OWG 9 Science Approved Recommendations

1. **Recommends no changes the Forensic catalog descriptions.**

2. **Recommends courses that are common to both DSC and ASU in Area F Foundations:**

   ISCI 2001 - Foundations of Life/Earth Science (3)

   An integrated overview of the core Life and Earth Science content covered in the K-5 Georgia Performance Standards. Topics include the Solar System, Earth Processes, Cells and Cellular Processes, Characteristics and Classification of Living Organisms, Biodiversity, Ecology and the Natural History of Georgia. Students will gain conceptual understanding through Inquiry-Oriented, Activity-Based pedagogical strategies in order to have experience learning science content in the ways they will be expected to teach in the future. There is a laboratory component. Prerequisite: Teacher Education major status or permission from the instructor.

   Offered: Fall, Spring and Summer (as needed).

   ISCI 2002 - Foundations of Physical Science (3)

   An integrated overview of the core Physical Science content covered in the K- 5 Georgia Performance Standards. Topics include the Energy, light, heat, sound, electricity, magnetism, matter, periodic table, periodic trends, chemical reactions and conservation of energy and matter. Students will gain conceptual understanding through Inquiry-Oriented, Activity-Based pedagogical strategies in order to have experience learning science content in the ways they will be expected to teach in the future. There is a laboratory component. Prerequisite: Teacher Education major status or permission from the instructor.

   Offered: Fall, Spring and Summer (as needed).

3. **Recommends that Chemistry courses common to both institutions have the following course numbers, names, and descriptions:**

   CHEM 1151K, **Survey of Chemistry I**, "This course is the first in a two-semester sequence covering elementary principles of general and organic chemistry and biochemistry designed for allied health profession majors. Topics to be covered include elements and compounds, chemical equations, nomenclature, and molecular geometry. Laboratory exercises will supplement the lecture material.

   Prerequisite(s): Completion or exemption of all learning support and English requirements; MATH 0099, MATH 0987, MATH 0989, or satisfactory math scores to place into co-requisite remediation or higher."

CHEM 1211K, Principles of Chemistry I, "First course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science plans of study. Topics to be covered include composition of matter, nomenclature, stoichiometry, solution chemistry, gas laws, thermochemistry, quantum theory and electronic structure, periodic relations, and bonding. Laboratory exercises supplement the lecture material.

Prerequisites: Completion or exemption of all learning support requirements.

Corequisites: MATH 1111 or satisfactory math scores to place into MATH 1112 or higher."

CHEM 1212K, Principles of Chemistry II, "Second course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science plans of study. Topics include molecular structure, intermolecular forces, properties of solutions, reaction kinetics and equilibria, thermodynamics, and electro-and nuclear chemistry. Laboratory exercises supplement the lecture material.

Prerequisite: CHEM 1211K."

CHEM 2301K, Organic Chemistry I, "This course will cover the stereochemistry, properties, as well as methods of preparation and mechanisms of the principle classes of carbon compounds. Laboratory instruction will include basic techniques for preparation, purification and identification of organic compounds. Laboratory exercises supplement the lecture material.

Prerequisite: CHEM 1212K."

CHEM 2302K, Organic Chemistry II, "This is a continuation of CHEM 2301K, a systematic study of the reactivity of organic compounds as well as their identification by spectroscopy. Laboratory exercises supplement the lecture material.

Prerequisite: CHEM 2301K."

NOTE: All courses will remain 4 credit hours:

4. Recommends that all laboratory science courses have the lecture and laboratory portions consolidated into a single course.

5. Recommends that the following tracks should be added to the BS in Biology degree in addition to the current biomed track and biotec concentration:

A. Research Track with following courses:

(i) **BIOL 2000** - **Foundations of Research I:** Critical Reading of the Biomedical Literature (1 credit hour): This course is the introductory course of the research track designed

for biology majors to gain competence as biomedical scientists. The goal of this course is to introduce students to the various types of research literature (primary, secondary, articles for the public, etc.) for developing competence in the use of literature sources. A necessary part of the course is learning how to search for relevant biomedical literature. Students will use common electronic search engines such as PubMed, SciFinder Scholar, Web of Science, MedLine, Psychology Abstracts, and Science Citation Index etc. to gain experience and generate an annotated bibliography of references pertinent to his/her research project.
Prerequisite: None

(ii) **BIOL 2240** - **Foundations of Research II:** Formulating Hypothesis Driven Research and Ethics of Research (2 credit hour): This is the second course for research track to build student confidence in formulating hypotheses and designing experiments. To ensure that students think ethically when doing so, this course also includes an introduction to the ethical issues that arise in research. Through case studies and review of literature, the course will present hypothesis-driven research from diverse areas related to biomedical science.
Prerequisite: BIOL 2000 or permission of the instructor

(iii) **BIOL 4223** - **Foundations of Research III**: Communication of Biomedical Information (1 credit hour): As the third and final course of the Reserach track, this course will provide students the formal context to become critical writers and speakers of biomedical information. Student competence is enhanced through exercises that demonstrate the need for effective written and oral communication. Students will learn to critique scientific literature; thereby, helping them to improve their own writing. Students will prepare both written and oral presentations of their research and results. Oral communications include a 3-minute elevator talk, a 10-minute presentation, and a 20-minute seminar. Written communications include posters in the formats of the professional societies in their disciplines.
Prerequisite: BIOL 2240

B. Bioenergy Track with following courses:

(i) **BIOL 2501** - **Introduction to biomass** (2 Credit hours): As the introductory course for students in the bioenergy track, this course is designed to introduce students to the source of bioenergy, which is biomass. Topics include defining biomass, sources of biomass, processing biomass, uses of biomass, and the role of environment and pollution in biomass production.
Prerequisite: BIOL 2107 K

(ii) **BIOL 3103** - **Fundamentals of Bioenergy** (3 credit hours): This course expands upon the concepts introduced in BIOL 2501. The course introduces students to the application of biomass in the bioenergy field. Topics include defining bioenergy,

sources of bioenergy, and the social, political and economic effects of using bioenergy.
Prerequisite: BIOL 2501B

C. Public health track with following courses:

(I) **BIOL 2330 - Principles of Epidemiology in Public Health (3 credit hours):** This course is first of two courses offered for student pursuing the track in public health. Principles of Epidemiology provides an overview of epidemiology methods used in research studies that address disease patterns in community and clinic-based populations. Topics covered include distribution and determinants of health-related states or events in specific populations and application to control of health problems.
Prerequisite: BIOL 2107K

(ii) BIOL 3801 - Environmental Health Concepts in Public Health (2 credit hours): As the second course for student's pursing the track in public health, this course provides a survey of major topics of environmental health. Topics include sources, routes, media, and health outcomes associated with biological, chemical, and physical agents in environment; effects of agents on disease, water quality, air quality, food safety, and land resources; current legal framework, policies, and practices associated with environmental health and intended to improve public health. **Prerequisite**: BIOL 2330

D. Food Safety track with following courses:

(i) **BIOL 2601 - Introduction to Foodborne Diseases (3 credit hours):** This course is one of the two courses offered for students completing the track in food safety. This is an intermediate level course, which will introduce students to the major pathogens associated with foodborne diseases, their epidemiology, and approaches to outbreak investigation and control of foodborne illness.
Prerequisite: BIOL 2107K

(ii) **BIOL 3201 - Fundamentals of Public Health Nutrition (2 credit hours):** This course is one of the two courses offered for students completing the track in food safety. This course will provide an introduction to Public Health Nutrition and the role of the Public Health Nutrition professional. Emphasis will be on definition, identification and prevention of nutrition related disease, as well as improving health of a population by improving nutrition. Malnutrition will be discussed on a societal, economic, and environmental level. It will include the basics of nutritional biochemistry as it relates to malnutrition of a community and targeted intervention. Finally, it will review existing programs and policies, including strengths, weaknesses and areas for modification or new interventions.
Prerequisite: BIOL 2107K

6. Recommends the following Forensic Science Course Description and Check Sheet:

FOSC - Forensic Science

FOSC 2100K - Intro to FOSC (3-2-3)

This course is designed as an introductory course for those who wish to pursue a career in forensic science. Course is an overview of investigative techniques and methods used in the crime laboratory to analyze physical evidence. Course will also provide lab exercises in the metric system of measurement, general crime scene investigative techniques, and methods of scientific analysis used in crime laboratories. No Prerequisite
Offered: Fall and Spring.

FOSC 2110 - Survey of Forensic Science (3-2-3)

This course will enlighten students with the basic principles and uses of forensic science in the criminal justice system. This course will review the basic applications of forensic science fields in crime reconstruction. The outcome of the course will include students gaining basic understanding of the importance and limitations of the forensic sciences in solving crime. No prerequisite
Offered: Spring.

FOSC 2120K - Forensic Photography (3-2-3)

Designed as an introductory course in forensic photography, the history of photography will be presented. Technical aspects of exposure, images characteristics, and crime scene and evidence documentation will be introduced and projects will be used to apply these techniques. A final crime scene project with a presentation using photographs generated in the project will be used to show how photographic documentation can be used as an investigative and analysis technique in the reconstruction of a crime scene. Pre requisite FOSC 2100
Offered: Fall

FOSC 2130 K- Crime Scene Invst & Recon I (3-2-3)

This course is intended to familiarize students with the basic principles of Crime Scene investigations and reconstruction through Crime Scene Unit, Crime Scene Protocol, Crime Scene Evidence Collection and Crime scene interpretations. Prerequisite FOSC 2100
Offered: Spring

FOSC 2140K - Crime Scene Invest & Recon II (3-2-3)

This course will present opportunities to learn more principles in crime scene investigation including crime scene processing, crime scene Evidence Classification collection methods and crime scene reports. The course will go in debt and much more beyond what is presented in Crime Scene Investigation and Reconstruction I. Prerequisite FOSC 2130
Offered: Spring

FOSC 3020 K- Forensic Microscopy of Trace (3-3-4)
Light microscopy of trace evidence including, contrast, resolving power and illumination; interference, phase and fluorescence microscopy; microscopy with polarized light, birefringence and crystal structure; dispersion staining; photomicrography; fibers, minerals, and residues. Prerequisite: PHYS 2221K and PHYS 2222K Or PHYS 1111K and PHYS 1112K
Offered: Fall

FOSC 3030 - Criminal Evidence/Court Proc (3)
Consideration of laws of criminal evidence, rules of search and seizures, chain-of-custody, admissibility, opinion and hearsay, etc., and the mechanics of trials.
Prerequisite: CRJU 1100 and FOSC 2100.
Offered: Fall

FOSC 3100K - International Forensic Sci DNA Typi (3-2-3)
This course consists of lectures that review in some detail the history, scientific principles, forensic applications and practice of DNA typing and databases in different countries. This course will teach students about different DNA typing technologies and databases and their international usage and variations. DNA typing provides information on genetic variations in all forms of life and molecular level which can be used in forensics, clinical diagnostics and evolutionary biology among many fields. This course will also examine the roles and activities of international, regional and national organizations in the promotion and exchange of DNA database technologies and information.
Prerequisite FOSC 2100, and BIOL 2111K
Offered: Fall

FOSC 3200K - Bio-Terrorism & Biotechnology (3-2-4)
This course was designed to help internalize the ASU Forensic Science program curriculum. The course is concerned with the scientific issues and nature of current and future threats posed by Bioterrorism and the connection between Biotechnology and bio-defense. The scientific theme and scope are international and involve showing how different countries, multinational companies and transnational organizations are active in the fields of Biotechnology and impacted by issues relating to Biotechnology and Bioterrorism. Prerequisite: FOSC 2100, BIOL 2111K Offered: Spring.

FOSC 4040K - Forensic Serology/DNA Tech I (3-2-3)
Practices of search, collection, preservation, and identification of blood and body fluids as wet or dry stains; immunologic typing of blood; DA- typing and electrophoresis, and laboratory report.
Distribution: Forensic Technology/Technician. Prerequisite: BIOL 2111K, CHEM 1212K, and CHEM 3250 K
Offered: Spring.

FOSC 4050K - Forensic Chemistry (3-3-4)
Theory and practice of quantitative chemical analysis, chemical spectroscopy and instrumental methods of analysis: U.V., visible and infrared (IR) spectrophotometry, Fourier transform IR, florescence and fluorometry, atomic absorption and emission, Raman NMR, mass- spec., for structures and molecular stereochemistry; chromatographic methods of separation- TLC, HPLC, and GC. Laboratory report. Prerequisite: CHEM 2302K or CHEM 2302 and CHEM 2351K or CHEM 2351.
Offered: Fall

FOSC 4060K - SEM-EDAX of Trace Evidence (3-2-3)
Practice of scanning electronic microscopy with energy-dispersive X-rays for physical and elemental characterization of trace evidence, including gunshot residue particles, image processing and automation. Laboratory report. Prerequisite: FOSC 3020. PHYS 1111K and PHYS 1112K
Offered: Spring.

FOSC 4080K- Forensic Serology/DNA Tech II (3-2-3)
Laboratory practice of confirmatory tests for traces of bloodstains and semen stains; electrophoresis of blood enzymes and blood grouping, advanced DNA-typing, etc., and Lab report. Prerequisite: BIOL 2111K, and CHEM 1212K
Offered Spring

FOSC 4090K - Controlled Substance/Toxicology (3-2-3)
Theory and practice of controlled substance identification GC-MS, HPLC, TLC, and infrared spectroscopy (IR/ FTIR), and detection of alcohol toxication by breath testing. Laboratory report. Prerequisite: CHEM 2302, and CHEM 3250 or CHEM 2351
Offered: Fall

FOSC 4120K - Electron Optics, EM/Quant Anal (3-2-3)
An introduction to electron microscopy, optical designs of SEM, TEM, HVEM and STEM, and to microanalysis with wave length dispersive, energy-dispersive, and X-ray fluorescence spectrometers. SEM-EDX practice and laboratory report. Prerequisite: 0-3 credits. Prerequisite: FOSC 4060.
Offered: Spring

FOSC 4130 - Expert Witness at Mock Trial (2)
Consideration of place of expert's in dispute resolution, cases that require expert testimony, pre- trail preparations, rules of evidence, articles and exhibits, courtroom demeanor, participation at criminal mock trials and offer expert testimony. Prerequisite: FOSC 3030 and CRJU 1100.
Offered: Fall

FOSC 4140K- Fingerprint Technology (2 – 2-2)
Practice of fingerprinting: identification and development of latent fingerprints, enhancements by laser, automated identification system, image processing and the expert fingerprint witness. Prerequisite: FOSC 2100 and FOSC 2000 or FOSC 2100.
Offered: Fall

FOSC 4150K- Evident Proc/Med Tech/Nur/Para (2)
Practice in evidence protection and collection: biological and medical evidence and controls to be collected, injuries to be photographed, legal and scientific requirements of packaging and storage, writing medical report and assisting, the coroner, rules of evidence and expert witness. Laboratory report. Prerequisite: FOSC 3020 and FOSC 2130.
Offered: Spring.

FOSC 4170K - Ballistics of Firearms/Tool mark (3-2-3)
Theory and practice of the physics of interior, exterior, and terminal ballistics as applied to identification of fire arms, bullets, and casing, primer and powder, gunshot residue formation and deposition, pellet distribution, muzzle-to-target distance and bullet wounds. Lab report. Prerequisite: FOSC 2100, FOSC 3020
Offered: Spring.

FOSC 4201K - Evidence Analysis/Research I (3-2-3)
On-campus research and evidence examination or Internship I to generate crime laboratory proficiency and competence in defending to witness in the presence of judges in a moot court. Prerequisite: Graduating Seniors only
Offered: Fall & Spring.

FOSC 4999 - Senior Capstone Seminar (3)
This course involves establishing students' understanding of ethics, quality control and assurance and their being able to explain, analyze and apply their knowledge of these topics. The course also reviews laboratory techniques and field practice in the forensic science field as well as certain of the forensic science professional literature. Preparation of application materials for Forensic careers and the review and exercise of their forensic knowledge gained during the degree program may also be done based on time and inclination of students. Prerequisite Graduating seniors only.
Offered: Fall & Spring.

7. Recommends that the following Biology Course Description and Check Sheet be used for new ASU:

Department of Natural and Forensic Sciences
The Department of Natural and Forensic Sciences offers degrees in biology, forensic sciences and chemistry with course offerings in physics and engineering. The department also offers a degree in science education with a broad based emphasis in biology.

BIOLOGY - BACHELOR OF SCIENCE DEGREE

The major in biology provides course sequences leading to the Bachelor of Science degree in biology. The program prepares a student for professional careers and employment in biological sciences and teaching in the area of biology. The flexibility and design of the program aids in preparation for entrance into graduate, medical, pharmacy and dental schools, as well as other professional schools. Students majoring in biology must complete a minimum of 36 hours in biology, including 2107K, 2108K, 2311K, 3101K, 3333K, 3501K, 4001, 4222 and 4701K. Additionally, the Biology major must complete *a minimum 13 hours of biology electives of which a minimum of eight hours must be at the 3000/4000 level.* The electives will be chosen by the student with the advisor from a list of approved electives. Biology majors and minors must make a "C" or better in all biology, chemistry, physics, and mathematics courses. Students must meet the requirements of the Core Curriculum. Students must also pass an Area Concentration Achievement Test (ACAT) in the biology field during the senior year.
Students interested in attending medical and dental schools choose from a select number of biology and chemistry courses and are advised by the Pre-Health advisor. Students desiring to opt for a concentration in biotechnology are advised to contact the biotech program coordinator or academic advisor. In addition to the biotech concentration and pre-med program, the biology degree program also offers additional tracks in Research, Bioenergy, Public Health, and Food safety. It is highly recommended for students to confer with their academic advisor or department chair prior to choosing courses.

COURSE DESCRIPTION

BIOL 1100K - Human Anatomy & Physiology for the Health Care Professional (4 credit: 3.2.4)[1]
This course is a survey of general principles of human anatomy and physiology with an emphasis on medical applications. It is restricted to students in Health Science programs or requires the consent of the Division Dean. Laboratory exercises supplement the instruction material. **Course Pre-requisite**: READ 0099, ENGL 0989 or satisfactory English scores to place into co-requisite remediation or higher

BIOL 1110K - Introduction to Environmental Biology (4 credit: 3.2.4) [1]
This course uses an interdisciplinary approach to contemporary environmental problems for students not studying in science. Laboratory exercises supplement the lecture material. **Course Pre-requisite**: None

BIOL 1111K - Introduction to Biological Sciences I (4 credit: 3.2.4) [1]
A course designed for non-science majors that emphasizes fundamental concepts of the cell (i.e. cell structure and function, mitosis and metabolism), and plant anatomy and physiology through the use of lectures, audio visual aids, selected laboratory experiments, and demonstrations. **Course Pre-requisite**: Completion or exemption of all learning support requirements.

BIOL 1112K - Introduction to Biological Sciences II (4 credit: 3.2.4) [1]
A course designed for non-science majors that emphasizes human anatomy and physiology, classical and molecular genetics, evolution, ecology, and surveys the plant and animal kingdoms through lectures, audio-visual aids, selected laboratory experiments, and demonstrations. **Course Pre-requisite**: BIOL 1111K

BIOL 1801 – Science Career Exploration (1 credit: 1.x.1) [1]
This course is designed to introduce students (majors and non-majors) to the diverse career opportunities in the biological, biomedical, chemical and related sciences. **Course Pre-requisite**: None

BIOL 2000 - Foundation of Research I: Critical Reading of Biomedical Literature (1 credit: 1.x.1) [1]
This course is the introductory course of the research track designed for biology majors to gain competence as biomedical scientists. The goal of this course is to introduce students to the various types of research literature (primary, secondary, articles for the public, etc.) for developing competence in the use of literature sources. A necessary part of the course is learning how to search for relevant biomedical literature. Students will use common electronic search engines such as PubMed, SciFinder Scholar, Web of Science, MedLine, Psychology Abstracts, and Science Citation Index etc. to gain experience and generate an annotated bibliography of references pertinent to his/her research project. **Course Pre-requisite**: None

BIOL 2001 - Introduction to Research (2 credit: 1.2.2) [1]
This course is designed specifically to teach students pursuing degrees in health professions the basic principles of performing a scientific research project. Each student will identify a problem, perform a literature search, design and perform an experiment, analyze data and present the results. **Course Pre-requisite**: BIOL 1111K, CHEM 1212K, PHYS 1112K or consent of Division Dean.

BIOL 2107K - Principles of Biology I (4 credit: 3.3.4) [1]
Biology I is the first part of a two course sequence required for students majoring in Biology. Designed specifically for the Biology major, discussions will include the chemistry of macromolecules in biological systems, cell structure and function, membrane structure and function, energy and metabolism, photosynthesis, cell communication, mitosis and meiosis, DNA structure, transcription and translation. Laboratory exercises supplement the lecture material. **Course Pre-requisite**: Completion of English composition I with C or better or exemption of all learning support requirements - (Only for BIO Majors)

BIOL 2108K - Principles of Biology II (4 credit: 3.3.4) [1]
Biology II is the second part of the two course sequence required for students majoring in Biology. The two course sequence is designed to give students a broad foundation in the biological sciences that will enable them to pursue advanced courses in the biology curriculum. The continuity and diversity of life, evolution and activities of plant and animal life and its environment will be discussed. Emphasis will be placed on the following topics:

classical and molecular genetics, organic evolution, plant and animal reproduction, human anatomy and physiology, ecology and environment. Selected laboratory exercises are used to emphasize the continuity, evolution and activities of plan and animal life which includes classical and molecular genetics, organic evolution, plant and animal reproduction, human anatomy and physiology, ecology and the environment. **Course Pre-requisite**: BIOL 2107K

BIOL 2211K - Introduction to Microbiology (4 credit: 3.3.4) [1]
This is a general course in microbiology designed for Nursing majors or non-biology majors which discusses the fundamental principles of the different types of microorganisms associated with organismal pathology, genetics, immunity, and disease control are included. Laboratory exercises supplement the lecture material. Select laboratory exercises will provide the basic skills and tools necessary in staining, culturing and the identification of different types of microorganisms associated with disease. **Course Pre-requisite**: BIOl 1100K and Chem 1151K or BIOL 1111K or BIOL 2107 or BIOL 2411K (For non-science major).

BIOL 2240 - Foundation of Research II: Formulating Hypothesis Driven Research and Ethics of Research (2 credit: 2.x.2) [1]
This is the second course for the research track to build student confidence in formulating hypotheses and designing experiments. To ensure that students think ethically when doing so, this course also includes an introduction to the ethical issues that arise in research. Through case studies and review of literature, the course will present hypothesis-driven research from diverse areas related to biomedical science. **Course Pre-requisite**: BIOL 2000 or permission of the Instructor.

BIOL 2250 – Responsible Conduct of Research (2 credit: 2.x.2) [1]
This course is designed to provide an introduction to the basic concepts required for the responsible and ethical conduct of students engaged in undergraduate research. Topics will include lab safety, conflict of interest, data management, data sharing, authorship, animal welfare and policies involving use of human and animal subjects. **Course Pre-requisite**: BIOL 2107K.

BIOL 2311K – General Botany (4 credit: 3.3.4) [1]
An introduction to the study of the plant kingdom with emphasis on plant structure and function, reproduction and heredity. **Course Pre-requisite**: BIOL 2108K.

BIOL 2320K - Laboratory Research Techniques (3 credit: x.3.3) [1]
This course provides students hands-on training in cutting-edge techniques, technologies, and equipment that are essential for conducting general and biomedical research. It contains four modules: Basic Lab Skills, DNA, Protein Techniques and Instrumental Methods in Chemistry. Students learn experimental techniques including reagent preparation, pipetting, DNA isolation, protein purification, Agarose Gel Electrophoresis, SDS Gel Electrophoresis, conventional PCR, cell culture, Western blot, ELISA, chromatography (GC-MS) and spectroscopy (FT-IR, NMR, UV-Vis). **Course Pre-requisite**: BIOL 2107K or CHEM 2112K.

BIOL 2330 - Principles of Epidemiology (3 credit: 3.x.3) [1]
This course is the first of two courses offered for students pursuing the track in public health. Principles of Epidemiology provides an overview of epidemiology methods used in research studies that address disease patterns in community and clinic-based populations. Topics covered include distribution and determinants of health-related states or events in specific populations and application to control of health problems. **Course Pre-requisite**: BIOL 2107K.

BIOL 2411K - Human Anatomy & Physiology I (4 credit: 3.3.4) [1]
BIOL 2411K is designed as an introductory course in human anatomy and physiology. Discussions include fundamental concepts related to the gross and microscopic structure and functional relationships of the integument, bones, muscles, nerves and endocrine organs. Laboratory exercises supplement the lecture material. **Course Pre-requisite**: Completion or exemption of all learning support requirements.

BIOL 2412K - Human Anatomy & Physiology II (4 credit: 3.3.4) [1]
This course is a continuation of human anatomy and physiology I (BIOL 2411). Discussion will focus on the structure and functions of body systems (endocrine, cardiovascular, lymphatic, immune, digestive, respiratory, urinary and reproductive). Laboratory exercises supplement the lecture material. **Course Pre-requisite**: BIOL 2411K or BIOL 2108K.

BIOL 2501 - Introduction to Biomass (2 credit: 2.x.2) [1]
As the introductory course for students in the bioenergy track, this course is designed to introduce students to the source of bioenergy, which is biomass. Topics include defining biomass, sources of biomass, processing biomass, uses of biomass, and the role of environment and pollution in biomass production. **Course Pre-requisite**: BIOL 2107K

BIOL 2601 - Introduction to Foodborne Diseases (3 credit: 3.x.3) [1]
This course is one of the two courses offered for students completing the track in food safety. This is an intermediate level course, which will introduce students to the major pathogens associated with foodborne diseases, their epidemiology, and approaches to outbreak investigation and control of foodborne illness. **Course Pre-requisite**: BIOL 2107K

BIOL 2702K – Fundamentals of Biotechnology (4 credit: 3.3.4) [1]
A course designed to illustrate the current rise in biotechnology and explore its possible applications in plant, animal, biomedical, societal and global environments. Basic concepts of gene and recombinant DNA technology and laboratory on biotechnology research techniques is included. **Course Pre-requisite**: BIOL 2107K.

BIOL 3101K – Environmental Biology (4 credit: 3.3.4) [1]
Environmental Biology is an interdisciplinary science that integrates the disciplines and sub-disciplines of biology, chemistry, social sciences, technology, business, law, ethics, philosophy, morality, aesthetics and government. Environmental Biology analyzes the effects and subsequent impact of man's activities on Earth's ecosystems as related to

issues of personal and community health. Laboratory exercises supplement the lecture material**. Course Pre-requisite**: BIOL 2108K.

BIOL 3103 - The Fundamentals of Bioenergy (3 credit: 3.x.3) [1]
This course expands upon the concepts introduced in BIOL 2501. The course introduces students to the application of biomass in the bioenergy field. Topics include defining bioenergy, sources of bioenergy, and the social, political and economic effects of using bioenergy**. Course Pre-requisite**: BIOL 2501.

BIOL 3201 - Fundamentals of Public Health Nutrition (2 credit: 2.x.2) [1]
This course is one of the two courses offered for students completing the track in food safety. This course will provide an introduction to Public Health Nutrition and the role of the Public Health Nutrition professional. Emphasis will be on definition, identification and prevention of nutrition related disease, as well as improving health of a population by improving nutrition. Malnutrition will be discussed on a societal, economic, and environmental level. It will include the basics of nutritional biochemistry as it relates to malnutrition of a community and targeted intervention. Finally, it will review existing programs and policies, including strengths, weaknesses and areas for modification or new interventions. **Course Pre-requisite**: BIOL 2701K.

BIOL 3250K/ CHEM 3250K - Biochemistry (4 credit: 3.3.4) [1]
The student examines the structure, function, and metabolism of carbohydrates, amino acids and proteins, lipids, and nucleic acids in this course. Topics include bioenergetics, enzyme kinetics, photosynthesis, and the interdependence of the various metabolic pathways of intermediate metabolism. **Course pre-requisite**: CHEM 2302

BIOL 3311K - Introduction to Natural Resources (3 credit: 2.2.3) [1]
Lecture and laboratory activities in this course are designed to introduce students to the problems of population, resource availability and environmental quality. Aspects of air, water resource problems, conventional sources of energy, and food and land resource issues will be considered in the course. **Course Pre-requisite**: BIOL 2107K and CHEM 2112K or permission of instructor.

BIOL 3316K - Sources/Use of Plant/Wildlife (3 credit: 2.2.3) [1]
Lecture and laboratory activities introduce the student to the ways plant and wildlife resources have been used throughout history and studies their importance in food production and non-edible production utilization. **Course Pre-requisite**: BIOL 2108K.

BIOL 3320K - Principles/Techniques in Water Resource Services (4 credit: 3.3.4) [1]
Lecture and laboratory activities introduce the student to the procedures needed to examine water over a wide quality of ranges, including water suitable for domestic or industrial supplies, surface water, and treated and untreated municipal or industrial wastewater. **Course Pre-requisite**: BIOL 2108K.

BIOL 3333K – Microbiology and Application (4 credit: 3.3.4) [1]
A general course in microbiology specifically for Biology majors. Lecture and laboratory activities emphasize the fundamental concepts of the different groups of microorganisms as related to applications in human, animal and plant health, environment, industry, technology and biotechnology. The course will cover Archaea, bacteria, protists, fungi, viruses, parasites, algae and other microbial groups. **Course Pre-requisite**: BIOL 2107K or BIOL 2108K

BIOL 3401K - Introduction to Histology (4 credit: 3.3.4) [1]
Lecture and laboratory activities introduce the study of tissues with emphasis placed on light microscopic preparations. **Course Pre-requisite**: BIOL 2107K or BIOL 2108K

BIOL 3501K – Principles of Genetics (4 credit: 3.3.4) [1]
Lecture and laboratory activities introduce the study of the classical and modern concepts of heredity in plant and animal systems. **Course Pre-requisite:** BIOL 2108K

BIOL 3506 - Bioinformatics (3 credit: 3.x.3) [1]
This course is designed to help students master the DNA analysis tools and resources to study the functions of genomics, understand the gene identity, and facilitate the analysis and presentation of molecular and biochemical data. **Course Pre-requisite**: BIOL 2702K or BIOL 2107K.

BIOL 3611K – Medical Mycology (4 credit: 3.3.4) [1]
Lecture and laboratory activities are designed to acquaint students with select fungal groups that cause human disease. **Course Pre-requisite**: BIOL 2108K.

BIOL 3701 - Current Issues & Topics in Biotechnology (2 credit: 2.x.2) [1]
This course is to familiarize the students with some of the frontier areas of biotechnological applications where a huge scope for further contributions for betterment of the society exists. This course will allow students to gain theoretical and practical, hands-on knowledge of both commonly used and some specialized laboratory instruments, as well as preparation of common solutions, reagents and methodology. **Course Pre-requisite**: BIOL 2702K.

BIOL 3801 - Environmental Health Concepts in Public Health (2 credit: 2.x.2) [1]
As the second course for student's pursuing the track in public health, this course provides a survey of major topics of environmental health. Topics include sources, routes, media, and health outcomes associated with biological, chemical, and physical agents in environment; effects of agents on disease, water quality, air quality, food safety, and land resources; current legal framework, policies, and practices associated with environmental health and intended to improve public health. **Course Pre-requisite**: BIOL 2330.

BIOL 3901 - Pathophysiology (3 credit: 3.x.3) [1]
This course discusses the fundamentals of human diseases, with emphasis on anatomical, physiological and clinical processes. **Course Pre-requisite**: BIOL 2108K.

BIOL 4001 – Research Independent Study I (1 credit: 1.x.1) [1]
This is a required course for the Biology major. The student will be introduced to concepts, methods and techniques necessary for the development of an undergraduate research topic. The student will make oral presentations on scientific topics of interest and plan a research project with assistance from a faculty advisor. (Required of all majors). **Course Pre-requisite**: Junior classification or permission of the instructor.

BIOL 4101K – General Physiology (4 credit: 3.3.4) [1]
In this course, lecture and laboratory activities will emphasize the experimental approach to physiology including the nerve impulse, enzymes and their properties, along with other selected topics. **Course Pre-requisite**: BIOL 2108K.

BIOL 4201K - Introduction to Parasitology (4 credit: 3.3.4) [1]
The fundamentals of parasitology are investigated using lecture and laboratory activities with emphasis on the life histories and economic importance of protozoans, helmiths, and arthropod parasites. **Course Pre-requisite**: BIOL 2108K

BIOL 4222K – Biology Senior Research (3 credit: x.3.3) [1]
This is a required course for Biology majors. The student will conduct a supervised research project in the biological/biomedical or related sciences. The students will perform the experiments, collect and analyze the data, and write up the research finding in a scientific report. The student will also give an oral presentation of the research findings. **Course Pre-requisite**: BIOL 4001.

BIOL 4223 - Foundation of Research III: Communication of Biomedical Information (1 credit: 1.x.1) [1]
As the third and final course of the Research track, this course will provide students the formal context to become critical writers and speakers of biomedical information. Student competence is enhanced through exercises that demonstrate the need for effective written and oral communication. Students will learn to critique scientific literature; thereby, helping them to improve their own writing. Students will prepare both written and oral presentations of their research and results. Oral communications include a 3-minute elevator talk, a 10-minute presentation, and a 20-minute seminar. Written communications include posters in the formats of the professional societies in their disciplines. **Course Pre-requisite**: BIOL 2240 or BIOL 4222.

BIOL 4301K - Developmental Biology (4 credit: 3.3.4) [1]
Lecture and laboratory activities will emphasize classical methods of analysis and the series of embryonic stages from gametogenesis to histogenesis Also, basic conceptual topics such as nuclear totipotency, cell determination, cytoplasmic localization, induction, and morphogenesis are interspersed. **Course Pre-requisite**: BIOL 2108K.

BIOL 4401K - Comparative Vertebrate Anatomy (4 credit: 3.3.4) [1]
Course lectures will include comparative structure and evolutionary relationships among a series of chordates from amphioxus to mammals with thorough laboratory dissections of at least one representative from each of the vertebrate classes. **Course Pre-requisite**: BIOL 2108K

BIOL 4501K - Immunology (4 credit: 3.3.4) [1]
Biology 4501 is an introductory level course in immunology. Lecture and laboratory exercises cover the basic concepts of immune system, antigen, autoimmune diseases, tumor immunology, specific and non-specific types of immune responses. **Course Pre-requisite**: BIOL 3333K or BIOL 2107K

BIOL 4601K – Plant Physiology (4 credit: 3.3.4) [1]
Lecture and laboratory exercises studyvascular plant functions, including absorption and translocation of water and solutes, transpiration, photosynthesis, respiration, growth and development and hormonal regulation. **Course Pre-requisite**: BIOL 2311K

BIOL 4701K - Cell/Molecular Biology (4 credit: 3.3.4) [1]
This course is designed to acquaint students with the organization and function of the cell utilizing cellular and molecular techniques to investigate structure and function. **Course Pre-requisite**: BIOL 2108K or BIOL 3333K.

BIOL 4703K – Genetic Engineering (4 credit: 3.3.4) [1]
This course is intended to bring students up to the leading edge of research in developing genetically altered organisms. Focus will be on concepts and laboratory techniques of transgenic organisms, transformations; screening and selection of transgenic organisms. **Course Pre-requisite**: BIOL 2702K

Suggested courses for Biotech concentration and various tracks for interest of profession:

1. **Biotechnology concentration**:

   Students wishing to earn a concentration in biotechnology are required to take the following courses as part of their biology course sequence: BIOL 2702K, BIOL 3506, BIOL 3701, and BIOL 4703K. Please note that satisfactory completion of these courses also fulfils the 13 hours of biology electives required for the major with no additional electives needed. Please note, the student's senior research project (required as a part of BIOL 4222K) must be related to the field of biotechnology. For detailed information discuss with biotech program coordinator.

2. **Pre-Med Track** (medical/dental/pharmacy):

   Based on current admissions criteria for medical based professional programs, biology students interested in the pre-med track are advised to place emphasis on the following courses: (Required courses in bold)

Biology: **Principles of Biology I (2107K), Principles of Biology II (2108K),**

(BIOL) **Principles of Genetics (3501K), and Cell Molecular Biology (4701K),** Human Anatomy and Physiology I (2411K), Human Anatomy and Physiology II (2412K).

Chemistry: **Principles Chemistry I (1211K), Principles Chemistry II (1212K), Organic**

(CHEM) **Chemistry I (2301K), Organic Chemistry II (2302K), Biochemistry (3250K)**

Physics:

(PHYS) **Introductory Physics I (1111K), Introductory Physics II (1112K)**

Due to the recent addition of behavioral and social sciences portions to the Medical College Admission Test (MCAT), students interested in **medical school** are also encouraged to take the following courses:

General Psychology (PSYC 1101), Basic Skills in Behavioral Science (PSYC 1002) or Basic Skills in the Behavioral Science (SOCI 2001), Introduction to Anthropology (SOCI 2031), and/or Social Basis of Human Behavior (SOCI 2282). For further discussion, contact pre-med advisor.

3. **Graduate program/ Research track**:

Biology students interested in the graduate program/research track are recommended to take the following courses as part of their biology course sequence: BIOL 2000, BIOL 2001 (optional), BIOL 2240, BIOL 2250, BIOL 2320K, **BIOL 4001 BIOL 4222K**, and BIOL 4223. Please note that bold courses are required for completion of the biology major. All other courses can be used to satisfy the 13 hours of biology electives required for the major.

4. **Bioenergy Track**:

Biology students interested in the bioenergy track are recommended to take BIOL 2501 and BIOL 3103 as part of their biology course sequence. Please note that satisfactory completion of these courses may be used towards 13 hours of biology electives required for the major.

5. **Public Health Track**:

Biology students interested in the public health track are recommended to take BIOL 2330 and BIOL 3801 as part of their biology course sequence. Please note that satisfactory completion of these courses may be used towards 13 hours of biology electives required for the major.

6. **Food Safety Track**:

Biology students interested in the food safety track are recommended to take BIOL 2601 and BIOL 3201 as part of their biology course sequence. Please note that satisfactory completion of these courses may be used towards 13 hours of biology electives required for the major.

8. Recommends the adoption of the following with regard to the Pre-Engineering program at the new ASU:

Department of Natural and Forensic Sciences

The Department of Natural and Forensic Sciences offers degrees in biology, forensic sciences and chemistry with course offerings in physics and engineering. The department also offers a degree in science education with a broad based emphasis in Biology.

PRE-ENGINEERING

Albany State University offers pre-engineering programs that lead to a Bachelor of Engineering degree either from Georgia Institute of Technology, Georgia Southern University, Kennesaw State University, Mercer University or University of Georgia under the Regents' Engineering Pathways Program (REPP). Requirements to transfer to four-year Engineering Schools are the followings -

- Successful completion of course requirements by engineering major.
- Achieve the minimum grade point average (GPA) requirements by the document deadline.

To know more about those two requirements which are engineering school specific, please consult with Pre-Engineering Co-coordinator or check the following website.

http://www.usg.edu/assets/academic_affairs_handbook/docs/REP_Agreement_Final.pdf

COURSE DESCRIPTION

PHYS 2100 – Computer Applications (3 credits: 3.0.3)
This course is designed to give students the necessary computer skills in using spreadsheets, word processors, graphics and other scientific software that facilitate learning, data analysis and simulation relevant to science disciplines.

PHYS 2211K – Principles of Physics I **(4 credits: 3.3.4)**
This is an introductory course in calculus-based physics for Chemistry and Pre-Engineering majors. This course covers mechanics (kinematics, dynamics, work and energy, momentum and collisions, and rotational motion and statics), and may also include thermodynamics and waves. Elementary differential calculus is used. Laboratory exercises supplement the lecture material.
Prerequisite: A grade of C or better in Calculus I (Math 1211).

PHYS 2212K – Principles of Physics II **(4 credits: 3.3.4)**
This is the second part of calculus-based introductory physics course for Chemistry and Pre-Engineering Majors. This course covers electrostatics, electric current and circuits, electromagnetism, optics and modern physics. Elementary calculus will be used. Laboratory exercises supplement the lecture material.
Prerequisite: A grade of D or better in PHYS 2211K. Co-requisite: Calculus II (Math 1212)

ENGR 1103 – Principles of Engineering Analysis & Design (3 credits: 2.3.3)
In this course, the field of engineering is introduced by an elementary presentation of the principles of the engineering sciences such as mechanics, thermodynamics and scientific computing (utilized in the analysis and design of engineering problems). **Course Pre-requisite:** MATH 1113.

ENGR 1200 – Engineering Computing (3 credits: 2.2.3)
This course is designed to provide students with the basic concepts of structured programming with an emphasis on developing algorithm, pseudo code, flowchart and programming in a modern high level language. Different software tools will be used to introduce various engineering problem solving techniques. **Course Prerequisite(s):** MATH 1113

ENGR 1203 – Engineering Graphics (3 credits: 2.3.3)
In this course, an introduction to engineering graphics and design including sketching, drawing, projection theory, tolerances and computer-aided graphics will be covered. **Course Pre-requisite**: None

ENGR 2001 – Introduction to Engineering Materials (3 credits: 3.0.3)
Primary objective of this course is to introduce students to the study of engineering materials. Building on an understanding of atomic structure and chemical bonding from the knowledge acquired in General Chemistry; students should understand the chemical and size-factors which determines the way in which atoms pack together in solid materials. They should then be able to relate this to the observed mechanical, electrical, thermal, magnetic and chemical properties of those materials. Students will be introduced to material selection and processing as part of engineering design. **Course Prerequisite:** ENGR 1103, CHEM 1211K.

ENGR 2025 – Introduction to Signal Processing (4 credits: 3.2.4)
Introduction to signal processing for discrete-time and continuous time signals includes topics on filtering, frequency response, Fourier transforms and Z transforms. The laboratory emphasizes computer based signal processing. **Course Prerequisite(s):** MATH 2111, PHYS 2100 or CSCI 2101.

ENGR 2201 – Engineering Statics (3 credits: 3.0.3)
In this course, the principles of statics (vector based) in two and three dimensions will be covered. Concept of force, moment equilibrium principles, truss, center of gravity and friction will be taught by solving realistic problems. This course is designed for Pre-

Engineering majors. It will satisfy the requirement by Georgia Institute of Technology for the Regents Engineering Pathway Program and the Dual Degree program. **Course Prerequisite(s):** PHYS 2211K and ENGR 1103; Co-requisite: MATH 2213.

ENGR 2413 – Electric Circuit Analysis (3 credits: 3.0.3)
In this course, the study and analysis of AC and DC electric circuits, circuit elements, steady state and transient analysis and applications will be covered. (This course is recommended for majors in Electrical Engineering). **Course Prerequisite(s):** ENGR 1103, PHYS 2212K and MATH 2213.

Pre-Engineering Course Check List

▲ Student starts with College Algebra
■ Student starts with Pre-Calculus

First Semester Fall	
English Composition I (ENGL 1101)	3
College Algebra (MATH 1111)▲ | Pre-Calculus (MATH 1113) ■	3
Principles of Chemistry I (CHEM 1211K)	4
Art Appreciation (AARP 1101) and/or Engineering Graphics (ENGR 1203)	3
Second Semester SPRING	
English Composition II (ENGL 1102)	3
Pre- Calculus (MATH 1113)▲ | *Calculus I (MATH 1211)* ■	3▲ | 4■
Principles of Chemistry II (CHEM 1212K)/Intro to Biological Sci. (BIOL 1111K) [Elective 1]	4
Engineering Analysis (ENGR 1103) and/or Engineering Computing	3
Third Semester FALL	
Calculus I (MATH 1211) ▲ | *Calculus II (MATH 2212*) ■	4
US & GA Govt. (POLS 1101)	3
Macro/Micro Economics (ECON 2105/ECON 2106)	3

Engineering Computing (ENGR 1200) and/or Art Appreciation (AARP 1101)	3
Discrete Mathematics (MATH 3112)▲ | *Linear Algebra (MATH 2111)*■	3
[Pre-requisite – Pre-Calculus▲ | Calculus I■]	
Fourth Semester SPRING	
Principles of Physics I (PHYS 2211K)	4
Calculus II (MATH 2212)▲ | *Calculus III (MATH 2213)*■	4
Fundamentals of Public Speaking (COMM 1100)/Art Appreciation (AARP 1101)/Elective 2	3 or 4
Linear Algebra (MATH 2111)▲ | *Ordinary Differential Equation (MATH 3211)*■	3
[Pre. Req. – Calculus I▲ | Calculus II■]	
Fifth Semester FALL	
Principles of Physics II (PHYS 2212K)	4
Calculus III (MATH 2213)▲ | Discrete Mathematics (MATH 3112)■	4▲ | 3■
Ordinary Differential Equation (MATH 3211)▲ | Statistical Methods (MATH 3411)■	3
Engineering Statics (ENGR 2201)	3
READY TO TRANSFER NOW	

Please note that this course sequence may change slightly depending on discipline. For details visit http://ceed.gatech.edu/admissions-requirements or consult with the program coordinator.

9. Recommend that a biology major be offered at the new ASU, with these courses included:

CORE CURRICULUM (60 HOURS)
Area A through E – 44 hours
Area F Core Requirements – 16 hours
Lower Division (1000-2000 Level)
BIOL 2107 K - Principals of Biology with Lab (3-3-4)

BIOL 2108K - Principles of Biology II with Lab (3-3-4)
PHYS 1111K – Introductory Physics I with Lab (3-3-4)
PHYS 1112K – Introductory Physics II with Lab (3-3-4)

Above the core – 5 hours

REQUIREMENTS FOR THE MAJOR

Area G: Major requirements (61 hours)

The Biology Major Course requirements, AREA G, include 39 credits in required courses and 13 hours of electives. Elective courses must be 5 credits from 1000 and 2000 level and include 8 credits from 3000 level or higher biology electives; at least 3 non-science credit hours and 6 credit hours of foreign language.

BIOL 2311K - General Botany (3-3-4)
BIOL 3101K - Environmental Biology (3-3-4)
BIOL 3333K - Microbiology Principles and Applications (3-3-4)
BIOL 3501K - Principles of Genetics (3-3-4)
BIOL 4001 - Research and Independent Study I (0-1-1)
BIOL 4222K - Biology Senior Research (0-3-3)
BIOL 4701K - Cell and Molecular Biology (3-3-4)
BIOL 3250K/CHEM 3250K - Biochemistry (3-3-4)
CHEM 2301K - Organic Chemistry I (3-3-4)
CHEM 2302K - Organic Chemistry II (3-3-4)
PHYS 2100 - Computer Applications (3-0-3)

10. Recommends the adoption of the following with regard to the Science Education Advanced Program the new ASU:

Science Education: Advanced Program

Graduate Program Description:

The Department of Natural Sciences in the College of Sciences and Health Professions believes that students should be provided with quality and quantifiable learning experiences needed for professional competence and to become productive citizens in a highly technical society. The Department is determined to meet the needs of the students that we serve. Consequently, Science Education graduates will be able to master the many academic and professional challenges found in the workplace.

This program is designed for persons holding Georgia T-4 certification in Science Education or who have completed basic prerequisite course work for certification in Science Education. This program leads to T-5 certification in Science Education.

The goals of the Department of Natural Sciences are as follows:

1. To help students understand the basic concepts and principles inherent in the body of knowledge of science.

2. To allow students the opportunity to become familiar with and comfortable using the scientific method.

3. To help develop rational thinking in our students. (Science is a cognitive tool used in all intellectual endeavors).

4. To sensitize the future citizenry concerning the role that science and technology play in modern society to foster interests, appreciation, positive attitude and cultural values in harmony with the scientific enterprise.

5. To prepare students for entrance into graduate and professional schools.

6. To prepare students for professional employment in the sciences, including teaching biology and chemistry.

The degree requires 36 semester hours, with 18 hours in the cognate field.

MISSION STATEMENT and PROGRAM DESCRIPTION

The mission of the Department of Natural Sciences and The College of Education is to collaboratively prepare advanced candidates who poses a strong content knowledge base and the knowledge and skills to perform as effective teachers in diverse school settings across the state and nation. The mission is to support scholarship and professional practices of all the teacher candidates

The preparation of the Broad Field Science advanced teacher candidates is a joint effort: content knowledge training is provided by The Department of Natural Sciences and pedagogical content knowledge, professional and pedagogical knowledge and skills, assessment of student knowledge and professional dispositions training is provided through Teacher Education. Both Departments collaborate extensively to prepare a well-trained candidate with a common mission: to support scholarship and professional practices of all the advanced teacher candidates.

The Department of Natural Sciences of the College of Sciences and Health Professions believes that candidates should be provided with quality and quantifiable learning experiences needed for professional competence and to become productive citizens in a highly technical society. The Department is determined to meet the needs of the students that we serve. Consequently, Science Education graduates develop advanced skills to address the many academic and professional challenges found in the workplace. The program for a Master of Science in Science Education leads to advanced certification in Broad Field Science.

GOALS AND OBJECTIVES

GOALS

The goals of the Department of Natural Sciences are as follows:

1. To help students demonstrate mastery of the basic concepts and principles inherent in the body of knowledge of science.
2. To allow students the opportunity to practice using the scientific method during laboratory activities.
3. To help develop rational thinking in our students. (Science is a cognitive tool used in all intellectual endeavors).
4. To sensitize the future citizenry concerning the role that science and technology play in modern society to foster interests, appreciation, positive attitude and cultural values in harmony with the scientific enterprise.
5. To prepare students for entrance into graduate and professional schools.
6. To prepare students for professional employment in the sciences, including teaching biology and chemistry. The degree requires 36 semester hours, with 18 hours in the cognate field.

OBJECTIVES (What we want our students to KNOW OR BE ABLE TO DO):
Note: Objectives are measurable.

The objectives of the Science Education preparation program are as follows:

1. The advanced candidate demonstrates mastery of the content knowledge in the core science areas of biology, chemistry, physics, and earth science as measured by GACE.
2. The advanced candidate applies scientific inquiry to solve problems through laboratory activities as measured through lab reports.
3. The advanced candidate rewrites lesson plans to reflect data-driven instructional decisions based on the analysis of student performance.
4. The advanced candidate analyzes student performance data and uses the information to revise instruction that supports improved student performance as measured through pre-and post-tests.
5. The advanced candidate analyzes current and seminal research articles and applies the knowledge to improve differentiated instructional strategies and culturally relevant classroom practices.
6. The advanced candidate exhibits the College of Education professional dispositions as measured by the dispositions rubric.

Program of Study:

The program of study is organized in specific areas that address the development of advanced skills. The program is divided into Areas A – E. Area A addresses the Nature of the Learner and Behavior and Area B addresses Programs and Problems of the School. Area C is the cognate area and addresses courses for content development that addresses the Georgia standards for

grades 6 – 12. Area D addresses Educational Research and Statistics. Area E is the area for electives.

Program of Study:

The program requires 36 hours in Areas A – E. The following table identifies the number of hours and courses required in each defined area:

Area	Course	Hours
A: 3 hours	SPED 5542: (Substitutes for PSYC 5515 – no longer offered)	3
B: 6 hours	EDUC 5540: Curriculum Principles	3
	EDUC 5570: Strategies of Instruction in Science	3
C: 18 hours	BIOL 5504: Ecology	3
	BIOL 5506: Genetics	3
	ISCI 5515: Selected Topics in Biology	3
	BIOL 5519: Plant Biology	3
	ISCI 5500: Integrated Earth Science	3
	ISCI 5501: Foundations of Physical Science	3
	ISCI 5530: Integrated Physical Science I	3
	ISCI 5531: Integrated Physical Science II	3
	ISCI 5564: Integrated Science Concepts	3
D: 6 hours	EDUC 5500: Educational Statistics	3
	EDUC 5502: Action Research	3
E: 3 hours	EDUC 5199: Orientation to Advanced Profession Education	0
	SPED 5501: Exceptional Child	3
		3

Course and course descriptions specific to Science Education are summarized on the following table:

Course Number and Title	Description	Hours
SPED 5542 (replaces PSYC 5515 that is no longer offered)	Application of behavior modification principles and behavior analysis in both general and special education classrooms.	3
EDUC 5540: Curriculum Principles	Models for curriculum development and the forces that bear on curriculum decision making will be studied. This is the basic	3

	course in principles of curriculum development for graduate students, including those from diverse backgrounds with a variety of career goals.	
EDUC 5570: Strategies of Instruction in Science	Designed to introduce the professional teacher to the theories and practices of supervising student teaching nature of learning science, a system for instruction, instructional skills and evaluation of science teaching. Candidates must earn a minimum grade of B to receive credit for this course in the program of study.	3
ISCI 5515: Selected Topics in Biology	The course focuses on the integration of inquiry, problem solving, content knowledge and pedagogical knowledge and skills to provide advanced candidates with multiple opportunities to develop, practice and apply these skills in the classroom. The course supports the exploration of basic concepts and processes in the life sciences to develop deeper content knowledge for grades K - 8 teachers. Content knowledge development is strongly supported with grade appropriate laboratory activities. The content topics include cells, cellular processes, macromolecules, genetics, classification, adaptations, and ecosystems. Strategies for teaching life science will be integrated throughout the course. The content development is closely aligned to the current state and national standards (Georgia Performance Standards and Next Generation Science Standards) and integrates the literacy standards of the CCGPS (Common Core GPS Literacy Standards. Candidates must earn a minimum grade of B to receive credit for this course in the program of study.	3

ISCI 5500: Integrated Earth Science	The course focuses on the integration of inquiry, problem solving, content knowledge and pedagogical knowledge and skills to provide advanced candidates with multiple opportunities to develop, practice and apply these skills in the classroom. The course supports the exploration of basic concepts and processes in the earth sciences to develop deeper content knowledge for grades K - 8 teachers. Content knowledge development is strongly supported with grade appropriate laboratory activities. The content areas include astronomy, geology and meteorology. Strategies of teaching earth science in grades K – 8 are integrated throughout the course. The content development is closely aligned to the current state and national standards (Georgia Performance Standards and Next Generation Science Standards) and integrates the literacy standards of the CCGPS (Common Core GPS Literacy Standards). Candidates must earn a minimum grade of B to receive credit for this course in the program of study.	3
ISCI 5530: Integrated Physical Science I	The course focuses on the integration of inquiry, problem solving, content knowledge and pedagogical knowledge and skills to provide advanced candidates with multiple opportunities to develop, practice and apply these skills in the classroom. The course supports the exploration of basic concepts and processes in the physical sciences to develop deeper content knowledge for grades 4 - 8 teachers. Content knowledge development is strongly supported with grade appropriate laboratory activities. The course focuses on the knowledge and application of scientific processes and major concepts required for teaching physical science in the grades 4 – 8 classrooms,	3

	including matter and energy (motion, gravity, work, and forces). Laboratory activities are included that support appropriate grade level instruction. The content development is closely aligned to the current state and national standards (Georgia Performance Standards and Next Generation Science Standards) and integrates the literacy standards of the CCGPS (Common Core GPS Literacy Standards. Candidates must earn a minimum grade of B to receive credit for this course in the program of study.	
ISCI 5531: Integrated Physical Science II	The course focuses on the integration of inquiry, problem solving, content knowledge and pedagogical knowledge and skills to provide advanced candidates with multiple opportunities to develop, practice and apply these skills in the classroom. The course supports the exploration of basic concepts and processes in the physical sciences to develop deeper content knowledge for grades 4 - 8 teachers. Content knowledge development is strongly supported with grade appropriate laboratory activities. The course focuses on the knowledge and application of scientific processes and major concepts required for teaching physical science in the grades 4 – 8 classrooms, including waves, heat, light, sound, electricity and magnetism. Laboratory activities are included that support instruction, grades 4 – 8. The content development is closely aligned to the current state and national standards (Georgia Performance Standards and Next Generation Science Standards) and integrates the literacy standards of the CCGPS (Common Core GPS Literacy Standards. Candidates must	3

	earn a minimum grade of B to receive credit for this course in the program of study.	
BIOL 5504: Ecology	Lecture and laboratory activities in this course will emphasize the basic concepts and principles used in the study of the environment and ecosystems.	3
BIOL 5506: Genetics	Lecture and laboratory activities in this course will emphasize the basic principles and concepts of classical and molecular genetics in living organisms.	3
BIOL 5519: Plant Biology	Lecture and laboratory activities in this course will emphasize the basic concepts of the botanical sciences with applications in health, industry, technology, agriculture, the environment and society.	3
ISCI 5501: Foundations of Physical Science	Integrated Foundations of Physical Science is the study of basic principles in relation to teaching science and their relation to the teaching of science in the elementary school. This course provides the foundations of Physical Science in the study of basic principles of physical science and their relation to the teaching of science in the elementary schools. The course focuses on the integration of inquiry, problem solving, content knowledge and pedagogical knowledge and skills to provide advanced candidates with multiple opportunities to develop, practice and apply these skills in the classroom. The course supports the exploration of basic concepts and processes in the physical sciences to develop deeper content knowledge for elementary teachers. Content knowledge development is strongly supported with grade appropriate laboratory activities. The course focuses on the knowledge and application of scientific processes and major concepts required for	3

	teaching physical science in the elementary classrooms, including matter and energy (motion, gravity, work, and forces). Laboratory activities are included that support appropriate grade level instruction. The content development is closely aligned to the current state and national standards (Georgia Performance Standards and Next Generation Science Standards) and integrates the literacy standards of the CCGPS (Common Core GPS Literacy Standards. Candidates must earn a minimum grade of B to receive credit for this course in the program of study.	
ISCI 5564: Integrated Science Concepts	The course focuses on the understanding and application of scientific processes and major concepts required for teaching science in the elementary classrooms. It develops the advanced candidate's ability to integrate inquiry, problem solving, content knowledge and pedagogical knowledge and skills and provides advanced candidates with multiple opportunities to develop, practice and apply these skills in the classroom. The course supports the exploration of basic concepts and processes in the physical sciences to develop the elementary teachers' ability to apply scientific inquiry and problem solving to practical situations. Content knowledge development is strongly supported with grade appropriate laboratory activities. A strong emphasis is placed on integrating content areas in the elementary classroom. The content development is closely aligned to the current state and national standards (Georgia Performance Standards and Next Generation Science Standards) and integrates the literacy standards of the CCGPS (Common Core GPS Literacy Standards. Candidates must earn a minimum grade of B	3

	to receive credit for this course in the program of study.	
EDUC 5500: Educational Statistics	Application of basic descriptive statistics to education. Data graphs and tables, probability, sampling statistics, correlation and hypothesis testing are studied.	3
EDUC 5502: Action Research	A study of research methods, procedures and designs, including the preparation of research abstracts and action research as it applies to educational settings.	3
EDUC 5199: Orientation to Advanced Profession Education	Orientation to Teacher Education provides graduate students with the training and information needed to successfully navigate ASU teacher preparation program requirements. Students will receive training on the College of Education's Conceptual Framework; the requirements needed to successfully complete teacher preparation programs; learn to navigate Degreeworks to complete academic program plans of study; and learn to navigate LiveText for purposes of assessment and evaluation of Key Unit and Program specific assessments. All students will be required to purchase a LiveText account and have an active ASU account prior to participation in the course.	3
SPED 5501: Exceptional Child	A survey course satisfying House Bill 671 and focusing on the characteristics, identification, prevalence, and programming of exceptionality areas for which children and youth may obtain special educational services.	3

Program Check Sheet:

THE DEPARTMENT OF NATURAL SCIENCES AND THE COLLEGE OF EDUCATION

BROAD FIELD SCIENCE EDUCATION PROGRAM OF STUDY (M.Ed. SCIENCE EDUCATION)

Name: _____ Address: _____ City/State/Zip: _____ Home Telephone: _____ Cell Telephone: _____ Email: _____ Advisor: _____	RAM ID: _____ Date Admitted to Program: _____ GPA Requirement Met (3.0 or higher) _____ Date Comprehensive Exam Passed: _____ Expected Graduation Date: _____ Graduation Audit: _____ T-5 certification date issued: _____

*required course **highly recommended

AREA A: NATURE OF THE LEARNER AND BEHAVIOR PROBLEMS (Minimum 3 hrs.)		SEMESTER PLANNED	SEMESTER TAKEN	GRADE	HRS
PSYC 5552	Conditions of Learning				3
PSYC 5530	Adolescent Psychology				3
PSYC 5515	Educational Psychology	Course Substitute: SPED 5542			3

AREA B: PROGRAMS AND PROBLEMS OF THE SCHOOL (Minimum of 3 hrs.) [Minimum 9 hrs. in Areas A & B]					
EDUC 5538	Curriculum Planning				3
EDUC 5540	Curriculum Principles				3
EDUC 5570	Strategies of Instruction in Science*				3
AREA C: TEACHING FIELD (Broadfield Concentration – total 18 hrs. required)					
BIOL 5501	Selected Topics in Botany				3
BIOL 5502	Selected Topics in Zoology				3
BIOL 5504	Ecology				3
BIOL 5506	Genetics				3
BIOL 5514	Biological Chemistry				3
ISCI 5515	Integrated Biology**				3
BIOL 5519	Plant Biology				3
BIOL 5520	Evolution and the Nature of Science				3
ISCI 5500	Integrated Earth Science**				3
PHYS 5501	Foundations of Physical Science				3
ISCI 5530	Integrated Physical Science I**				3
ISCI 5531	Integrated Physical Science II				3
ISCI 5564	Integrated Science Concepts				3
AREA D: EDUCATIONAL RESEARCH AND STATISTICS					
EDUC 5500	Educational Statistics				3
EDUC 5501	Methods of Research in Education*				
AREA E: EDUCATIONAL ELECTIVES					
EDUC 5199	Orientation to Advanced Profession Education*				0
SPED 5501	Exceptional Child				3

	Can be chosen from Area C with adviser				3
	Total Hours Required				36

11. Recommends the adoption of the following with regard to a Minor in Chemistry at the new ASU:

REQUIRED COURSES FOR A MINOR IN CHEMISTRY

- *A minor must contain 17 semester hours of coursework.*
- *A minor must contain at least 9 hours of upper division course work (numbered 3000 or above).*
- *Courses taken to satisfy Core Areas A through E may not be counted as course work in the minor.*

REQUIRED COURSES		**CREDIT HOURS**	**TOTAL HOURS**
CHEM 2301K	Organic Chemistry I	4	8 hours
CHEM 2302K	Organic Chemistry II	4	
CHEM 2351K	Quantitative Analysis I	4	

UPPER DIVISION CHEMISTRY COURSES		**CREDIT HOURS**	**TOTAL HOURS**
CHEM 3221K	Physical Chemistry I	4	9 hours
CHEM 3250K	Biochemistry I	4	
CHEM 4110	Chemical Literature	1	

CHEM 3231K	Intermediate Inorganic Chemistry I	4	
CHEM 3222K	Physical Chemistry II	4	
CHEM 3400	Polymer Science	3	
CHEM 3300	Nanoscience and Nanotechnology or other upper division courses	3	
TOTAL OF REQUIRED & UPPER DIVISION HOURS			**17 HOURS**

12. Recommends the adoption of the following with regard to a Minor in Biology at the new ASU:

REQUIRED COURSES FOR A MINOR IN BIOLOGY

Coursework for the minor in Biology consists of two foundational courses, Principles of Biology I and II, followed by a highly flexible range of options in one or more specific fields. Students may choose to obtain a greater breadth of understanding in biology or focus on one area of particular interest. The minor serves as an excellent complement to related sciences, such as chemistry or forensic sciences. Even students majoring in business, psychology, sociology or art may choose to pursue a minor in biology, providing a different perspective that enhances a student's appreciation and understanding of the material encountered in their chosen major.

The minor in Biology is an excellent stepping-stone to further education in the life sciences, which in turn may lay the groundwork for future participation in various health-related professions and other pursuits.

Requirements:

- *A minor must contain 18 semester hours of coursework.*
- *A minor must contain 8 hours of required course work and at least 10 hours of upper division of biology course work. Only one elective course will be approved.*
- *Courses taken to satisfy Core Areas A through E may not be counted as course work in the minor.*
- *Students must receive a grade of C or higher in all courses taken toward the minor.*

REQUIRED COURSES		CREDIT HOURS	TOTAL HOURS
BIOL2107K	Principles of Biology I	4	8 hours
BIOL 2108K	Principles of Biology II	4	

UPPER DIVISION BIOLOGY COURSES (Only one elective course will be approved)		CREDIT HOURS	TOTAL HOURS
BIOL 2311K	General Botany	4	10 hours
BIOL 3101K	Environmental Biology	4	
BIOL 3333K	Microbiology Principles and Applications	4	
BIOL 3501K	Principles of Genetics	4	
BIOL 3250K	Biochemistry	4	
BIOL 4001	Research Independent Study I	1	
BIOL 4701K	Cell and Molecular Biology	4	
2000 level or higher	Biology Elective	2 to 3 credit hours only	
TOTAL OF REQUIRED & UPPER DIVISION HOURS			**18 HOURS**