

2021-2022 MCB Area of Interest Course Information

Computational Biology

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

FOUNDATIONAL COURSES

Foundational Course One:

Course Number: MCB 536

Course Title: Tools for Computational Biology

Instructor (s): T. Bedford, J. Bloom, P. Bradley, G. Ha, E. Matsen, M. Setty, A.Subramaniam

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

Credits: 3

Quarter, Weeks, and Frequency course is offered: Autumn, every year

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

Sub Area (if applicable):

Synopsis: Introduces computational research methods to graduate students in biomedical science and related disciplines. Provides a survey of the most common tools and programming languages in the field. Students will gain foundational knowledge in reproducible computational science, including workflows and code documentation, and sufficient expertise that they can continue learning relevant tools to suit specific research interests. Classes will involve hands-on learning through coding exercises, collaborative problem solving, and extensive use of online learning resources.

Foundational Course Two:

Course Number: GS 541

Course Title: Introduction To Computational Molecular Biology: Molecular Evolution

Instructor (s): Bill Noble, et al.

Location: UW

Credits: 4

Quarter, Weeks, and Frequency course is offered: Spring, every year

Attributes: graded, lecture-based

Sub Area (if applicable):

Synopsis: Computational methods for studying molecular evolution. Students must be able to write computer programs for data analysis. Prior coursework in biology and probability are highly desirable.

Foundational Course Three:

Course Number: GS 560

Course Title: Statistics for Genome Sciences

Instructor (s): Devin Schweppe, Kelley Harris

Location: UW

Credits: 3

Quarter, Weeks, and Frequency course is offered: Spring, every year

Attributes: graded, lecture-based

Sub Area (if applicable):

Synopsis: Provides the key statistical concepts and methods necessary for extracting biological insights from data. In-class exercises and homework assignments are written in R.

ELECTIVE COURSES

Elective Course One:

Course Number: CSE 527

Course Title: Computational Biology

Instructor (s): Su-In Lee

Location: UW

Credits: 4

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-10, every year

Attributes: Lecture, graded

Sub Area (if applicable):

Synopsis: Introduces computational methods for understanding biological systems at the molecular level. Problem areas such as mapping and sequencing, sequence analysis, structure prediction, phylogenetic inference, regulatory analysis. Techniques such as dynamic programming, Markov models, expectation-maximization, local search.

Elective Course Two:

Course Number: STAT 509

Course Title: Econometrics I: Introduction to Mathematical Statistics

Instructor (s): Thomas Richardson

Location): UW

Credits: 4

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-10, every year

Attributes: Graded, lecture

Sub Area (if applicable):

Synopsis: Examines methods, tools, and theory of mathematical statistics. Covers, probability densities, transformations, moment generating functions, conditional expectation. Bayesian analysis with conjugate priors, hypothesis tests, the Neyman-Pearson Lemma. Likelihood ratio tests, confidence intervals, maximum likelihood estimation, Central limit theorem, Slutsky Theorems, and the delta-method

Elective Course Three:

Course Number: BIOL 519

Course Title: Data Science for Biologists

Instructor (s): Bing Brunton

Location: UW

Credits: 4.0

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10, every year

Attributes: Lecture, graded

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 Four:

Course Number: CSE 583

Course Title: Software Development for Data Scientists

Instructor (s): David Beck

Location: UW

Credits: 4

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-10, every year

Attributes: Lecture, graded

Sub Area (if applicable):

Synopsis: Provides students outside of CSE with a practical knowledge of software development that is sufficient to do graduate work in their discipline. Modules include Python basics, software version control, software design, and using Python for machine learning and visualization.

Elective Course Five:

Course Number: GS 540

Course Title: Introduction to Computational Molecular Biology: Genome and Protein Sequence Analysis

Instructor (s): Phil Green

Location: UW

Credits: 4

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10, every year

Attributes: Lecture, graded

Sub Area (if applicable):

Synopsis: Algorithmic and probabilistic methods for analysis of DNA and protein analysis. Students must be able to write computer programs for data analysis. Prior coursework in biology and probability is highly desirable.

Elective Course Six:

Course Number: CSE 512

Course Title: Data Visualization

Instructor (s): Jeffrey Heer

Location: UW

Credits: 4

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-10, every other year (last offered in Spring 2021)

Attributes: Lecture, graded

Sub Area (if applicable):

Synopsis: Techniques and algorithms for creating effective visualizations based on principles from graphic design, visual art, perceptual psychology and cognitive science. Topics: data and image models, visual encoding, graphical perception, color, animation, interaction techniques, graph layout, automated design. Lectures, reading and project.

GENERAL METHODS/PROFESSIONAL DEVELOPMENT (GM/PD) COURSES

GM/PD Course One:

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.

GMPD Course Two:

Course Number: MCB 533

Course Title: How to give a scientific 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 Three:

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 2022*

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.

GM/PD Course Four:

Course Number: MCB 560

Course Title: MCB Biotechnology Externship

Instructor(s): Nina Salama

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.