



# STAFFORD COUNTY PUBLIC SCHOOLS

## Curriculum Overview Dual Enrollment Advanced Biology

### **Course Description:**

This is an accelerated course that explores fundamental characteristics of living matter from the molecular level to the ecological community with emphasis on biological principles. The course provides lab experiences in handling, constructing, and manipulating materials in a safe manner and develops abilities to measure, organize, and communicate scientific information. If a verified science credit is needed, the Biology Standards of Learning test can be taken at the end of the course. Students who successfully complete the course will receive two semesters of college credit through Germanna Community College as well as one year of high school credit.

### **Essential Skills/Processes:**

The goals of the course are to educate the student in the material content of Advanced Biology, to increase science inquiry skills and logical thinking, and foster positive attitudes for further science study.

- The student will investigate and understand the history of biological concepts
- The student will investigate and understand the chemical and biochemical principles essential for life
- The student will investigate and understand relationships between cell structure and function
- The student will investigate and understand life functions of archaeobacteria, monerans (eubacteria), protists, fungi, plants, and animals including humans
- The student will investigate and understand common mechanisms of inheritance and protein synthesis
- The student will investigate and understand bases for modern classification systems
- The student will investigate and understand how populations change through time
- The student will investigate and understand dynamic equilibria within populations, communities, and ecosystems

### **Essential Knowledge:**

Essential knowledge and skills is categorized into six strands.

### **Science as Process:**

- Data collected, recorded, reported, and analyzed with appropriate terminology and instruments.
- Analysis of data involving the use of biostatistics will include average, standard distributions, random samples, and chi square analysis.
- Laboratory exercises including appropriate dissections.
- An emphasis on laboratory safety.

**Cells:**

- Cell structure and function including roles of the organelles.
- Energy use and production including respiration and photosynthesis.
- Cell reproduction including the cell cycle, mitosis and meiosis, and re-assortment of genes.

**Information Coding and Transfer:**

- DNA structure, mutations, genomes.
- RNA and protein synthesis including RNA structure, replication, transcription, and translation.
- Gene expression and cell differentiation.
- Animal embryology.
- Genetic inheritance, genetic engineering and ethical considerations.

**Biochemistry:**

- Characteristics and role of lipids, carbohydrates, nucleic acids, and proteins.

**Tissues and Organ Systems:**

- Basic tissue types: epithelial, connective, muscular, and nervous.
- Organ systems.

**Evolution:**

- Origin of life hypotheses.
- Work of Lamarck and Darwin.
- Types of evidence of evolution.
- Natural selection.
- Adaptation and coevolution.
- Population genetics.
- The process of speciation including mutation, mating preferences, genetic drift , gene flow, and the Hardy-Weinberg Law.

**Diversity of Organisms:**

- The science of taxonomy.
- Viruses, viroids, and prions.
- Kingdoms Monera, Protista, Fungi, Plantae, and Animalia.
- Origin of multicellularity.

**Ecology:**

- The biosphere including biomes, terrestrial and aquatic communities.
- Ecosystems and change.
- Populations and biogeography.
- Human ecology and natural resources.