EARTH SYSTEMS COURSE OVERVIEW

The Earth Systems course has been developed to support Maryland's adoption of the Next Generation Science Standards (NGSS) and to address the state's environmental literacy graduation requirement (COMAR 13A.04.17).

This new course merges Earth and Environmental Science concepts. The NGSS standards addressed by this course include all of the Earth and Space Sciences (ESS) Performance Expectations (PEs), as well as a few PEs from the Life Sciences (LS), Physical Sciences (PS), and Engineering Design (ETS) domains. The NGSS call for an integration of three dimensions - science content, science and engineering practices, and crosscutting concepts.

The course focuses on Earth's spheres, global earth and environmental issues, as well as how these issues affect local areas. Each of the following units focuses on one of Earth's spheres. The goal of each unit is to develop an understanding of the sphere while also exploring interactions between this sphere and other Earth systems, as well as how humans impact and are impacted by the focus sphere.

Each unit also incorporates the engineering design process which includes identifying a challenge/issue, synthesizing new learning, and brainstorming and/or evaluating possible solutions. This engineering process is also used to meet MSDE Environmental Literacy Standard 1. In the Maryland's Changing Hydrosphere Unit, students develop an action plan that addresses an environmental problem in order to complete the Environmental Literacy graduation requirement.

The following chart provides information on each unit including the suggested number of 80 to 90-minute class periods.

Unit Title	Unit Summary
Course Intro and Space (20 classes)	Students begin the unit by exploring the Big Bang Theory and how it provides and explanation for the formation of the universe. Students then identify and communicate the relationship between the life cycle of stars and the production of elements. Students study stars' light spectra to determine brightness, composition, movement, and distance from Earth. Students use evidence to explain how energy from the sun's core reaches the Earth. Students also use mathematical and computational models to describe the predictable motions of orbiting objects.
Our Complex Crust (20 classes)	This unit is framed by the overarching question: How have internal and surface processes shaped Earth's features and affected human civilization? Using knowledge of Earth's internal structure, the theory of plate tectonics, and evidence from other objects in the solar system, students explain how land and sea floor features change on Earth due to constructive and destructive forces. Students explain the age of crustal rocks using evidence from radiometric dating. Students investigate how the availability of natural resources, occurrence of natural hazards, and changes in climate influenced and continues to impact human population distribution on Earth. Students

	also evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
Climate Change (24 classes)	This unit focuses on how scientists monitor, model, and predict changes in Earth's climate. The unit begins with an investigation of the evidence of historical climate change and how these changes have produced feedbacks in other Earth's systems, including the biosphere. Students investigate the carbon cycle, its connection to climate change, and how it is impacted by human activity. Students explore how scientists use models and geoscience data to predict current and future climate change and the resulting impacts. Students also investigate technological solutions for reducing anthropogenic causes of climate change and the impacts on related to these changes in climate.
Maryland's Changing Hydrosphere (18 classes)	In this unit, students use the health of a local tributary and watershed as a context for learning how natural and anthropogenic forces affect hydrology and the living systems that depend on it. Students explore how the physical and chemical properties of water contribute to its role in changing Earth's surface. The role of water as a natural resource is explored as students investigate current local water quality issues and evaluate possible solutions. Students learn that tributary health is a function of geological setting and landforms, the physical nature of moving water and local hydrology, pollution inputs, and the ability of a tributary to support a diverse community of organisms. Throughout the unit, students collect and access water quality data from a variety of field and remote sources in order to make real-time decisions regarding current and future local watershed issues.
Human Sustainability Capstone Project (7 classes)	The Earth Systems course concludes with students developing and implementing an action plan that addresses an environmental issue related to human sustainability. Successful completion of the Human Sustainability Capstone Project fulfills the High School Science Student Service-Learning graduation requirement.