

## **Biology Graduate Course Descriptions**

All courses require that students have, as minimal prerequisites, one year of Biology courses on the undergraduate level. Additional prerequisites are noted in each course description. While a degree in Biological Sciences or its equivalent is an admission requirement for the graduate degree programs in Biology, not all courses require this extensive background. Certain courses will thus also be appropriate for graduate students in other fields who may not have undergraduate degrees in Biology.

### **503. INTRODUCTION TO NEUROSCIENCE**

This course is a broad overview of the field of neuroscience covering three levels of analysis: 1) molecular and cellular; 2) systems neuroscience; and 3) behavioral neuroscience. This course provides a common foundation in neuroscience for students planning further study or for those simply interested in learning about the area.

### **505. EXPERIMENTAL DESIGN and BIO-STATISTICS**

A survey of statistical methods used in biological research. Topics include parametric and nonparametric statistics, aspects of experimental design, and use of the computer in statistical analysis. Two lectures and one two-hour laboratory per week. Credit, three hours.

### **507. LABORATORY/FIELD TEACHING METHODS IN BIOLOGY**

A practical experience in planning, developing, organizing and conducting laboratory and field activities in the life sciences. Two two-hour class periods. Credit, three hours.

### **511. PHARMACOLOGY**

A study of how drugs are used to achieve therapeutic benefits. The mechanism of action of various drug types at the molecular, cellular and interactive-system levels will be addressed. Topics will include the basis for rationale uses of medically-relevant drugs in biological systems and detailing their effectiveness in various diseases and disorders. Focus will be on understanding the balance between pharmacodynamic, pharmacokinetic, and toxicological side-effects that underlies effective treatments.

### **515. MOLECULAR FOUNDATIONS of BEHAVIOR**

This course explores the broad and diverse spectrum of behaviors demonstrated by living things. The scope of this course is, taxonomically speaking, broad-based, although most of attention will be directed within the animal kingdom. The course will examine behaviors in both proximate and ultimate contexts and will include analysis of their mechanisms, origins, transmission, development, and significance. Thus it is clear that the study of behavior is multidimensional and embraces many primary biological arenas including anatomy, physiology, heredity, ontogeny, ecology, and evolution. Many approaches have been employed in the study of behavior. These include comparative and physiological psychology, neurobiology, ethology, behavioral ecology, and sociobiology. In this course our study will consider all of these elements, but the focus will concentrate on the ethological and ecological perspectives.

### **520. CELL BIOLOGY**

A study of cellular and subcellular biology. This is the first course in a series. Three-50 minute lectures. Prerequisites: Cell Biology 215; Molecular Biology 310; Genetics 210, or equivalent at graduate level.

### **521. MOLECULAR BIOLOGY**

Molecular biology can now be found in ALL areas of science, and is truly the study of life at the molecular level. This molecular biology course is rooted in the most basic understanding of life, at the molecular level. This is the second course in a series. Three-50 minute lectures. Prerequisites: Cell Biology 215; Molecular Biology 310; Genetics 210, or equivalent at graduate level.

**535. RESEARCH LAB ROTATION**

The student will spend at least 8 weeks participating in the ongoing research in each of two Biology research laboratories. In addition to becoming acquainted with the research project, the student becoming. The primary goal is to expand the research experience for the student while assisting in the selection of a Thesis project. Prerequisites - none.

**552. ENVIRONMENTAL EDUCATION WORKSHOP**

Opportunity for practical experience in development and implementation of environmental education concepts from pre school to adult. May be elected whenever offered. Credit, three hours per semester.

**555. POPULATION-ENVIRONMENT CURRICULUM, K-12**

The integration of a conceptual framework for population-environmental studies in school curriculum as a part of a program in environmental studies. Prerequisites: consent of instructor. Credit, three hours.

**590. PROFESSIONAL DEVELOPMENT WORKSHOP I**

The course focuses on developing professional skills and experiences by participation and presentation in workshops, seminars, grant writing, and research reviews.

**591. PROFESSIONAL DEVELOPMENT WORKSHOP II**

This course assigns credit for continued participation as described in 23-590 and for the student to identify a research advisor to initiate a faculty-supervised research leading to development and writing of a thesis project proposal.

**600. MOLECULAR ENDOCRINOLOGY**

This graduate level course is designed to (1) engage students in mastering a working knowledge of advanced principles in endocrinology, (2) broaden student comprehension and discussion of current topics in endocrinology, in particular current journal articles, and (3) develop experimental design / grant writing techniques relevant to endocrinology.

**603. STRATEGIES FOR EFFECTIVE TEACHING IN BIOLOGY**

This course provides an introduction to the principles and techniques of effective pedagogy as it applies to teaching in the life sciences. While the course is focused on college-level instruction, secondary school teaching will be considered. This course is required for graduate students planning to teach in DSU's biology department.

**604. SCIENTIFIC INTEGRITY**

This course provides an introduction to the principles of ethical conduct of research including scientific integrity and relevant human subjects and animal use regulations. The course will be taught using a case-study method where students will read and discuss situations that they might encounter in the practice of research.

**605. CELL MORPHOGENESIS**

Current topics related to basic processes of molecular aspects of differentiation and development in living cells. Prerequisite: Cell Biology. Two hours lecture, two hours lab. Credit, three hours.

**610. FUNCTIONAL NEUROANATOMY**

This course is designed for graduate students in the life sciences who are interested in becoming familiar with the structure and function of the vertebrate nervous system at both the gross and microstructure levels. The course will include computer exercises and microscopic examinations.

**611. ADVANCED GENETICS**

An in-depth exploration of principles of modern genetics as they apply to plants, animals, and micro-organisms ranging from the molecular to the population level. Prerequisite: A course in Genetics or permission of the instructor. Four hours lecture/laboratory. Credit, three hours.

**612. NEUROCHEMISTRY**

This course is designed for graduate students in the life sciences who are interested in learning the current state of scientific knowledge about neurotransmitters, their receptors and cellular effectors, and their relationship to disease. This course will help students understand the history and development of the current understanding of the chemistry of the nervous system by presenting

some of the experimental evidence on which the knowledge is based.

**621. ADVANCED MICROBIOLOGY**

The course will emphasize the role of micro-organisms in the diseases of man. The history of microbiology, and the anatomy, physiology, ecology, and applications of bacteria will be emphasized. Two one-hour lectures, one two-hour lab. Prerequisite: Microbiology/Bacteriology or consent of the instructor. Credit, three hours.

**622. THE PHYSIOLOGY OF EXCITABLE CELLS**

This course is designed for graduate students in the life sciences who are interested in learning the current state of scientific knowledge of the physiology of nerve, muscle and sensory cells. This course will help students understand this the history and development of the current understanding of excitable cell physiology by presenting some of the experimental evidence on which the knowledge is based.

**625. IMMUNOLOGY**

A study of cellular, humoral, and molecular aspects of immune reactions. There will be an introduction to immunobiology and immunochemistry. The use of antigen-antibody reactions will be emphasized. Prerequisite: (Microbiology or Bacteriology). Four hours of lecture and laboratory each week.

**631. CELL BIOCHEMISTRY/HISTOCHEMISTRY**

A comparative and correlative study of cellular chemistry as related to the physiological functions and metabolism of various tissues and organs from a diverse range of vertebrates. Some human biomedical correlations will be included. Demonstrations and laboratory exercises. Two lectures and one two-hour laboratory per week. Prerequisites: Histology and organic chemistry or biochemistry, or the consent of the instructor. Credit, three hours.

**635. METHODS IN EXPERIMENTAL BIOLOGY**

An introduction to the history, development, theory and practical application of a variety of techniques (simple and sophisticated) in quantitative and qualitative biochemical analysis. In depth emphasis will be given to techniques such as chromatography, densitometry, and in situ and in vitro enzymology. This course is intended to provide laboratory experience in selective aspects of modern biotechnology and their applications in bioassays. Prerequisites: Consent of the instructor. Four hours of lectures/laboratory per week. Credit, three hours.

**650. BIOLOGICAL MECHANISMS**

An integration of the molecular and cellular functions within a cell and how these relate to overall system operations. The course will emphasize regulatory, homeostatic, and biochemical approaches to understanding cell function. Three-50 minute lectures. Prerequisites: Cell Biology 215; Molecular Biology 310; Genetics 210, or equivalent at graduate level.

**651. PROTEINS: STRUCTURES AND MOLECULAR PROPERTIES**

This course will examine the chronological events in the life of a protein. These events include protein composition, biosynthesis, and molecular dynamics. Evolutionary aspects of ancestral proteins will be used to explore the origins of contemporary primary structures. A laboratory will be included to examine the various protein separation schema that are currently used in modern molecular labs. Background in genetics, molecular and cell biology required. Credit, three hours.

**666. BIOTECHNOLOGY**

A series of lecture presentations featuring speakers from academics and industry in the expanding field of Biotechnology. An extensive research paper will be required of each study. Credit, 3 hours.

**689. PROBLEMS IN BIOLOGY**

An in-depth individualized literature investigation of a research problem conducted under supervision of advisor. Includes use of library, integrating data from various sources and conceptual thinking to produce a final Review paper. The outcome will be reviewed by a faculty Committee and the student must pass a comprehensive examination. Prerequisites: Graduate Biology student in MA program, typically second year

**690, 691, 692. THESIS RESEARCH**

An in-depth individualized investigation of a research problem conducted under close supervision of the thesis advisor. Includes training in experimental techniques, problem design, testing, data collection, data analysis, and preparation of thesis. University

and departmental guidelines are to be followed in preparing and defending the thesis. It is expected that the research will be of sufficient quality to be published as a scholarly paper coauthored by the thesis advisor in an appropriate refereed journal. Typically three credit hours each, but may be taken for 1 to 6.

### **698. THESIS SUSTAINING**

An in-depth individualized literature investigation of a research problem conducted under supervision of advisor. Includes use of library, integrating data from various sources and conceptual thinking to produce a final Review paper. The outcome will be reviewed by a faculty Committee and the student must pass a comprehensive examination. Prerequisites: Graduate Biology student in MA program, typically second year.

### **700. CURRENT TOPICS I**

This course will be a combination of presentations in both “Journal Club” and “lab meeting” format. Students will make presentations and discuss primary literature describing new and exciting scientific advances in the field of neuroscience. At least once each semester students will also make a presentation and lead a discussion about their own research project.

### **701. CURRENT TOPICS II**

This course is a continuation of 23-700 that is offered in spring semester.

### **800. DISSERTATION RESEARCH**

This course is for students who have advanced to candidacy in a PhD program in the Department of Biological Sciences and who are working on their dissertation research under the supervision of a faculty mentor.

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