2022-2023  MCB Area of Interest Course Information

Developmental Biology, Stem Cells & Aging

FOUNDATIONAL COURSES

Foundational Course One:

**Course Number**: CONJ 530
**Course Title**: Directing Stem Cells Toward Regenerative Medicine
**Instructor(s)**: Hannele Ruohola-Baker
**Location**: SLU
**Credits**: 3.0

**Quarter, Weeks, and Frequency course is offered**: Winter weeks 1-10, *will be offered in Winter 2023*

**Attributes**: lecture and literature review

**Sub Area (if applicable)**: Stem Cells

**Synopsis**: In this class we will discuss three topics: the recent findings on adult and embryonic stem cell classes and their niches, on epigenetic control of stem cells and stem cells in human disease. **Learning objectives**: 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, Phil Abitua
**Location (e.g. UW, FH, SLU)**: UW
**Credits**: 3

**Quarter, Weeks, and Frequency course is offered**: Autumn weeks 1-10, even-numbered years

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

**Foundational Course Three:**
- **Course Number:** MCB 522
- **Course Title:** The Developmental Basis of Human Disease
- **Instructor(s):** Cecilia Moens
- **Location:** FH
- **Credits:** 3.0
- **Quarter, Weeks, and Frequency course is offered:** Autumn weeks 1-10, odd-numbered years
- **Attributes:** lecture and literature review
- **Sub Area (if applicable):** Development

**Synopsis:** Rapid advances in human genetics have identified a host of new genes associated with rare human genetic disorders. In many cases, the functions of these genes have already been elucidated by developmental and cell biologists working in non-human model systems. This ten-week course will explore the intimate relationship between developmental biology and human disease, including both inherited genetic disorders and cancer. Each week we will choose a different human disorder whose underlying genetic cause has been discovered. We will then discuss how the causal gene or genetic pathway controls normal animal development. The second meeting of each week will be an opportunity for students to present papers from the literature to uncover specific mechanistic links between normal developmental gene functions and disease.

**Foundational Course Four:**
- **Course Number:** PATH 517
- **Course Title:** The Biology and Pathology of Aging
- **Instructor(s):** Jonathan An and Alex Mendenhall
- **Location:** UW
- **Credits:** 3
- **Quarter, Weeks, and Frequency course is offered:** Winter, weeks 1-10, will be offered in Winter 2023
- **Attributes:** lecture and 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):** Takato Imaizumi
- **Location:** UW
- **Credits:** 3.0
- **Quarter, Weeks, and Frequency course is offered:** Autumn, weeks 1-10, will be offered in Autumn 2022
Attributes: Lecture and Literature Review
Sub Area (if applicable): Course includes upper-level undergraduates
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. 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 519
Course Title: Data Science for Biologists
Instructor(s): Bing Brunton
Location: UW
Credits: 4.0
Quarter, Weeks and frequency: Winter, weeks 1-10, will be offered in winter 2023
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. Automated techniques are useful for image analysis because cells/tissues change shape during development; e.g., morphometric analysis.

Elective Course Three:
Course Number: BIOL/FHL 536
Course Title: Evolutionary Development of Marine Invertebrates
Instructor(s): Billie Swalla and Andreas Heyland
Location: UW/Friday Harbor Labs
Credits: 5.0
Quarter, Weeks, and Frequency course is offered: Summer, weeks 1-10
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 Four:
Course Number: CONJ 544
Course Title: Protein Structure, Modification and Regulation
Instructor(s): Stoddard, Campbell, Bradley
Location: FH
Credits: 1.5
Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-5, will be offered in winter 2023
Attributes: Lecture, Lit review and methods
Sub Area (if applicable):
Synopsis: Overview of general principles of protein structure, including forces that contribute to folding and stabilization (in week 1), followed by comparative presentation of the primary means by which protein structure and function are studied (NMR, Crystallography, CryoEM and Computational Structure Prediction and modeling) in weeks 2 through 5. The course is intended for molecular and cellular biology students without a background or ongoing research training or experience in structural analyses. The course will introduce students to the basic principles, differences and similarities between different approaches to structural analyses, and will use examples from the recent literature to learn how to evaluate and exploit such studies. Grading is based on participation, questions and answers, and a final writing assignment.

Elective Course Five:
Course Number: MCB 539
Course Title: Biological Basis of Neoplasia
Instructor(s): David MacPherson and Bob Eisenman
Location: FH
Credits: 3.0
Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-10, will be offered in Spring 2024
Attributes: Lecture and 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.

Elective Course Six:
Course Number: PATH 511
Course Title: Topics in Experimental Pathology: The Biology of Aging
Instructor(s): Jonathan An and Alex Mendenhall
Location: UW
Credits: 1.0
Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-10
Attributes: Seminar and Discussion
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.

GENERAL METHODS/PROFESSIONAL DEVELOPMENT (GM/PD) COURSES
GM/PD Course One:
Course Number: BIOL 540B
Course Title: Uncommon Leaders: Women in Black, Indigenous, People of Color in Science
Instructor(s): Billie Swalla
Location: TBA
Credits: 2.0

Updated October 2022
Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-5  
Attributes: Graded, Career development and methods  
Sub Area (if applicable):  
Synopsis: This course is to learn about Women and Black, Indigenous, People of Color in Science and how they have extra challenges to overcome because of their identity. The way that some people think about their science is different and can lead to new discoveries and insights. It is important that you delve into the person that you choose to study and also what is exciting and transformational about their science. We will work on Wikipedia pages for these scientists and you will contact them and hopefully be able to interview them.

GM/PD Course Two:  
Course Number: CENV 500  
Course Title: Communicating Science to the Public Effectively  
Instructor(s): Nicole Gregorio  
Location: UW  
Credits: 3.0  
Quarter, Weeks, and Frequency course is offered: Winter, will be offered in Winter 2023  
Attributes: Career development and methods  
Sub Area (if applicable):  
Synopsis: Whether you’re looking to give an unforgettable job talk, change a policymaker’s mind, or finally get your family to understand your research, the Engage course is a great professional development opportunity and learning experience. This is a discussion-based course for graduate students in the sciences that focuses on effective techniques for communicating science, with an emphasis on sharing your science with non-specialists. At the end of the quarter, each student will present a 20 minute public talk on their graduate research to be delivered during the 2023 Engage: The Science Speaker Series at Town Hall Seattle. In this course, students will:
• Develop and practice analogies to distill their research  
• Perfect their elevator pitches  
• Practice storytelling, audience consideration, and cultural competency  
• Play improv games to leverage improvisation as a public speaking tool  
• Engage in weekly readings and discussions  
• Hear from guest speakers on science communication  
Note: Space is limited in this course and it often fills quickly, with an extensive waitlist. An application process and expectation agreement must be completed by the student to be considered for the course. Please reach out to the instructor for more information.

GM/PD Course Three:  
Course Number: MCB 512  
Course Title: Scientific Speaking Seminar  
Instructor(s): Jihong Bai  
Location: FH  
Credits: 1.5  
Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-5, will be offered in 2023  
Attributes: Career development and methods  
Sub Area (if applicable):  
Synopsis: A crucial part of a scientific career is the ability to effectively deliver a research seminar. This course will focus on all aspects of giving a seminar and teach students how to introduce the research topic, how to make clear and effective slides, and how to explain
methods and data in a clear manner. Students will prepare their own research seminar throughout the course. Each week they will practice a part of it and receive feedback from other students and the instructors. By the end of the course, students will have an entire seminar about their thesis project prepared. The course will also give examples of good and bad seminars and help students learn how to communicate with non-scientists about their research.

GM/PD Course Four:

Course Number: MCB 543
Course Title: Logic Constructs and Methodologies of Biological Research
Instructor(s): Sandra Bajjalieh
Location: UW
Credits: 3.0
Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-10, will be offered in 2023
Attributes: Career development and methods
Sub Area (if applicable):
Synopsis: This course surveys the logic and methods of scientific practice from historical, practical, and sociological points of view. Topics covered include how the philosophy of science influences experimental approaches, how the demarcation between science and pseudoscience has evolved, how common cognitive biases lead to errors in judgement and interpretation, and how sociological factors impact scientific progress. After completing the course, students should understand and interface differently with science they encounter, papers they read, and their own projects.

GM/PD Course Five:

Course Number: MCB 560
Course Title: MCB Biotechnology Externship
Instructor(s): Celeste Berg
Location: TBA
Credits: 2.0
Quarter, Weeks, and Frequency course is offered: Summer, weeks 1-10
Attributes: Career development and methods
Sub Area (if applicable):
Synopsis: This externship program provides MCB students with the opportunity to gain firsthand research experience in biotechnology companies in the Puget Sound area. Applications are available in the early spring and reviewed by the Externship Program Director. Applications are submitted to participating companies to find a suitable match. This externship is only available during the summer between Year 1 and Year 2 to students who have completed 3 rotations and identified a dissertation laboratory. Students are supported by MCB for the summer quarter.

GM/PD Course Six:

Course Number: UCONJ 510
Course Title: Introductory Laboratory Based Biostatistics
Instructor(s): Lloyd Mancl
Location: UW
Credits: 2.0
Quarter, Weeks, and Frequency course is offered: Summer
Attributes: Lecture-based with assignments
Sub Area (if applicable):
Synopsis: Introduces methods of data description and statistical inference for experiments. Covers principles of design and analysis of experiments; descriptive statistics; comparison of
group means and proportions; linear regression; and correlation. Emphasizes examples from laboratory-based biomedical sciences, and provides demonstrations using standard statistical programs.