

MOLECULAR, CELLULAR, AND INTEGRATIVE BIOSCIENCES (MCIBS)

MCIBS 503: Critical Elements of Genetics and Molecular and Cellular Biology

4 Credits

Foundational topics and critical analysis in evolution, genetics, molecular and cellular biology and cell differentiation. BIOL (/BMMB/MCIBS/ VB SC) 503 Critical Elements of Genetics and Molecular and Cellular Biology (4) Central elements in genetics, genomics and molecular and cell biology will be covered. The course will focus on foundational principles and concepts that will allow students to understand the behavior of proteins and organelles within cells, and to appreciate how intracellular events influence interactions of cells with one another in multicellular systems and during development. Another major focus will be genome architecture, both in the context of evolution and gene expression. Students will also learn how genetic approaches can be used to understand cell and molecular biology, and will develop critical thinking skills through the analysis of the primary scientific literature. The course will include lecture and discussion sessions.

Cross-listed with: BIOL 503, BMMB 503, VBSC 503

MCIBS 511: Molecular Immunology

2 Credits

The study of molecular and biochemical events that influence immune responses and define current questions in immunology. BMMB 511 / MCIBS 511 / VBSC 511 Molecular Immunology (2) The goals of the course are to integrate the current questions of immunology with other disciplines, in particular cell biology and biochemistry, and to provide training in critical thinking and evaluation of data and experiments. The course will be approximately 2/3 lecture by the instructor and 1/3 student presentations of papers related to the material. In addition, written critical reviews of recently published papers and a short research proposal will be assigned. By focusing on the mechanisms involved in immunity and disease, this course complements several existing courses on immunology, virology, and biochemistry. The prerequisites of MICRB 410 and BMB 400 assure that the students enrolling in the course have a general understanding of immunology and biochemistry. This course is projected as an elective for the Molecular Medicine and Immunobiology focus areas in the MCIBS graduate program and for the Pathobiology and BMMB graduate programs. The course will be offered in the fall semester with an enrollment limit of 20 students

Prerequisite: B M B400 , MICRB410

Cross-listed with: BMMB 511, VBSC 511

MCIBS 530: Regulation of gene expression by xenobiotics

3 Credits

The course examines mechanisms by which foreign chemicals alter gene expression and techniques used to analyze these effects. MCIBS (VB SC) 530 Regulation of Gene Expression By Xenobiotics (3) The goals of the present course are to enhance the students' ability to read, design, implement and discuss studies focusing on how chemicals

regulate gene expression. Through the use of current research articles, the students will understand the principles of experimental design. They will learn critical reading skills as well as enhance their own research and problem solving abilities. In addition, an emphasis will be placed on presentation clarity and ability to defend scientific inquiry from peers. Thus students will develop critical communication skills. Each student will give several presentations during the semester (depending on the number of students enrolled), each based on a current journal article. All students are expected to read the article and participate in in-class discussions. This course requires a good understanding of biochemistry and molecular biology.

Cross-Listed

MCIBS 535: Oncology: Bench to Bedside

3 Credits

This course is required for graduate students in the MCIBS program who are in the Cancer Biology Emphasis Area. It is designed to give students who are studying cancer at a molecular, reductive level experience with the clinical aspects of the disease. The course will be held at Mt. Nittany Medical Center once a week for 3 hrs, in both patient-oriented, hands-on and didactic settings to understand how cancer is diagnosed, imaged, and treated, how patient care and side effects of therapy are managed, and the importance of clinical trials in developing new treatments for cancer. For each subject area students will spend 2 hours engaged in a clinical experience related to cancer under the supervision of course directors or additional clinicians at Mt. Nittany, followed by a 1 hour lecture/didactic session on a related topic. In addition to broad learning objectives, this course will make students aware of critical issues in cancer biology and treatment that may serve as a springboard for future research.

Prerequisite: MCIBS 503, MCIBS 590, BIOL 416; VBSC 534

MCIBS 541: Critical Analysis of Bioinformatics and Genomics Research Topics

1 Credits/Maximum of 2

A weekly review of current literature related to the area of bioinformatics and genomics research. MCIBS 541 Critical Analysis of Bioinformatics and Genomics Research Topics (1 per semester maximum of 2) Critical Analysis of Bioinformatics and Genomics Research Topics reviews the recent developments made in the understanding of basic genomics and bioinformatics research. This approach provides an insight into the topics that are shaping the current and future directions in a field that is rapidly evolving and literally transforming lives. Tutorials provide a comprehensive overview of the new and fundamental developments in genomics research and highlight the way in which genomic concepts are applied to basic biological processes. This course will provide insights into computational, evolutionary, and functional aspects of genomic sciences. Basic concepts that describe how life was organized and evolved and applications that promise huge advances in biomedical and biotechnological fields will be discussed. In addition to helping students develop critical oral and written presentation skills, this course is intended to kindle excitement about genomic research among graduate students and provide an intellectual framework for identifying potentially challenging and interesting questions that may be pursued.

MCIBS 551: Genomics

3 Credits

Structure and function of genomes including use of some current web-based tools and resources for studies and research in genomics. BMMB 551 / MCIBS 551 Genomics (3) This course will deal with the structure and function of genomes including the use of some current web-based tools and resources for studies and research in genomics. The overall objective is to learn current information about the structure and function of genomes, to develop facility in the many web-based tools and resources for further studies and research in genomics, and to appreciate the power and limitations of current resources and knowledge. This course is designed as a basic course for any student in the life sciences who needs to exploit the developments and tools in genomics in their own research and who wants to broaden their understanding of the current knowledge and research in the life sciences that are increasingly drawing on genomics advances. The course will be taught by a team of faculty (members active in genomics research and will be video-conferenced. Students' grades will be based on take home exams or assignments that require their understanding of the concepts in genomics and the hands-on use of web-based analysis tools, as well as on class discussion participation. Students will be assigned one or more projects, tutorials, problem sets or essays to complete. Reading assignments will further help students explore the materials, do the assignments and participate in classroom discussions.

Cross-listed with: BMMB 551

MCIBS 554: Foundations in Data Driven Life Sciences

3 Credits

Expanded overview of current developments and technique in computational biology and genomics. BMMB (MCIBS) 554 Foundations in Data Driven Life Sciences (3) The successful progression of data-driven biomedical research is obscured by a wide-range of logistical problems related to data handling and processing, a widespread disconnect between developers and consumers of biomedical analysis software, and lack of accessible, well-developed curricula and active learning opportunities necessary for the development of key data analysis skills in the next generation of researchers and clinicians. This course aims at filling these gaps. Topics include fundamental concepts that underpin analysis of sequence data, design of complex experiments, research transparency and reproducibility, as well as result dissemination practices relevant to presentations and publications.

Cross-listed with: BMMB 554, BIOS 554

MCIBS 555: Statistical Analysis of Genomics Data

3 Credits

Statistical Analysis of High Throughput Biology Experiments.

Cross-listed with: BIOL 555, STAT 555

MCIBS 556: Computation, Bioinformatics, and Statistics Practicum

3 Credits/Maximum of 999

Training in developing and implementing team research projects using high dimensional genomic data. CBIOS Practicum builds on fundamental knowledge of the literature and scientific process learned in MCIBS 541 Critical Analysis of Bioinformatics and Genomics Research Topic. Students will identify, plan, and implement actual research projects

involving high dimensional, complex "omics" data that are relevant to the biomedical sciences and of direct interest to the students enrolled and their mentors. Students will form teams and work on these projects throughout the semester, fostering interdisciplinary exchanges, the ability to work collaboratively in teams, and excellence in oral and written communication through presentations and reports. Various types of computational tools and statistical techniques will be discussed, utilized, and compared, based on students' background and choice of research projects. Students will be assessed based on the creativity of their team research project and the quality of its implementation. Assessment will involve progress presentations during the semester, as well as a final presentation and written report on the research project. Students will be evaluated on their ability to identify, plan, and implement the research projects and their understanding of biomedical, computational, and statistical concepts related to the projects, as well as their oral and written scientific communication skills.

Prerequisite: MCIBS 541

MCIBS 571: Current Issues in Biotechnology

2 Credits

Lecture-discussion series by academic and industry experts on the cutting-edge of science, business, intellectual property, legal, social, and ethical issues in biotechnology. The course also requires a group project, involving case studies or market research on various areas of biotechnology. MCIBS 571 Current Issues in Biotechnology (2) Lecture-discussion series by academic and industry experts on the cutting-edge of science, business, intellectual property, legal, social, and ethical issues in biotechnology. The course also requires a group project, involving case studies or market research on various areas of biotechnology.

MCIBS 589: Colloquium in Bioinformatics and Genomics

1-2 Credits/Maximum of 3

Colloquium in Bioinformatics and Genomics will be based on seminars by faculty, students, and outside speakers in the area of bioinformatics and genomics. Students will attend weekly seminars and listen to various faculty talks on broad research topics. Students will additionally meet either on a weekly (fall semester) or a bimonthly (spring semester) basis and review and discuss the talks attended.

MCIBS 590: Colloquium

1-3 Credits/Maximum of 3

Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.

MCIBS 591: Ethics in the Life Sciences

1 Credits

An examination of integrity and misconduct in life sciences research, including issues of data collection, publication, authorship, and peer review.

MCIBS 592: Current Research Seminar

2 Credits

This course uses a weekly biological seminar as a springboard for discussion of a research topic of high current interest.

MCIBS 593: Molecular Biology Laboratory

3 Credits

An intensive laboratory course on the principles and techniques of nucleic acid purification, analysis by restriction enzymes, gel electrophoresis, nucleic acid labeling and hybridization, cloning, sequencing, PCR amplification, and analysis of cloned heterologous gene expression by western blotting. MCIBS 593 Molecular Biology Laboratory (3) An intensive laboratory course on the principles and techniques of nucleic acid purification, analysis by restriction enzymes, gel electrophoresis, nucleic acid labeling and hybridization, cloning, sequencing, PCR amplification, and analysis of cloned heterologous gene expression by western blotting.

MCIBS 594: Research Topics

1-15 Credits/Maximum of 15

Supervised student activities on research projects identified on an individual or small-group basis.

MCIBS 595: Internship

1-18 Credits/Maximum of 18

Supervised off-campus, nongroup instruction, including field experiences, practicums, or internships. Written and oral critique of activity required.

MCIBS 596: Individual Studies

1-9 Credits/Maximum of 9

Creative projects, including nonthesis research, that are supervised on an individual basis and which fall outside the scope of formal courses.

MCIBS 597: Special Topics

1-9 Credits/Maximum of 9

Formal courses given on a topical or special interest subject which may be offered infrequently.

MCIBS 600: Thesis Research

1-15 Credits/Maximum of 999

No description.

MCIBS 601: Ph.D. Dissertation Full-Time

0 Credits/Maximum of 999

No description.

MCIBS 602: Supervised Experience in College Teaching

1-3 Credits/Maximum of 6

Supervised experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University.

MCIBS 610: Thesis Research Off Campus

1-15 Credits/Maximum of 999

No description.

MCIBS 611: Ph.D. Dissertation Part-Time

0 Credits/Maximum of 999

No description.