2025-2026 MCB Area of Interest Course Information

Developmental Biology, Stem Cells & Aging

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

Area Directors

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FOUNDATIONAL COURSES

Foundational Course One:

Course Number: CONJ 530
Course Title: Directing Stem Cells Toward Regenerative Medicine
Instructor (s): Hannele Ruohola-Baker
Location (e.g. UW, FH, SLU): SLU
Credits: 3.0
Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10. *Will be offered in Winter 2026.*
Schedule for 2025-26: Tues, Thurs. 10:00-11:20 a.m.
Attributes (e.g., graded, lecture-based): Lecture, literature review
Sub Area (if applicable): Stem Cells
Synopsis: An introduction to the rapidly developing field of human embryonic stem cells in regenerative medicine crossing all medical disciplines including ethics. Requires a strong background in biological sciences. After this class, the students should have a solid foundation on stem cell biology, epigenetic analysis and regulation of stem cells and human diseases connected to stem cell biology.

Foundational Course Two:

Course Number: CONJ 542
Course Title: Cell Biology of Development
Instructor (s): Dave Raible
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: Tues, Thurs. 1:00-2:20 p.m.
Attributes: Lecture, literature review
Sub Area (if applicable): Development

Synopsis: The goals of this course are:

- to introduce students to the cell biological mechanisms that mediate developmental processes
- to demonstrate the conservation of developmental processes across organisms and organ systems
- to encourage curiosity-driven questioning
- to enhance student skills required to analyze and interpret primary literature in cell and developmental biology, to develop presentation skills to communicate key ideas, and to write effective critiques of scientific literature

The course will focus on four topics that reveal how molecular processes within individual cells are coordinated across tissues to build structures. The instructors will introduce each topic through an explanatory lecture and then devote four sessions to the discussion of key papers in the field. The topics are:

1. how cytoskeletal and motor proteins create tensile forces that change cell shapes and alter tissue structures
2. how apical-basal polarity within cells contributes to the establishment and maintenance of tissue architecture
3. how cellular metabolism influences cell behaviors and differentiation
4. how these cell biological characteristics combine to influence collective cell migration
5. Students will read each paper, including the supplementary data, and be prepared to explain the logic, methods, results, and conclusions described therein. Students will participate in in-class discussions that will focus on novel findings within the papers and on questions that students propose based on their reading.

<u>Foundational Course Three:</u>

Highly recommended by MCB students
Course Number: MCB 522
Course Title: Developmental Basis of Human Disease
Instructor (s): Cecilia Moens
Location: FH
Credits: 3.0
Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10, even years*. Will be offered Winter 2026.*
Schedule for 2025-26: Tues, Thurs. 3:30-4:50 p.m.
Attributes: Lecture, literature review
Sub Area (if applicable): Development
Synopsis: Uses recent discoveries in human genetics to guide student learning about animal development. Explores the normal developmental function of genes that have been identified as causal in human developmental disorders such as skeletal dysmorphologies, ciliopathies, autism, and cancer.
Instructions: Contact graduateeducation@fredhutch.org for add code.

Foundational Course Four:

Course Number: PATH 517
Course Title: The Biology and Pathology of Aging
Instructor (s): Alex Mendenhall, Jessica Young
Location: SLU
Credits: 3.0
Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10. *Will be offered in Winter 2026.*
Schedule for 2025-26: Fri. 12:00-1:50 p.m.
Attributes: Lecture, literature review
Sub Area (if applicable): Aging
Synopsis: The students focus on learning about aging, either centered around the hallmarks of aging or some contemporary topic in aging. Students attend or listen to prerecorded lectures, discuss the topic of the lecture in class, perform peer review of a related paper, and discuss the peer review in groups. The peer review model we use is the eLife peer review model.

ELECTIVE COURSES

Elective Course One:

Course Number: BIOL 416
Course Title: Molecular Genetics of Plant Development
Instructor(s): N/A
Location: N/A
Credits: 3.0
Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-10. ***Not currently offered.***
Schedule for 2025-26: N/A
Attributes: Lecture, literature review
Sub Area (if applicable):
Synopsis: The major goal of this class is to convey the excitement and challenges of doing research in the dynamic field of plant developmental biology. This class will not be a complete survey of plant development, but rather we will take an in-depth look at a few selected areas of current research.
Prerequisite: BIOL 355 and either GENOME 361 or GENOME 371.
Note: Students must obtain approval from the MCB Co-Directors for this 400-level class to count toward their 18 graded credits.

Elective Course Two:

Course Number: BIOL 536
Course Title: Comparative Invertebrate Embryology
Instructor(s): TBD
Location: UW/Friday Harbor Labs
Credits: 9.0

Quarter, Weeks, and Frequency course is offered: Summer, weeks 1-10. *Will be offered in Summer 2026.*
Schedule for 2025-26: TBD
Attributes: Practical course, literature and methods
Sub Area (if applicable):
Synopsis: Evolutionary Development of Marine Invertebrates will use hands-on lab experience to introduce students to the great diversity of developmental modes and processes found among marine invertebrates. The course will bridge cell and molecular approaches with ecological and evolutionary approaches to provide an integrated view of animal development. The course is intended to serve both biologists who wish to understand diversity in modes of development for ecological and evolutionary studies, and cell and developmental biologists who wish to broaden their knowledge of embryos beyond the standard model systems.

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):
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: GENOME 553
Course Title: Advanced Genetic Analysis
Instructor(s): Phil Abitua
Location: UW
Credits: 1.5
Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-10. *Will be offered Spring 2026.*
Schedule for 2025-26: TBD
Attributes: Graded, discussion
Sub Area (if applicable):

Synopsis: Explores genetic analysis as a powerful approach for dissecting complex biological processes. Discusses methods for selectively removing, adding, or altering specific proteins, identify and order genes in a pathway, define protein function, determine tissue and temporal requirements for gene function, and distinguish among competing hypotheses to explain biological phenomena.
Prerequisite(s): GENOME 371, GENOME 551 or equivalent.
Capacity Limit: 20 – required for the GS first-year students. Remaining slots will be available on first-come, first-served basis.

Elective Course Five:

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):
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 Six:

Course Number: MCB 539
Course Title: Biological Basis of Neoplasia
Instructor(s): David MacPherson, Robert Eisenman
Location: FH
Credits: 3.0
Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-10. *Will be offered Spring 2026*
Schedule for 2025-26: Tues, Thurs. 3:30-4:50 p.m.
Attributes: Lecture, literature review
Sub Area (if applicable):
Synopsis: Introduces the major themes in research in the biology of neoplastic change. Covers principle molecular mechanisms responsible for tumor initiation and progression, with a specific emphasis on intracellular signaling, DNA repair, cell

cycle checkpoints, and loss of normal tissue homeostasis. The latest state of the art research in Cancer Biology will be presented by invited scientists, experts in their relevant field. The discussion meetings will concentrate on selected major papers in cancer biology and be presented and discussed by the students with help and guidance of the instructors.
Instructions: Contact graduateeducation@fredhutch.org for add code.

Elective Course Seven:

Course Number: PATH 511
Course Title: Topics in Experimental Pathology
Instructor(s): TBD
Location: TBD
Credits: 2.0
Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10. *Will be offered Winter 2026.*
Schedule for 2025-26: TBD
Attributes: Seminar, discussion, lecture
Sub Area (if applicable):
Synopsis: Students listen to invited speaker lectures on aging research and review and discuss related papers. Class sessions alternate between a lecture and a literature review.