MIDDLE & SECONDARY SCHOOLS PROGRAM COURSE DESCRIPTIONS

SUBJECT AREA CONCENTRATIONS

BIOLOGY

BIO 101: GENERAL BIOLOGY
BIO 102:
CHEM 101: PRINCIPLES OF CHEMISTRY 1
PHYS 101:

BIO 371 - EVOLUTION AND CULTURE

1. Pre-requisites: BIO 101; CHEM 101; PHYSICS 101,
2. Credits: Three (3) units
3. Course Description

Interest in human behavior motivates much of our research in evolution and behavior of all organisms. It is also an area in which poor science has consequences and where controlled experiments and unbiased sampling are usually not possible. This course presents current understanding of epigenetic and epigenetic modes of inheritance, how traits evolve in cultures and groups and the levels of selection and nitration between cultural and genetic evolution. The evolution of behavior on both human and non-human organisms will be explored for a better understanding of evolution, scientific methods and thinking and the limits of knowledge. Standard Met: NSTA Standard #1

BIO 372 - CELL BIOLOGY

1. Pre-requisites: BIO 101, CHEM 101
2. Credits: Four (4) units (3 lecture and 2 lab hours)
3. Course Description

Cell biology is the study of the structure and function of prokaryotic and eukaryotic cells. In this course we will examine many different areas of cellular biology including the synthesis and function of macromolecules such as DNA, RNA and proteins; control of genetic expressions; membrane and organelle structure and function; bioenergetics; and cellular communication. Examples of relevant human disorders will also be used to help the students’ understand what happens when cells don’t work as they should.

STANDARD MET: NSTA Standard #1

BIO 373 - BOTANY

1. Pre-requisites: BIO 101, 102, ENVSC 201; PHYS 101; BIO 372
2. Credits: Four (4) credit units – 3 lecture & 2 lab hour
3. Course Description:
Study plant ecology, plant pathology, mycology, the ecological physiology of plants, plant biochemistry, plant molecular biology, genetic engineering of plants, and the taxonomy, evolution and biogeography of flowering plants. Topics in Ethno-botany will also be included in this course: plant products that are an important part of everyday life, and the ways that the development of different cultures has been influenced by plants throughout history, origins of major agricultural crops, economically important plant products, and medicinal and poisonous plants in Liberia and West Africa.

**BIO 374 - ANIMAL BEHAVIOR AND FUNCTION**

4. Pre-requisites: BIO 101, 102, ENVSC 201; PHYS 101; BIO 372
5. Credit Hours: Four (4) credit units -(3 lecture units: 1 lab unit)
6. Course Description:

This course will cover such topics as functions and design of circulatory systems in a wide range of animal groups; the various physiological and biochemical adaptations developed by diving birds and mammals that allow them to remain submerged for prolonged periods; the similarities and differences of reproductive strategies in different animal groups; the relationship between animals, temperature and their environment and the ways in which they have adapted to survive in an extended range of temperatures; the effects of genetic change on proteins, the phylogeny of cytochrome C and the genetic analysis of human hemoglobin. Design, carry out and write up an experimental project.

Standard met: NSTA Standard #1

**BIO 376 - METHODS OF TEACHING SCIENCE IN MIDDLE AND HIGH SCHOOL**

1. Pre-requisites: BIO 101, 102, ENVSC 201; PHYS 101; BIO 372; 374
2. Credits: Three (3) units
3. Course Description

Open only to students in the science teaching major concentrations. Through explorations of epistemological foundations of biology, chemistry and physics (the natural sciences) and their pedagogical and philosophical underpinnings, develop a point of view in science teaching. The course offers a review of Liberian science curricula, strategies for teaching science with emphasis on planning using backward design and the 5E instructional model, resources and lab. Performance/Project-based assessment and evaluation of learning emphasized.

Field Experience Required:

Standards Met: NSTA standard #2 & standard #3

**BIO 377 - ANATOMY AND PHYSIOLOGY**

1. Pre-requisites: BIO 101, CHEM 101; BIO 371
2. Credits: Four (4) units (3 lecture and 2 lab hours)
3. Course Description
A detailed study of the human organism according to levels of chemical and structural organization with special reference to cytology, histology and organs of the integumentary, skeletal, muscular, and nervous systems and fluid and electrolyte balance. 

NSTA Standard #1

**BIO 477 - ECOLOGY**

1. **Pre-requisites**: BIO 101, 102, ENVSC 201; PHYS 101; BIO 371
2. **Course Credits**: Three (3) credit units
3. **Course Description**:

Ecology is the study of the interaction between organisms and the environment. In this course we will investigate the relationship between abiotic (nonliving) and biotic (living) components of an ecosystem. Building upon an introduction to environmental factors, we will examine the interplay between these components at the organismal, population, community and ecosystem levels. Throughout the course, we will discuss current ecological applications and issues, such as habitat destruction, biogeographic ecology, nutrient cycling and energy flow, sustainability, disease and parasitism - the challenges of infectious disease in the developing world, focusing on tuberculosis, HIV, and malaria-invasive species, and global climate change. Field trips will be scheduled at times before and other times during our regular class hours (will last several hours). You will be responsible for your transportation to the site. In addition to the prerequisites, it is strongly encouraged that you have also completed the all the math requirements prior to enrolling in this course. If you have not taken the course prerequisites, you are very likely to have a difficult time doing well in this. Standards Met: NSTA Standard #1

**BIO 471 - INTEGRATED SCIENCE or CHEM 472 or PHYS**

3 Credit Hours

1. **Pre-requisites**: BIO 101, CHEM 101; PHYSICS 101; BIO 371
2. **Credits**: Three (3) units
3. **Course Description**

Integrated science is an interdisciplinary approach to the teaching and learning of science. Students taking this course will learn about concepts, content and inquiry processes linking various topics across the disciplines in the sciences. Students will be provided with hands-on opportunities for systematic inquiry into the sciences from an interdisciplinary perspective. Thinking scientifically, critically and creatively through engaging in problem-solving activities will be promoted. They will develop the knowledge and skills of how to apply this approach in the teaching of science in classrooms in the middle and secondary schools in Liberia.

NSTA Standard #1 & Standard #2

**BIO 472 - PERSPECTIVES ON SCIENCE AND MATHEMATICS**

2 Credit Hours
1. **Pre-requisites:**
2. **Credits:** Three (3) units
3. **Course Description**

This course is intended to help future math and science teachers learn how to think about math and science “from the outside” to ask questions about what scientists and mathematicians do and why, about where science and technology come from and how they got to be important in the world today, about what kinds of questions scientists and mathematicians have tried to answer and why, what is the significance of scientists and mathematicians using local contexts and their associated issues and problems to advance the search for deeper meaning in scientific discoveries? This course additionally offers an opportunity to think about science and math education in Africa incorporating indigenous African ways of learning and knowing. This course is also designed to teach students the skills of the liberal arts sophisticated research and information analysis, fluent writing, and substantive argument. It requires students, having acquired all these perspectives and skill to put them to work in science and math pedagogy.

**BIO 473 - BIO-STATISTICS**

1. **Pre-requisites:** BIO 101, 102, MATH 103
2. **Credits:** Three (3) credit units
3. **Course Description**

**COURSE DESCRIPTION:** The ability to organize and analyze biological data is an essential research tool. This course provides an introduction to the methods used to analyze biological data. The course will introduce topics such as describing and displaying data, probability, hypothesis testing, how to design experiments, and many others. Hands on experience will be provided through weekly exercises using biological data and R, free open source statistical software. NSTA Standard #1