MCDB & Neuroscience (MCDBN) graduate learning objectives and courses

**Introduction:** Students in the MCDBN PhD program take a 2-year series of courses that provides them the tools to critically evaluate the literature in their research discipline, design experiments that test specific hypotheses, gain deeper knowledge in their scientific specialty, and develop scientific writing & communication skills. After completing these courses, students continue to explore the research literature and develop presentation skills through journal clubs, seminar courses and an annual student seminar.

**Required first year courses:**

**Fall – Bios 524: Concepts in Biochemistry and Molecular Biology (5 credits)**

Students will:
- learn basic concepts in biochemistry and molecular biology
  - the synthesis, structure and function of proteins and nucleic acids
  - energetics and enzyme kinetics
  - information flow and the central dogma
- become familiar with a wide range of experimental approaches in molecular biology and biochemistry research
- achieve competence in understanding and critically evaluating the research literature, including:
  - identifying key experiments in a published paper
  - identifying key elements in published figures and tables
  - relating those elements to the hypothesis tested
- learn how genetic, molecular, and biochemical approaches are used to characterize biological mechanisms

**Spring – Bios 525 Topics in Cell Biology (5 credits)**

Students will:
- learn the molecular mechanisms that underlie crucial cellular processes
  - protein and membrane trafficking
  - cellular morphogenesis
  - transmembrane signaling
  - proliferation and cell death
- become familiar with various approaches and methodologies in cell biology research
- develop their ability to understand and critique the primary research literature in modern cell biology
- orally present and critically evaluate research papers
- design experiments to answer to current questions in cell biology

**Required second year elective** - Required elective selected by student and research advisor

**Options for required 3rd semester course in students research area may include:**

**Bios 526 Molecular and genetic analysis of development (3 credits)**

Students will:
- understand basic molecular and genetic mechanisms controlling development in various model systems.
- understand how genetic and molecular analyses are used to characterize development
- begin designing and writing research proposals
- learn how cells, tissues, and organisms get their shapes through a process called morphogenesis
Neus 501  Foundations of Neuroscience I (3 credits)
- understand key concepts and processes in neuroscience

**Advanced GPN or GCLS courses:**
[http://catalog.uic.edu/gcat/course-descriptions/neus/](http://catalog.uic.edu/gcat/course-descriptions/neus/)
- NEUS 483. Neuroanatomy (4 credits)
- NEUS 502 Foundations of Neuroscience II (3 credits)
- NEUS 527. Cellular and Systems Neurobiology (3 credits)
- NEUS 582. Methods in Modern Neuroscience (2 credits)

[http://chicago.medicine.uic.edu/education/masters_and_doctorate_programs/graduate_education_in_medical_sciences___g_e_m_s_/curriculum/course_descriptions](http://chicago.medicine.uic.edu/education/masters_and_doctorate_programs/graduate_education_in_medical_sciences___g_e_m_s_/curriculum/course_descriptions)
- GCLS 500 Physiology (3 credits)
- GCLS 501 Biochemistry (3 credits)
- GCLS 502 Molecular Biology (3 credits)
- GCLS 504 and GCLS 505 Research Methods I and II (1-3 credits)
- GCLS 511 Molecular Genetics (3 credits)
- BCHE 513 Structure of Biopolymers (3 credits)
- MIM 553 Molecular Biology of Cells and Viruses (2 credits)
- MIM 552 Molecular Microbiology - (2 credits)
- PHYB 586 Cell Physiology - (3 credits)
- PHYB 516 - Biochemistry and Physiology of Muscle Contraction
- PHYB 518 - Molecular, Cellular and Integrative Cardiovascular Physiology
- PHYB 540 - Ion Channels: Structure, Function, Pharmacology and Pathology
- GCLS 515 - Receptors & Cell Signaling

**Spring semester - second year - Bios 594 Scientific Writing and Integrity (2 credits)**

**3rd year and beyond**: At least 4 additional credits of Bios 594 seminar courses or additional 500-level courses