

# MOLECULAR & CELLULAR BIOLOGY (MCB)

## College of Biological Sciences

### MCB 010 – Introduction to Human Heredity (4 units)

*Course Description:* Topics in human heredity and human gene structure and function, including the genetic basis of human development, causes of birth defects, mental retardation, genetic diseases, sexual determination, development, and behavior.

*Learning Activities:* Lecture 3 hour(s), Discussion 1 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL).

### MCB 023 – Biography of Cancer: Past, Present & Future (3 units)

*Course Description:* Historical account of the progression of cancer treatment, prevention, and human understanding of the biological basis of cancer. Past, present and future social implications of cancer treatment and prevention. May be taught abroad.

*Learning Activities:* Lecture/Discussion 3 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE) or Social Sciences (SS); American Cultures, Governance, & History (ACGH); Scientific Literacy (SL); Writing Experience (WE).

### MCB 099 – Special Study (1-5 units)

*Course Description:* Special study.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Independent Study 3-15 hour(s).

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE).

### MCB 110Y – iBioseminars in Cell & Molecular Biology (3 units)

*Course Description:* Hybrid course in Cellular & Molecular Biology for senior level (1) Biochemistry/Molecular Biology; (2) Genetics; or (3) Cell Biology majors. Face-to-face instruction combined with online lectures available at iBioseminars website delivered by leading researchers in Cellular & Molecular Biology.

*Prerequisite(s):* BIS 101 or BIS 101V; BIS 102; (BIS 103 or BIS 105); BIS 104.

*Learning Activities:* Web Virtual Lecture 1.50 hour(s), Web Electronic Discussion 1.50 hour(s), Lecture/Discussion 2 hour(s).

*Credit Limitation(s):* Students who have previously taken MCB 110V cannot receive credit for MCB 110Y.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Scientific Literacy (SL).

### MCB 112 – Communicating Research in the Biological Sciences (3 units)

*Course Description:* Writing and communicating research concepts in the biological sciences for scientific audiences. Refining brief, informal, oral descriptions of research, writing documents required for graduate school applications, preparing conference posters, and drafting proposals for scientific fellowships.

*Prerequisite(s):* Consent of instructor; open to students with senior status and currently involved in laboratory research.

*Learning Activities:* Extensive Writing/Discussion 3 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE).

### MCB 115V – Introduction to Digital Data & Research Skills (3 units)

*Course Description:* Best practices in digital data management and basic computer skills necessary to optimally organize and analyze biological datasets. Reading and understanding scientific literature, developing workflows for data analysis, using data to derive conclusions and identify research questions and translating data-derived conclusions into visual communication products.

*Prerequisite(s):* BIS 101 C- or better (can be concurrent).

*Learning Activities:* Web Virtual Lecture 3 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL).

### MCB 120 – Molecular Biology & Biochemistry Laboratory Associated Lecture (3 units)

*Course Description:* Introduction to laboratory methods and procedures employed in studying molecular biology and biochemical processes. Lecture component for MCB 120L.

*Prerequisite(s):* BIS 102; or consent of instructor.

*Learning Activities:* Lecture 2 hour(s), Discussion/Laboratory 1 hour(s).

*Enrollment Restriction(s):* Pass One restricted to upper division Biochemistry & Molecular Biology majors; concurrent enrollment in MCB 120L required; on-time attendance for first lecture is mandatory.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Scientific Literacy (SL).

### MCB 120L – Molecular Biology & Biochemistry Laboratory (3 units)

*Course Description:* Introduction to laboratory methods and procedures employed in studying molecular biology and biochemical processes. Designed for students who need experience in use of molecular biology and biochemical techniques as research and analytical tools.

*Prerequisite(s):* BIS 102; or consent of instructor; must be taken concurrently with MCB 120.

*Learning Activities:* Laboratory 10 hour(s).

*Enrollment Restriction(s):* Pass One restricted to upper division Biochemistry & Molecular Biology majors; concurrent enrollment in MCB 120 required; mandatory on-time attendance for first lab.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL); Visual Literacy (VL).

**MCB 121 – Advanced Molecular Biology (3 units)**

*Course Description:* Structure, expression, and regulation of eukaryotic genes. Chromosome structure and replication; gene structure, transcription, and RNA processing; protein synthesis and translation control; development, immune system, and oncogenes.

*Prerequisite(s):* (BIS 101 or BIS 101V); (BIS 102 (can be concurrent) or BIS 105 (can be concurrent) or ABI 102 (can be concurrent)); BIS 102 or BIS 105 or ABI 102 can be concurrent although prior completion is recommended.

*Learning Activities:* Lecture 3 hour(s).

*Credit Limitation(s):* Not open for credit to students who have completed MCB 161.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL).

**MCB 123 – Behavior & Analysis of Enzyme & Receptor Systems (3 units)**

*Course Description:* Introduction to the principles of enzyme kinetics and receptor-ligand interactions with emphasis on metabolic regulation and data analysis. Topics include simultaneous equilibria, chemical and steady-state kinetics, allosteric enzymes, multireactant systems, enzyme assays, membrane transport and computer-assisted simulations and analyses.

*Prerequisite(s):* BIS 103.

*Learning Activities:* Lecture 3 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL).

**MCB 124 – Macromolecular Structure & Function (4 units)**

*Course Description:* In-depth investigation into protein and nucleic acid structure and thermodynamics and how these properties influence their biological functions. Key examples of important functional classes of these molecules are examined.

*Prerequisite(s):* BIS 102 C- or better; (BIS 101 or BIS 101V).

*Learning Activities:* Lecture 4 hour(s).

*Credit Limitation(s):* Not open for credit to students who have completed CHE 108.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE).

**MCB 126 – Plant Biochemistry (3 units)**

*Course Description:* The biochemistry of important plant processes and metabolic pathways. Discussion of methods used to understand plant processes, including use of transgenic plants.

*Prerequisite(s):* BIS 103 or BIS 105.

*Learning Activities:* Lecture 3 hour(s).

*Cross Listing:* PLB 126.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Scientific Literacy (SL).

**MCB 138 – Undergraduate Seminar in Biochemistry (1 unit)**

*Course Description:* Discussion of the historical developments of modern biochemistry or current major research problems.

*Prerequisite(s):* BIS 103.

*Learning Activities:* Seminar 1 hour(s).

*Repeat Credit:* May be repeated 2 time(s) when topic differs.

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE); Oral Skills (OL).

**MCB 139 – Undergraduate Seminar in Biochemistry (2 units)**

*Course Description:* Discussion of the historical developments of modern biochemistry or current major research problems.

*Prerequisite(s):* BIS 103.

*Learning Activities:* Seminar 2 hour(s).

*Repeat Credit:* May be repeated 2 time(s) when topic differs.

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE); Oral Skills (OL).

**MCB 140L – Cell Biology Laboratory (5 units)**

*Course Description:* Exercises illustrating the principles of cell biology with emphasis on light microscopy.

*Prerequisite(s):* BIS 104 (can be concurrent).

*Learning Activities:* Lecture 2 hour(s), Laboratory 6 hour(s), Discussion 1 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Oral Skills (OL);

Quantitative Literacy (QL); Scientific Literacy (SL); Visual Literacy (VL).

**MCB 142 – Advanced Cell Biology: Contractile & Motile Systems (4 units)**

*Course Description:* Advanced cell biology with emphasis on molecular, biophysical and cellular properties of contractile and motile systems.

*Prerequisite(s):* BIS 102; BIS 104 (can be concurrent); (MAT 016B or MAT 019B).

*Learning Activities:* Lecture 3 hour(s), Term Paper.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE).

**MCB 143 – Cell & Molecular Biophysics (3 units)**

*Course Description:* Physical chemical principles by which molecules form living, moving, reproducing cells. Physical nature of cytoplasm; molecular structure/bonding in macromolecules, macromolecular assemblies and protein machines. Physical techniques and modeling of cytoskeletal polymer-motor dynamics and function during intracellular transport, mitosis and motility.

*Prerequisite(s):* (BIS 101 or BIS 101V); BIS 102; BIS 103; BIS 104 strongly recommended.

*Learning Activities:* Lecture 3 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL).

**MCB 144 – Mechanisms of Cell Division (3 units)**

*Course Description:* The molecules and mechanisms that allow eukaryotic cells to coordinate cell growth, DNA replication, segregation of chromosomes and cell division.

*Prerequisite(s):* (BIS 101 or BIS 101V); BIS 102; BIS 104.

*Learning Activities:* Lecture 3 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Writing Experience (WE).

### MCB 145 – Assembly & Function of Cell Signaling Machinery (3 units)

*Course Description:* Molecular basis of cell signaling, including positioning of cellular machinery, components of various signaling pathways, and downstream effects of signaling on cell adhesion, cell differentiation, and programmed cell death.

*Prerequisite(s):* (BIS 101 or BIS 101V); BIS 102; BIS 104.

*Learning Activities:* Lecture 3 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE).

### MCB 148 – Undergraduate Seminar in Cell Biology (2 units)

*Course Description:* Student reports on current topics in cell biology with emphasis on integration of concepts, synthesis, and state-of-the-art research approaches. Reviews of literature and reports of undergraduate research may be included.

*Prerequisite(s):* Upper division standing in the biological sciences or a related discipline.

*Learning Activities:* Seminar 2 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE); Oral Skills (OL).

### MCB 150 – Developmental Biology (4 units)

*Course Description:* Analysis of the mechanistic basis for animal development with a focus on experimental evidence and the relevant fundamental experimental strategies. Fertilization and early development, morphogenesis and patterning, cell differentiation, regulation of cell proliferation and tissue growth.

*Prerequisite(s):* BIS 101 or BIS 101V.

*Learning Activities:* Lecture 4 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Scientific Literacy (SL).

### MCB 158 – Undergraduate Seminar in Developmental Biology (2 units)

*Course Description:* Student reports on current topics in cell biology with emphasis on integration of concepts, synthesis, and state-of-the-art research approaches. Reviews of literature and reports of undergraduate research may be included.

*Prerequisite(s):* Upper division standing in the biological sciences or a related discipline.

*Learning Activities:* Seminar 2 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE); Oral Skills (OL).

### MCB 160L – Principles of Genetics Laboratory (5 units)

*Course Description:* Laboratory work in basic and molecular genetics including gene mapping, isolation and characterization of mutants in eukaryotic model systems, reverse genetics, gel electrophoresis, recombinant DNA techniques, and PCR.

*Prerequisite(s):* BIS 101 or BIS 101V.

*Learning Activities:* Laboratory 6 hour(s), Lecture 2 hour(s), Discussion/Laboratory 1 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL); Visual Literacy (VL); Writing Experience (WE).

### MCB 162 – Human Genetics & Genomics (3 units)

*Course Description:* Human genome and genetic variation in human populations, molecular and genomic approaches in the practice of human genetics, epigenetic gene regulation, personal genetics and genomic medicine.

*Prerequisite(s):* BIS 101 or BIS 101V.

*Learning Activities:* Lecture 3 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL).

### MCB 163 – Developmental Genetics (3 units)

*Course Description:* Current aspects of developmental genetics. Historical background and current genetic approaches to the study of development of higher animals.

*Prerequisite(s):* MCB 121 (can be concurrent).

*Learning Activities:* Lecture 3 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE).

### MCB 178 – Undergraduate Seminar in Molecular Genetics (1 unit)

*Course Description:* Discussion of current topics in molecular genetics to show advanced applications of basic principles and to highlight professional career opportunities.

*Prerequisite(s):* (BIS 101 or BIS 101V); MCB 121 (can be concurrent); upper division standing, and completion or concurrent enrollment in MCB 121.

*Learning Activities:* Seminar 1 hour(s).

*Repeat Credit:* May be repeated 1 time(s) when topic differs.

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE); Oral Skills (OL).

### MCB 182 – Principles of Genomics (3 units)

*Course Description:* Fundamentals of genomics, including structural genomics, functional genomics, proteomics, and bioinformatics, focusing on the impact of these disciplines on research in the biological sciences. Social impacts of genomic research.

*Prerequisite(s):* BIS 101 or BIS 101V.

*Learning Activities:* Lecture 3 hour(s).

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE).

### MCB 185 – Computer Programming for Biologists (3 units)

*Course Description:* Introduction to computer programming specifically for biology majors. Programming projects have molecular biology and bioinformatic themes.

*Prerequisite(s):* BIS 101 C- or better or BIS 101V C- or better.

*Learning Activities:* Lecture/Lab 3 hour(s).

*Enrollment Restriction(s):* Pass One restricted to all undergraduate majors in the College of Biological Sciences.

*Credit Limitation(s):* Only two units of credit for students who have previously taken ECS 012 or ECS 032A or ECS 032AV or ENG 006.

*Grade Mode:* Letter.

*General Education:* Science & Engineering (SE).

**MCB 190C – Undergraduate Research Conference (1 unit)**

*Course Description:* Presentation and discussion of current research by faculty and students.

*Prerequisite(s):* MCB 193 (can be concurrent) or MCB 199 (can be concurrent); and consent of instructor; upper division standing; MCB 193 or MCB 199 required concurrently.

*Learning Activities:* Discussion 1 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE).

**MCB 191 – Introduction to Research (1 unit)**

*Course Description:* Various topics in molecular and cellular biology including biochemistry, genetics, and cell biology will be discussed, along with ways undergraduates can participate in research projects of faculty members.

*Prerequisite(s):* BIS 102 (can be concurrent); or consent of instructor.

*Learning Activities:* Seminar 1 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE).

**MCB 192 – Internship (1-12 units)**

*Course Description:* Technical and/or practical experience on and off campus, supervised by a member of the Section of Molecular and Cellular Biology faculty.

*Prerequisite(s):* Consent of instructor; completion of 84 units.

*Learning Activities:* Internship 3-36 hour(s).

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE).

**MCB 193 – Advanced Research (3 units)**

*Course Description:* Research project carried out under the supervision of a faculty sponsor. Discussion and analysis of results and proposed experiments on a weekly basis with faculty sponsor. May include presentation of a seminar to a research group.

*Prerequisite(s):* Consent of instructor; upper division standing; completion of an upper division Molecular Cellular Biology (MCB) laboratory course.

*Learning Activities:* Laboratory 6 hour(s), Discussion 1 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE).

**MCB 194 – Thesis Research (3 units)**

*Course Description:* Continuation of an intensive, individual laboratory research project in biochemistry, genetics, or cell biology culminating with the presentation of the work in a written thesis and in a seminar.

*Prerequisite(s):* Consent of instructor; 6 units of MCB 193 and/or MCB 199 with faculty director; senior standing.

*Learning Activities:* Independent Study 9 hour(s).

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE); Oral Skills (OL); Writing Experience (WE).

**MCB 194H – Research Honors (3 units)**

*Course Description:* Honors project. Continuation of an intensive, individual laboratory research project in biochemistry, genetics, or cell biology culminating with the presentation of the work in a written thesis and in a seminar.

*Prerequisite(s):* Consent of instructor; 6 units of MCB 193 and/or MCB 199 with faculty director; senior standing; GPA of at least 3.250.

*Learning Activities:* Independent Study 9 hour(s).

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE); Oral Skills (OL); Writing Experience (WE).

**MCB 197T – Tutoring in Molecular & Cellular Biology (1-5 units)**

*Course Description:* Assisting the instructor in one of the section's regular courses by tutoring individual or small groups of students in a laboratory, in voluntary discussion groups, or other voluntary course activities. May be taught abroad.

*Prerequisite(s):* Consent of instructor; upper division standing, completion of course to be tutored.

*Learning Activities:* Tutorial 2-6 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE).

**MCB 198 – Directed Group Study (1-5 units)**

*Course Description:* Directed group study. May be taught abroad.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Variable 1-5 hour(s).

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE).

**MCB 199 – Special Study for Advanced Undergraduates (1-5 units)**

*Course Description:* Special study for advanced undergraduates. May be taught abroad.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Independent Study 3-15 hour(s).

*Grade Mode:* Pass/No Pass only.

*General Education:* Science & Engineering (SE).

**MCB 248 – Seminar in Cell Biology (2 units)**

*Course Description:* Discussion of recent literature on the physical and chemical aspects of organization and function of living systems, topics of current interest in ultrastructure and function of cells. Organizational and functional properties of the molecular and cellular levels of biological systems.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Seminar 2 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Letter.

**MCB 258 – Seminar in Development (2 units)**

*Course Description:* Reports and discussion on embryology, morphogenesis, and developmental mechanisms.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Seminar 2 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Letter.



**MCB 259 – Literature in Developmental Biology (1 unit)**

*Course Description:* Critical presentation and analysis of recent journal articles in developmental biology.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Seminar 1 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Satisfactory/Unsatisfactory only.

**MCB 282 – Biotechnology Internship (7-12 units)**

*Course Description:* Research at a biotechnology company or interdisciplinary cross-college lab for a minimum of 3 months as part of the Designated Emphasis in Biotechnology Program.

*Prerequisite(s):* Consent of instructor; graduate standing.

*Learning Activities:* Internship 21-36 hour(s).

*Enrollment Restriction(s):* Open only to students participating in the Designated Emphasis in Biotechnology program.

*Grade Mode:* Satisfactory/Unsatisfactory only.

**MCB 290C – Research Conference (1 unit)**

*Course Description:* Presentations and critical discussions of faculty and graduate student research in molecular and cellular biology including biochemistry, genetics, and cell biology.

*Prerequisite(s):* Consent of instructor; graduate standing.

*Learning Activities:* Discussion 1 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Satisfactory/Unsatisfactory only.

**MCB 291 – Current Progress in Molecular & Cellular Biology (1 unit)**

*Course Description:* Seminars presented by guest lecturers on subject of their own research activities.

*Prerequisite(s):* Graduate standing or consent of instructor.

*Learning Activities:* Seminar 1 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Satisfactory/Unsatisfactory only.

**MCB 295 – Literature in Molecular & Cellular Biology (1 unit)**

*Course Description:* Critical reading and evaluation of current literature in molecular and cellular biology disciplines. Papers presented and discussed in detail.

*Prerequisite(s):* Consent of instructor; graduate standing.

*Learning Activities:* Seminar 1 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Satisfactory/Unsatisfactory only.

**MCB 298 – Group Study (1-5 units)**

*Course Description:* Group study.

*Prerequisite(s):* Consent of instructor.

*Learning Activities:* Variable 1-5 hour(s).

*Grade Mode:* Satisfactory/Unsatisfactory only.

**MCB 299 – Research (1-12 units)**

*Course Description:* Research.

*Learning Activities:* Independent Study 3-36 hour(s).

*Grade Mode:* Satisfactory/Unsatisfactory only.

**MCB 390 – Methods of Teaching (1 unit)**

*Course Description:* Practical experience in the methods and problems of teaching biochemistry/genetics/cell biology. Includes analysis of texts and supporting material, discussion of teaching techniques, preparing for and conducting discussion and laboratory sections, formulating examinations under supervision of instructor. Participating in the teaching program required for Ph.D.

*Prerequisite(s):* Consent of instructor; graduate standing.

*Learning Activities:* Discussion 1 hour(s).

*Repeat Credit:* May be repeated.

*Grade Mode:* Satisfactory/Unsatisfactory only.