecture, group discussion, and analysis of recent research.

Prerequisite: Organic chemistry, biochemistry, and introductory anatomy and physiology.

Elective Course Eight:

Course Number: PHCOL 562

Course Title: Molecular Basis for Motivated Behavior

Instructor (s): Charles Chavkin

Location: UW

Credits: 1.0

Quarter, Weeks, and Frequency course is offered: Autumn, Winter, weeks 1-10.

Will be offered in Winter 2026.

Schedule for 2025-26: TBD

Attributes: Literature review, discussion-based

Sub Area (if applicable):

Synopsis: Discussion of research strategies and methodologies involved in the regulation of motivated behavior by understanding signal transduction and synaptic physiology. Emphasis on practical problem solving, data analysis, and presentation methods important to modern scientific work.

Elective Course Nine:

Course Number: PHCOL 579

Course Title: Genetic Regulation of Emotional Behavior

Instructor (s): Larry Zweifel

Location: UW

Credits: 1.0

Quarter, Weeks, and Frequency course is offered: Autumn, Winter, weeks 1-10.

Will be offered in Winter 2026.

Schedule for 2025-26: TBD

Attributes: Literature review, discussion-based

Sub Area (if applicable):

Synopsis: Provides background in the materials and methods used in the study of the genetic basis of learning and memory and neural circuit function achieved through discussion of current literature, data acquisition and analysis, and experimental design.

Instructions: Must email instructor for approval.