

DEVELOPMENTAL BIOLOGY (DBIO)

DBIO 199. Undergraduate Research. 1-18 Unit.

Students undertake investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

DBIO 200. Genetics and Developmental Biology Training Camp. 1 Unit.

Open to first year Department of Genetics and Developmental Biology students, to others with consent of instructors. Introduction to basic manipulations, both experimental and conceptual, in genetics and developmental biology.
Same as: GENE 200

DBIO 201. Cells and Signaling in Regenerative Medicine. 2 Units.

Conserved molecular and cellular pathways regulate tissue and organ homeostasis. Errors in these pathways result in human diseases. Manipulation of key cells and signals is leading to new strategies for stimulating tissue formation and regeneration. Topics: Stem cells. Molecules regulating stem cell proliferation and differentiation. Signaling pathways. Gene regulation. Embryonic stem cells. Programmed cell death. Cell lineage. Tissue regeneration. Use of stem cells in transplantation. Organoids. Emphasis on links between stem cells, signals, and clinically significant topics including diabetes, bone loss, cancer, and aging.

DBIO 210. Developmental Biology. 4 Units.

Current areas of research in developmental biology. How organismic complexity is generated during embryonic and post-embryonic development. The roles of genetic networks, gene regulation, organogenesis, tissue patterning, cell lineage, maternal inheritance, cell-cell communication, signaling, and regeneration in developmental processes in well-studied organisms such as vertebrates, insects, and nematodes. Team-taught. Students meet with faculty to discuss current papers from the literature. Prerequisite: graduate standing, consent of instructor. Recommended: familiarity with basic techniques and experimental rationales of molecular biology, biochemistry, and genetics.

DBIO 211. Biophysics of Multi-cellular Systems and Amorphous Computing. 2-3 Units.

Provides an interdisciplinary perspective on the design, emergent behavior, and functionality of multi-cellular biological systems such as embryos, biofilms, and artificial tissues and their conceptual relationship to amorphous computers. Students discuss relevant literature and introduced to and apply pertinent mathematical and biophysical modeling approaches to various aspect multi-cellular systems, furthermore carry out real biology experiments over the web. Specific topics include: (Morphogen) gradients; reaction-diffusion systems (Turing patterns); visco-elastic aspects and forces in tissues; morphogenesis; coordinated gene expression, genetic oscillators and synchrony; genetic networks; self-organization, noise, robustness, and evolvability; game theory; emergent behavior; criticality; symmetries; scaling; fractals; agent based modeling. The course is geared towards a broadly interested graduate and advanced undergraduates audience such as from bio / applied physics, computer science, developmental and systems biology, and bio / tissue / mechanical / electrical engineering. Prerequisites: Previous knowledge in one programming language - ideally Matlab - is recommended; undergraduate students benefit from BIOE 42, or equivalent.

Same as: BIOE 211, BIOE 311, BIOPHYS 311

DBIO 215. Frontiers in Biological Research. 1 Unit.

Students analyze cutting edge science, develop a logical framework for evaluating evidence and models, and enhance their ability to design original research through exposure to experimental tools and strategies. The class runs in parallel with the Frontiers in Biological Research seminar series. Students and faculty meet on the Tuesday preceding each seminar to discuss a landmark paper in the speaker's field of research. Following the Wednesday seminar, students meet briefly with the speaker for a free-range discussion which can include insights into the speakers' paths into science and how they pick scientific problems. Same as: BIOE 215, GENE 215

DBIO 219. Special Topics in Development and Cancer: Evolutionary and Quantitative Perspectives. 3 Units.

The course will serve as a literature-based introductory guide for synthesis of ideas in developmental biology and cancer, with an emphasis on evolutionary analysis and quantitative thinking. The goal for this course is for students to understand how we know what we know about fundamental questions in the field of developmental biology and cancer, and how we ask good questions for the future. We will discuss how studying model organisms has provided the critical breakthroughs that have helped us understand developmental and disease mechanisms in higher organisms. The students are expected to be able to read the primary literature and think critically about experiments to understand what is actually known and what questions still remain unanswered. Students will develop skills in the educated guesswork to apply order-of-magnitude methodology to questions in development and cancer. Same as: BIOE 219

DBIO 220. Genomics and Personalized Medicine. 3 Units.

Principles of genetics underlying associations between genetic variants and disease susceptibility and drug response. Topics include: genetic and environmental risk factors for complex genetic disorders; design and interpretation of genome-wide association studies; pharmacogenetics; full genome sequencing for disease gene discovery; population structure and genetic ancestry; use of personal genetic information in clinical medicine; ethical, legal, and social issues with personal genetic testing. Hands-on workshop making use of personal or publicly available genetic data. Prerequisite: GENE 202, Gene 205 or BIOS 200. Same as: GENE 210

DBIO 234. Elements of Grant Writing. 1 Unit.

Focus is on training first year graduate students in proposal writing. In an intensive 4-week period, students learn fundamental skills focused on scientific proposal writing, including writing and criticizing a proposal on the scientific topic of their choice. Students encouraged to use these new skills and the proposal they create to apply for external funding to support their research training. Students in the Genetics home program may enroll in this course with prior approval from the course director.

DBIO 273A. The Human Genome Source Code. 3 Units.

A computational primer to "hacking" the most amazing operating system "disk" on the planet: your genome. Handling genomic data is deceptively easy. But that's muscle. You want to be the brain, too. Topics include genome sequencing (assembling source code from code fragments); the human genome functional landscape: variable assignments (genes), control-flow logic (gene regulation) and run-time stack (epigenomics); human disease and personalized genomics (as a hunt for bugs in the human code); genome editing (code injection) to cure the incurable; and the source code modifications behind amazing animal adaptations. The course will introduce ideas from computational genomics, machine learning and natural language processing. Course includes primers on molecular biology, and text processing languages. Prerequisites: CS106A or equivalent. No biological background assumed. Same as: BIOMEDIN 273A, CS 273A

DBIO 299. Directed Reading in Developmental Biology. 1-18 Unit.

Prerequisite: consent of instructor.

DBIO 299C. CURRICULAR PRACTICAL TRAINING. 1 Unit.

CPT Course required for international students completing degree requirements.

DBIO 370. Medical Scholars Research. 4-18 Units.

Provides an opportunity for student and faculty interaction, as well as academic credit and financial support, to medical students who undertake original research. Enrollment is limited to students with approved projects.

DBIO 399. Graduate Research. 1-18 Unit.

Students undertake investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

DBIO 802. TGR Dissertation. 0 Units.

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