

DEPARTMENT OF BIOLOGICAL SCIENCES

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Violetta Williams, Ph.D., Chairperson and Professor of Biology

MASTER OF SCIENCE IN BIOLOGY

Program Description

This curriculum is designed primarily to accommodate students who wish to pursue a Master of Science (M.S.) degree in Biology. This program supports a broad range of student needs and interests. This program will serve students who wish to pursue advanced study towards a doctoral degree or prepare for a professional career.

Mission Statement of Master of Science in Biology Program

The mission of the Master of Science degree in Biology is to equip students with advanced scientific knowledge and skills necessary to pursue doctoral programs and professional careers in biological sciences. The M.S. program in biology consists of classroom instruction at an advanced level, along with mentored scholarly pursuit of new knowledge leading to the preparation of a thesis document or a special project paper. The graduate program intends to prepare creative scientists with a good theoretical background, training in research techniques, and communication skills required to disseminate the research results including the significance of such research work in relation to the human environment.

Student Learning Outcomes / Objectives

A student completing a Master of Science in Biology will:

- Broaden his/her knowledge in a discipline related to his/her thesis research.
- Be able to state clearly the research goals or objectives, hypothesis, and explain the significance of his/her planned thesis research work.
- Organize and interpret the results generated from his/her research in a thesis consistent with the guidelines set by ASU's Office of Graduate Studies.
- In case of Non-Thesis, a student will develop a project paper on review of literature on a selected research topic or idea.
- Be able to prepare and submit an abstract of his/her research work to a national / regional / state research conference; and be able to make a quality oral or poster presentation at a designated conference.
- Be capable of communicating his/her research finding in the form of a research manuscript for publication in a scientific journal.
- Be capable of relating his/her knowledge in biological science in daily life, and utilize inquiry.
- Based methodologies to gain a good understanding of professional practices and responsibilities for the community at large.

- Be able to gain admission to a doctoral degree program at a university of his/her choice or will enhance his/her success in seeking admission into a professional program.
- Enhance student's likelihood of success in finding employment at workplace related to biological or life sciences;
- Gain employment at teaching institutions such as secondary schools or junior colleges, or occupational/technical/vocational schools.

Program Requirements:

A student must meet all requirements for graduate admission as described in the Alcorn State University Graduate Catalog. This program requires completion of 33 semester credit hours of course work spread as follows: 12 semester graduate hours as Core; 9 semester graduate hours as Required Electives, and 12 semester graduate hours as Electives.

Courses under required or elective group must be approved by the student's Faculty Research Advisor (FRA) and shall be selected from the graduate courses in biology or related areas that are offered during the time the student is in residence. For the benefit of the student, a suggested list of Required and Elective courses is given. The Director of Biology Graduate Program or the Chairperson of the Department of Biological Sciences must approve all courses before registration. By the end of the first semester, the student must indicate his/her preference for a FRA. The FRA must be a member of the graduate faculty. The FRA (in consultation with the student) will select other members of the Thesis Research Advisory Committee (TRAC). This Committee must be approved by the Department Chair and communicated to the office of the Dean of Graduate Studies.

Each prospective graduate student must submit a written statement of planned research (Research Proposal) to the FRA. This document must be carefully prepared in consultation with the student's FRA. It must present in a concise and literate manner the research problem that a student plans to investigate as part of her/his Thesis research. The proposal should not be more than ten (10) pages, typewritten, and double-spaced, including references which may be single-spaced.

Upon completion of the proposed thesis research work under the guidance of a designated FRA, a student must prepare a Master's Thesis document. The Thesis should reflect a student's competence in conceptualization of research, experimental designs, and selection of appropriate statistical methods to process, analyze, and interpret research data. The student is also encouraged to prepare a manuscript based on his/her research work for possible publication in a peer reviewed scientific journal. Prior to the approval of the Thesis, a student must defend his/her research work by making an oral presentation before the members of the TRAC. The FRA may invite other faculty members and members of the graduate class in biology to attend such thesis defense.

ASU-Pennsylvania State University Bridges to Doctoral Program

ASU graduate students enrolled in a M.S. degree program in Biology are provided with a unique opportunity to continue their graduate work at Penn State University to earn a doctoral degree in selected biomedical sciences. A student pre-identified as an ASU-PSU Bridges Scholar will: a) take graduate courses in the first two semesters at Alcorn State University; b) enroll at Penn State as ASU-PSU Bridges participant in the summer and fall semester for extended research experiences, and taking two pre-selected courses; c) return to Alcorn State University for one more semester to write and defend Thesis. Upon completion of the M.S. degree program at Alcorn, ASU-Penn scholar will enter into a Ph.D. program at Penn State. Up to 6 semester hours earned at Penn State will be transferred to ASU. All selected ASU students are provided competitive stipends and tuition with continued enrollment in the program. Travel expenses as appropriate will be paid. Expenses while ASU-PSU Bridges Scholar is at Penn State in summer and fall semester will be borne by Bridges program. Interested students may visit <http://vetsci.psu.edu/bridges.cfm> for additional information.

Interested students are required to submit a letter of intent to the Chair, Department of Biological Sciences, along with all documentation at the beginning of his/her graduate program.

Transfer Credits

A graduate student may transfer up to 6 semester graduate credit hours earned in an accredited graduate program.

Course Requirements (Thesis Option)

Core Biology Courses (12 Sem. Hours)		Credits
BI 507	Advanced Cellular & Molecular Biology	3 hrs.
BI 523	Advanced Biostatistics	3 hrs.
BI 599	Thesis I	3 hrs.
BI 600	Thesis II	3 hrs.

Credits

Electives (Select 12 Sem. Hours)

BI 500	Advanced Parasitology	3 hrs.
BI 501	Advanced Plant Physiology	3 hrs.
BI 502	Advanced Plant Pathology	3 hrs.
BI 503	Mycology	3 hrs.
BI 509	Current Literature Topics in Biology	3 hrs.
BI 515	Computer Application in Biology	3 hrs.
BI 522	Natural History of the Animal Kingdom	3 hrs.
BI 525	Advanced Immunology	3 hrs.
BI 526	Advanced Pharmacology	3 hrs.
BI 531	Advanced Invertebrate & Vertebrate Zoology	3 hrs.
BI 536	Bioethics	3 hrs.
BI 540	Molecular Genetics	3 hrs.
BI 546	Advanced Histology	3 hrs.
BI 547	Advanced Field Biology & Ecology	3 hrs.
BI 550	Graduate Research Methods & Seminar	3 hrs.
BI 560	Advanced Modern Problems in Biology	3 hrs.
BI 581	Advanced Toxicology	3 hrs.
BI 590	Advanced Environmental Biology	3 hrs.
BI 591	Advanced Anatomy & Physiology	3 hrs.

TOTAL **33 hrs.**

MASTER OF SCIENCE IN BIOLOGY NON-THESIS OPTION

Program Description

This program is designed for students who do not plan to pursue a research-based career but need an advanced degree in biology to move up in their career ladder. However, these candidates will be introduced to basics in research such as defining a research problem, review of research literature, gain knowledge of laboratory techniques and research methods such as data acquisition, statistical analysis, and data interpretation. For this purpose, non-thesis students are required to take BI 597 Special Project and submit a Research Review Paper on selected topics in biological sciences.

Course Requirements

The student must meet all requirements for graduate admission as described in the Alcorn State University Graduate Catalog. The student will be required to complete 33 graduate credit hours: 12 semester graduate hours as Core (including BI 597 Special Project), 6 semester graduate hours as Required Electives, and 15 semester graduate hours as General Electives.

The required Core Courses for Non-Thesis Option are different from that of the Thesis Option.

Core Biology Courses (12 Sem. Hours)		Credits
BI 507	Advanced Cellular & Molecular Biology	3 hrs.
BI 523	Advanced Biostatistics	3 hrs.
BI 540	Molecular Genetics	3 hrs.
BI 597	Special Project	3 hrs.
Electives (Select 21 Sem. Hours)		Credits
BI 500	Advanced Parasitology	3 hrs.
BI 501	Advanced Plant Physiology	3 hrs.
BI 502	Advanced Plant Pathology	3 hrs.
BI 503	Mycology	3 hrs.
BI 509	Current Literature Topics in Biology	3 hrs.
BI 515	Computer Applications in Biology	3 hrs.
BI 525	Advanced Immunology	3 hrs.
BI 526	Advanced Pharmacology	3 hrs.
BI 531	Advanced Invertebrate & Vertebrate Zoology	3 hrs.
BI 536	Bioethics	3 hrs.
BI 546	Advanced Histology	3 hrs.
BI 547	Advanced Field Biology & Ecology	3 hrs.
BI 550	Graduate Research Methods and Seminar	3 hrs.
BI 560	Advanced Modern Problems in Biology	3 hrs.
BI 581	Advanced Toxicology	3 hrs.
BI 590	Advanced Environmental Biology	3 hrs.
BI 591	Advanced Anatomy & Physiology	3 hrs.
BI 598	Biology Research Instrumentation	3 hrs.
TOTAL		33 hrs.

- Note:** 1. The courses used in one master's degree program cannot be applied toward a second master's or advanced degree program. When in doubt, consult the Chairperson of the Department of Biological Sciences.

BIOLOGY ONLINE OPTION

Program Description

This program offers an online Master of Science in Biology program that will be completely web-based. The program provides the opportunity to gain advanced education and training in the Biological Sciences leading to the enhancement of knowledge and preparing students to pursue careers in a variety of fields. The program exposes students to a wide range of online courses providing a well-rounded graduate education.

Essential Knowledge and Skills:

Students must have completed a Bachelor of Science Degree in an area of Biology or in a closely related area. Many of the online courses in the curriculum are advanced courses. To be successful, students must have the appropriate academic background and should be proficient with the use of computers and the Internet.

Who the Program Is for:

The online Master of Science Degree Program in Biology is designed for non-traditional students with a desire to complete an advanced degree via distance learning. The highlight of this program is its flexibility with scheduling, cost effectiveness, and overall convenience.

Delivery Format

The program is designed to be completely web-based with course offerings in a sixteen-week session during an Academic Calendar Year (fall and spring semesters) and two four-week sessions during the summer. The program will require the completion of 33 credit hours with a minimum 3.0 Grade Point Average (GPA).

Orientation

Online instructions will be delivered using the “Blackboard” platform. This is a user-friendly platform with online tutorials to aid with the maneuverability of course materials. Students can also seek assistance from Blackboard Helpdesk and Blackboard Support Team.

Interaction with professors and other students

Students will be encouraged to maintain effective communication with instructors and advisors via email and Blackboard Collaborate throughout the duration of the course. Additionally, students may interact with peers in the course via Blackboard Discussion board and other means available through Blackboard.

Technology and Computer Skills

Students must have access to a reliable computer with a minimum recommended specification of Windows-7 or OSX, 4 GB of RAM and updated JAVA. Students should be able to download instructional materials (Word files, pdf documents, audio-visual media files), upload assignments and take online examinations using Blackboard. Using this type of technology for coursework requires a dependable and high-speed internet connection.

Advising

Student advisement will be available via email and telephone. Advisors will have access to student records and registration pins.

The Degree Plan

(Includes length of program, curriculum, learning resources, etc.)

Students will have the opportunity to complete the program in one year provided they attend full-time (Fall, Spring, and both summer sessions). Part-time graduate students should be able to complete the program in two years based upon their course load(s) and work pace. Students are encouraged to use online university resources such as library, counseling, writing center, student support services, etc. during their tenure at the university.

Assessments

Students must successfully complete 33 credit hours of core and elective courses including BI-597 (Special Research Project) to complete this program. Students must not receive more than two grades of “C” and must maintain at least a minimum GPA of 3.00. Students with an “Analytical” GRE score less than 3.0, must enroll in ST 597 (an online technical writing course), or EN 500 (Teaching Writing) or AN 501 (Technical Writing in Agriculture) to fulfill their writing proficiency requirement. EN 500 and AN 501 are contact courses only. Students are to maintain at least a “B” in ST 597/EN 500/AN 501, and this is in addition to the 33 hour required curriculum. Students may also meet the requirement by passing the English writing proficiency exam administered by the Department of Biological Sciences. This proficiency exam will be administered at the Alcorn State University’s main campus. Prior arrangement to take the writing exam should be made with the academic advisor.

Course Requirements

The student must meet all requirements for graduate admission as described in the Alcorn State University Graduate Catalog. The student will be required to complete 33 graduate credit hours: 12 semester graduate hours as Core (including BI 597 Special Project), 6 semester graduate hours as Required Electives, and 15 semester graduate hours as General Electives.

The required Core Courses for Non-Thesis Option are different from that of the Thesis Option.

Core Biology Courses (12 Sem. Hours)		Credits
BI 507 OL	Advanced Cellular & Molecular Biology	3 hrs.
BI 523 OL	Advanced Biostatistics	3 hrs.
BI 591 OL	Advanced Anatomy and Physiology	3 hrs.
BI 597 OL	Special Project	3 hrs.
Restricted Elective Courses (21 Sem. Hours)		Credits
BI 501 OL	Advanced Plant Physiology	3 hrs.
BI 515 OL	Computer Applications in Biology	3 hrs.
BI 525 OL	Advanced Immunology	3 hrs.
BI 526 OL	Advanced Pharmacology	3 hrs.
BI 531 OL	Advanced Invertebrate Zoology	3 hrs.
BI 546 OL	Advanced Histology	3 hrs.
BI 560 OL	Modern Problems in Biology	3 hrs.
TOTAL		33 hrs.

Biology Course Descriptions (BI)

BI 500 – ADVANCED PARASITOLOGY

(3 Credits)

An advanced study of the morphological and physiological characteristics of organisms that live in the vectors of the organisms.

BI 501 – ADVANCED PLANT PHYSIOLOGY

(3 Credits)

Advanced study of metabolism, mineral nutrition, absorption and translocation, respiration, photosynthesis, transpiration, plant hormones, flower parts, growth and reproduction in plants. Students will also learn about planting seeds, seed maturation, seed germination, seed storage, relation between seed and quality crop production in the field; study of fruits and seed and fruit dispersals. Pre-requisite: BI 124 or BI 324, CH 122. This course is specifically designed to meet the needs of agricultural and related science majors.

BI 502 – ADVANCED PLANT PATHOLOGY

(3 Credits)

Advanced study of selected diseases of important field and garden crops. Students study in detail representative plant diseases commonly observed on field crops, garden crops, fruit and vegetable crops caused by different pathogens, disease development, epidemiology and control of diseases. Pre-requisite : BI 124.

BI 503 – MYCOLOGY

(3 Credits)

This course deals with fungi from a cultural, ecological, phylotype, and phylogenetic perspective. It will involve the taxonomy, habitat, structure, physiology, and adaptation of fungi.

BI 507 – ADVANCED CELLULAR AND MOLECULAR BIOLOGY

(3 Credits)

A study designed to provide a deeper insight and understanding of the cellular and molecular functions. Emphasis is placed on control and regulatory mechanisms of various cellular activities such as metabolic, genetic, and bio-energetic mechanisms.

BI 509 – CURRENT LITERATURE TOPICS IN BIOLOGY

(3 Credits)

This course deals with current and emerging problems of global significance that are identified through scientific research. It takes under consideration both scientific and technical problems that exist currently. It discusses consequences and opportunities available through scientific and technological capabilities of today's world. Students study the contributions made towards resolution of these problems. Students study department faculty members' representative research publications.

BI 515 – COMPUTER APPLICATIONS IN BIOLOGY

(3 Credits)

This course provides introduction to computer applications in the biological sciences. The three major applications involved in this course are data interpretation, presentation in appropriate formats, charts, graphs, tables, database usage, and statistical analysis.

BI 522 – NATURAL HISTORY OF THE ANIMAL KINGDOM

(3 Credits)

This course is designed to provide the student with information on animal density and diversity. It shows the student the basic principles that control population dynamics, animal dispersal, evolutionary trends, and the changes that have occurred over centuries of animal development. The focus of the course deals with global changes and how these changes are causing the species diversity that exists today.

BI 523 – ADVANCED BIostatISTICS

(3 Credits)

Methods of collection, tabulation, analysis, and application of biological data specifically related to various problem solving activities in biology using descriptive statistics probability theory and statistical inference.

BI 525 – ADVANCED IMMUNOLOGY

(3 Credits)

Basic mechanism of immune responses will be presented from a theoretical basis. Students will be assigned several research articles to read covering both classic and current studies in immunology and will discuss the experiment data and conclusions in class. Students learn the historical significance of these studies as well as, the methodology used to determine the results.

BI 526 – ADVANCED PHARMACOLOGY

(3 Credits)

This course is designed to study various classes of drugs relative to their specific mechanisms of action and clinical application.

BI 531 – ADVANCED INVERTEBRATE & VERTEBRATE ZOOLOGY

(3 Credits)

This course is designed to provide the student with a broad background dealing with the taxonomy, locomotion, feeding habits, mode of life, and adaptive biology of invertebrates. In addition, anatomical, physiological, and embryological descriptive details are discussed and compared for various groups of animals.

BI 536 – BIOETHICS

(3 Credits)

This course introduces students to the history of bioethics, role of various theories and approaches in medical, environmental and technological bioethics as well as critical issues related to novel technologies including: genetically engineered food crops, cloning, stem cell therapies, and nanotechnology. This course will also include discussions with examples on ethical questions that arise in the relationships between life sciences, biotechnology and medicine.

BI 540 – MOLECULAR GENETICS

(3 Credits)

This course explores the molecular basis of heredity with a focus on the structure and function of genes, mutations and their effect on the phenotype, genetic analysis of prokaryotes and lower eukaryotes, gene transfer, and selection, plasmids, plasmid analysis, genetic recombination, and non-Mendelian patterns of inheritance, particularly the organization of the mitochondrial genome. In the laboratory component, students learn basic molecular genetics techniques such as: bacteria transformation and selection, plasmid preparation, restriction analysis of plasmids, agarose gel electrophoresis, endpoint polymerase chain reaction, primer design, and basic yeast genetics techniques: mating, sporulation, diploid selection, tetrad dissection and allele segregation. Pre-requisites: BI 327, 327L; Cell Biology, CH 331 & CH 331L; Introduction to Biochemistry, and BI 445, BI 445L Genetics.

BI 546 – ADVANCED HISTOLOGY

(3 Credits)

An advanced study of the microscopic and chemical structures of organs, tissues, and their cellular constituents.

BI 547 – ADVANCED FIELD BIOLOGY AND ECOLOGY

(3 Credits)

An advanced study of environmental factors influencing the distribution of plants and animals including the interrelationships of terrestrial and aquatic ecosystems, concentrating on biological, physical, and chemical relationships.

BI 550 – GRADUATE RESEARCH METHODS AND SEMINAR

(3 Credits)

A survey of current research articles with emphasis on techniques, the scientific method, and basic research. Lectures will cover the fundamentals of research and the study of several scientific manuscripts encompassing various areas of biology. Students will also be required to present data from other published scientific papers as a part of a seminar series. Students will be introduced to selected high precision research methodologies adopted in the laboratories of departmental faculty members.

BI 560 – ADVANCED MODERN PROBLEMS IN BIOLOGY

(3 Credits)

This course encompasses numerous areas concerning new and developing issues in biological sciences. Students are required to address several topics assigned in class and in addition, describe what they think are “modern problems.” Although the course is designed to allow students independence in selecting certain topics, it also enables them to learn how to read and interpret scientific articles and to present those articles to the class.

BI 581 – ADVANCED TOXICOLOGY

(3 Credits)

This course is designed to fill the need for a comprehensive source of information concerning toxicology. It presents a definite description of basic concepts and methods employed in environmental toxicology studies as well as examples of typical data and its interpretation. Specific topics covered in this course include: toxicity of genetic types of chemicals (such as pesticides and metals) to organisms, the distribution and fate of chemicals in the environment.

BI 585 – METHODS OF TEACHING SCIENCE

(3 Credits)

This course presents the methods of teaching science in the secondary school, placing emphasis upon the integration of the curriculum and the individual in a democracy. It seeks to provide experiences leading to the creation of dynamic classroom conditions for effective teaching – essentially a special methods course dealing with techniques and procedures on the high school level. Students will be required to prepare teaching units, lesson plans, examinations, and to observe classroom teaching in nearby schools.

BI 590 – ADVANCED ENVIRONMENTAL BIOLOGY

(3 Credits)

An advanced study of specific ecological problems, research methodology and techniques, and solutions of local and national environmental problems.

BI 591 – ADVANCED ANATOMY AND PSYCHOLOGY

(3 Credits)

This is a one-semester graduate course in Human Anatomy & Physiology. This course is designed to provide advanced concepts in human anatomy and physiology for students who plan to pursue careers in education, biology, biotechnology, medical technology, dentistry, physical therapy, nursing, or medicine.

BI 597 – SPECIAL RESEARCH PROJECT

(3 Credits)

This course involves individual investigation of a specific problem in biology or related area. This includes extensive survey of literature to write a professional paper based on research data. The student will work under the supervision of biology Faculty Research Advisor (FRA) and bound copies of the completed work will be submitted to the Office of Graduate Studies as a requirement of Non-thesis M.S. degree program. Consent of the FRA is required.

BI 598 – BIOLOGY RESEARCH INSTRUMENTATION

(3 Credits)

This is a laboratory-based course where students will learn the theory and practice behind techniques and instruments commonly used in modern biological research with special emphasis on detection, quantification, and analysis of nucleic acids and proteins, enzymatic assays, fluorescent microscopy, cell structure, and aseptic technique. Students will learn basic experimental design and methods, and will be expected to present their experiences in a seminar format. Pre-requisites: BI 327, BI 327L, CH 330, CH 330L, or instructor's permission.

BI 599 – THESIS I

(3 Credits)

This course is designed to prepare candidates for a Master of Science Degree Program. It assists students in preparing a research proposal that is a pre-requisite before beginning actual thesis research work.

BI 600 – THESIS II

(3 Credits)

This course is required for students in the Master of Science Degree Program. Its main thrust is to assist students in preparing a written document of their research work in an acceptable thesis format. Students will defend their research work before the graduate committee.

ENDORSEMENT AREA: BIOLOGY EDUCATION

Degree

Secondary Education Masters: Biology

Requirement for Admission

Standard Educator License

Program Description

The Department of Biological Sciences offers the Master of Science in Education degree in Secondary Education with a Concentration in Biology Education. In this program, the curriculum consists of core courses in education and courses in the biological sciences. The objectives for biology education are to:

1. Provide students for teaching careers in biology (secondary education);
2. Provide a foundation in research, education, industry, and the health professions;
3. Pursue programs of study leading to advanced degrees in Biological Sciences or closely related areas.

Course Requirements

Core Education Courses (12 hours)

		Credits
ED 512	Foundations of American Education.	3 hrs.
ED 514	Methods of Educational Research	3 hrs.
ED 533	Curriculum Development	3 hrs.
PH 513	Advanced Educational Psychology	3 hrs.

Generally Required Courses (12 Hrs.)

		Credits
BI 509	Current Literature Topics in Biology or	3 hrs.
BI 597	Special Research Project	
BI 507	Advanced Cellular & Molecular Biology	3 hrs.
BI 523	Advanced Biostatistics	3 hrs.
BI 585	Methods of Teaching Science	3 hrs.

Electives (21 Hours)

		Credits
BI 500	Advanced Parasitology	3 hrs.
BI 501	Advanced Plant Physiology	3 hrs.
BI 502	Advanced Plant Pathology	3 hrs.
BI 507	Advanced Cellular & Molecular Biology	3 hrs.
BI 509	Current Literature Topics in Biology or	3 hrs.
BI 597	Special Research Project	3 hrs.
BI 523	Advanced Biostatistics	3 hrs.
BI 525	Advanced Immunology	3 hrs.
BI 526	Advanced Pharmacology	3 hrs.
BI 531	Advanced Invertebrate & Vertebrate Zoology	3 hrs.
BI 536	Bioethics	3 hrs.
BI 540	Molecular Genetics	3 hrs.
BI 546	Advanced Histology	3 hrs.
BI 547	Advanced Field Biology and Ecology	3 hrs.
BI 560	Advanced Modern Problems in Biology	3 hrs.
BI 581	Advanced Toxicology	3 hrs.
BI 585	Methods of Teaching Science	3 hrs.

BI 590	Advanced Environmental Biology	3 hrs.
BI 598	Biology Research Instrumentation	3 hrs.
ED 521	Classroom Management	3 hrs.
ED 527	Evaluation and Measurement in Schools	3 hrs.
GS 503	Advanced Evolution	3 hrs.
PH 525	Psychology of the Exceptional Child	3 hrs.
TOTAL		33 hrs.

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(3 Credits)

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(3 Credits)

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(3 Credits)

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(3 Credits)

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BI 598 – BIOLOGY RESEARCH INSTRUMENTATION

(3 Credits)

This is a laboratory-based course where students will learn the theory and practice behind techniques and instruments commonly used in modern biological research with special emphasis on detection, quantification, and analysis of nucleic acids and proteins, enzymatic assays, fluorescent microscopy, cell structure, and aseptic technique. Students will learn basic experimental design and methods, and will be expected to present their experiences in a seminar format. Pre-requisites: BI 327, BI 327L, CH 330, CH 330L, or instructor's permission.