

FOUNDATIONS OF SCIENTIFIC INQUIRY – HONORS/MPS PRE-IB

#4022

Freshman, Sophomore

1.00 credit

Yearlong

Prerequisite: A strong background in mathematics

The study of higher level science requires a strong foundation in the fundamentals of physics and chemistry provided by this course. Honors is an intensive course that reinforces the importance of topics like the SI system and basic mathematics from a scientist's perspective. Students will explore the concept of energy in great depth and use that knowledge to explore atoms, compounds and the periodic table in a new light. Throughout the class analytical and critical thinking skills in the sciences will be honed. Special attention will be paid to mastering laboratory techniques, developing technical writing skills, and incorporating math skills in the science area. Technology will be utilized both in classroom and lab activities. This class will pave the way for success in the higher HONORS/IB science courses.

Foundations of Scientific Inquiry is a prerequisite for all upper level science classes.

CHEMISTRY – COLLEGE PREP

#4003

Sophomore, Junior, Senior

1.00 credit

Yearlong

Prerequisite: Foundations of Scientific Inquiry

Since atoms make up all matter, living and nonliving, the field of chemistry is the basis of all science. In our expanding global environment, students need to understand how materials respond and react to other materials around them. This course begins the study of chemistry to prepare the student for possible future study in medical fields, science fields, or engineering. It encompasses in-depth studies of matter, atomic theory, nuclear chemistry, periodicity, bonding, chemical compounds, chemical reactions, stoichiometry, states of matter, solutions, and organic chemistry. Students will expand laboratory techniques gaining experience using spectrophotometers, HyperChem, and Vernier equipment, as well as develop skills in the interpretation, analysis, and application of collected data to strengthen their technical writing and math skills.

CHEMISTRY I – HONORS/IB

#4004

Sophomore, Junior, Senior

1.00 credit

Yearlong

Prerequisite: Foundations of Scientific Inquiry (teacher recommendation) and a strong background in mathematics.

Since all materials are comprised of atoms, the field of chemistry is the basis of all science. This course follows the study of chemistry as outlined by the International Baccalaureate program to prepare the student for possible future study in medical, technological, physical or engineering sciences. It encompasses in-depth studies of matter, atomic theory, nuclear chemistry, periodicity, bonding, chemical compounds, chemical reactions, stoichiometry, states of matter, solutions, acids and bases, and organic chemistry. Students will expand laboratory techniques and gain experience using spectrophotometers, HyperChem, and Vernier equipment. They will develop skills in the interpretation, analysis and application of collected data to strengthen their technical writing and math skills.

CHEMISTRY II – HONORS/IB STANDARD or HIGHER LEVEL

#4006

Junior, Senior

1.00 credit

Yearlong

Prerequisites: Chemistry I - HONORS/IB and Biology I - HONORS/IB – previously or concurrently (teacher recommendation)

Students who are continuing their academic studies in a science field, particularly in health professions, will find that one of their first college courses will be chemistry. In preparation for this and for a broader awareness of the impact atoms and compounds have on our global environment, this course will extend material covered in Chemistry I HONORS/IB following the International Baccalaureate syllabus. Areas of study will include stoichiometry, atomic theory, periodicity, bonding, states of matter, energetics, kinetics, equilibrium, acids and bases, oxidation and reduction, organic chemistry, human biochemistry, and food chemistry. Emphasis will also be placed on further development of experimental techniques as chemical principles are applied in laboratory investigations to enhance and strengthen technical writing, data interpretation, and math applications. Students will complete an interdisciplinary lab activity with the Biology II and Sports Exercise & Health II students, as well as an individual lab project on a topic of the student's choice with teacher approval. All students will take the IB exam upon completion of the course.

BIOLOGY – COLLEGE PREP

#4007 Junior, Senior 1.00 credit Yearlong

Prerequisite: Chemistry

We are the caretakers of this living planet. Consequently, this course will explore key biological concepts within an ecological systems based context. Students will be introduced to the basic requirements for life – with the cell as that basic unit. The life functions and organization of microorganisms, plants, and animals will be compared and contrasted. The dissection of a vertebrate will be a component of this course. This not only gives students a perspective on their own anatomy, but also provides them a laboratory experience typical of courses at the college level. Other lab activities include the use of digital microscopes, Vernier probes and software and electrophoresis equipment. Taxonomy, genetics and biotechnology will be presented and coupled with current evolutionary theory. All of these concepts will be framed in an environmental perspective with an emphasis on the connections between functions and organisms.

BIOLOGY I – HONORS/IB

#4008 Junior, Senior 1.00 credit Yearlong

Prerequisite: Chemistry I – HONORS/IB (teacher recommendation)

The curriculum is based on the International Baccalaureate biology program; therefore, students must have demonstrated proficiency in prior science courses. Humans are bound to this earth and possess an intense and dynamic relationship with all creatures. Students will study those living systems from the very simple to the very complex - from the molecular level to that of the biosphere. Students are introduced to the concepts of biochemistry, cell biology, energetics, Mendelian and population genetics, evolutionary theory, and taxonomy. A comparative study of the structure and function of microorganisms, plants, and animals will follow. Other lab activities include the use of digital microscopes, Vernier probes and software and electrophoresis equipment. Students will also dissect a selected vertebrate specimen to gain an appreciation of their own mammalian systems.

BIOLOGY II – HONORS/IB STANDARD or HIGHER LEVEL

#4010 Senior 1.00 credit Yearlong

Prerequisites: Biology I - HONORS/IB and Chemistry I - HONORS/IB (teacher recommendation)

This course completes the curriculum outlined by the International Baccalaureate higher level biology program. The earth's ecology and the impact of humans on this planet require a lengthy investigation. Comparative anatomy, physiology and behavior will also be explored in depth. Historical developments and current research in these areas will give the students a perspective on the manner in which science pursues the answers to life's questions. Twenty-five percent of class time will be used for pertinent laboratory investigations. Students will complete an interdisciplinary lab activity with the Chemistry II and Sports, Exercise & Health II students, as well as an individual lab project on a topic of the student's choice with teacher approval. All students will take the IB exam upon completion of the course.

PHYSICS – COLLEGE PREP

#4011 Junior, Senior 1.00 credit Yearlong

Prerequisites: Chemistry and Biology - previously or concurrently, Algebra II

A solid foundation in Physics is essential in today's society to understand increasing advances and changes on our planet both technologically and environmentally. In this course students will study and apply the principles of classical and modern physics. Topics include motion, mechanics, heat, electricity, magnetism, and waves with continual references to how they impact our students' lives. Class activities will include laboratory investigations along with problem solving techniques focusing on the concepts learned.

Students need signatures of approval from their current science teacher AND current math teacher.

PHYSICS – HONORS

#4012 Junior, Senior 1.00 credit Yearlong

Prerequisites: Chemistry I HONORS/IB and Biology I HONORS/IB – previously or concurrently (teacher recommendation), Algebra II

For students interested in a scientific career in the health, engineering, or physical science fields, a solid background in physics is vital. In order to accomplish this, the physics curriculum will include topics such as motion, mechanics, thermodynamics, electricity, magnetism, waves, and particle physics. These concepts are explored in depth with emphasis on how they relate to current societal issues and future careers in science. Problem solving and laboratory investigations will entail higher level math skills including trigonometry. Students will be required to do independent projects.

Students need signatures of approval from both their current science teacher AND current math teacher.

HUMAN ANATOMY AND PHYSIOLOGY – HONORS

#4024 Senior 1.00 credit Yearlong

Prerequisite: Biology – previously or concurrently (teacher recommendation)

Occupations in health care are among those with the fastest rate of growth. Students who enjoy biology and chemistry, medical issues, and working with people will find that this course is preparation for a variety of career paths from physician or pharmacist to any of the allied health professions. The class will survey the structure and function of the human body in lecture and laboratory investigations that include dissection of vertebrate organs and human cadaver anatomy. Because of the vocabulary and pace of topics, this is considered a rigorous course and is recommended for seniors who are seriously considering pursuit of further study of a health science at the college level.

SPORTS, EXERCISE and HEALTH SCIENCE I – HONORS/IB STANDARD LEVEL

#4026 Junior 1.00 credit Yearlong

Prerequisite: Foundations of Scientific Inquiry CP or MPS PreIB/H and Algebra I CP or MPS Pre IB/H, both with minimum grade of B

Because this is the first year of a two year course, juniors will be given preference. However, if space allows, seniors will be admitted.

This is the first year of a new two year IB Standard Level course for juniors who wish to explore the scientific aspects of human physical activity and the relationship to health and sport. The arena of Sports Science has exploded in the last 20 years, and many careers can spring from this academic avenue of study. The fields of Athletic Training, Strength and Conditioning, Nutrition, Sports Psychology, Coaching, Physical Therapy, and Sports Medicine require a solid scientific understanding of how physical activity, in its many forms, affects our bodies and overall performance. Within this course we will study Anatomy and Physiology, Biomechanics, Skill Acquisition, Nutrition and Energy Systems, Measurement and Evaluation of Human Performance and Program Design, all with a view to how human performance in sport, exercise, and health are affected. Students will cover a range of core and option topics and carry out practical (experimental) investigations in both laboratory and field settings. This will provide an opportunity to acquire the knowledge and understanding necessary to apply scientific principles and critically analyze human performance. Where relevant, the course will address issues of internationalism and ethics by considering sport, exercise and health relative to the individual and in a global context. Students who study the full two year course will be in a position to sit for the IB exam in their senior year.

SPORTS, EXERCISE and HEALTH SCIENCE II – HONORS/IB STANDARD LEVEL

#4028 Senior 1.00 credit Yearlong

Prerequisite: Sports, Exercise and Health Science I – IB Standard Level/Honors

This course completes the curriculum outlined in the IB Sports, Exercise, & Health Science (SEHS) standard level IB course. The course analyzes the intersection of human biology and sports/exercise performance by investigating the effect of physical activity on the body, patterns of movement, metabolism, psychology and nutrition. Various training methods are considered and analyzed for their sports-specific goals. Students will complete laboratory studies including one interdisciplinary investigation in cooperation with students in IB chemistry II and biology II and will be eligible to take the IB exam upon completion of this course.

EARTH & SPACE SCIENCE – COLLEGE PREP or HONORS

#4101-College Prep	Sophomore, Junior, Senior	1.00 credit	Yearlong
#4102-Honors	Junior, Senior	1.00 credit	Yearlong

Prerequisite: Foundations of Scientific Inquiry

This elective class may be taken as a yearlong course or by terms. One term will be deal with Hydrology, one term will focus on Astronomy and one term will emphasize Environmental Science. For more details on each class, please see the course description below the individual course listings. Students who sign up for this yearlong course should not also request one of the term components as an elective. As an honors course, students will be expected to engage with the material, employing a higher level of critical thinking and synthesis throughout the year.

EARTH & SPACE SCIENCE (BY TERMS) (#4105, #4107, #4109)**HYDROLOGIC SYSTEMS – COLLEGE PREP**

#4105	Sophomore, Junior, Senior	.33 credit	Term course
-------	---------------------------	------------	-------------

Prerequisite: Foundations of Scientific Inquiry

Many analysts have said that the wars of the future will be fought, not over land or oil, but over water. What's the big deal? Water has properties that make it unique and invaluable. This course will investigate the immense role of water in our lives. We will discover some of those interesting properties of water (why is it odd that ice floats and what would happen if it didn't?). Water is also the largest agent of change to the surface of the Earth and we will explore many of those processes. Special attention will be paid to the Great Lakes system and our local watershed in relating the physical and chemical properties of water systems to the organisms they support. We will also address the global social, economic and political roles of water in a rapidly growing population.

INTRODUCTION TO ASTRONOMY – COLLEGE PREP

#4107	Sophomore, Junior, Senior	.33 credit	Term course
-------	---------------------------	------------	-------------

Prerequisite: Foundations of Scientific Inquiry

For years people have looked to the heavens in wonder. This class will introduce and explain close to home astronomical topics like Earth and Moon's place in the solar system and how that affects us all the way through to topics like galaxy formation. The class will include discussions on telescopes, the Solar System, stellar evolution, galaxy structure and exotic phenomena like black holes and dark matter.

ENVIRONMENTAL SCIENCE – COLLEGE PREP

#4109	Sophomore, Junior, Senior	.33 credit	Term course
-------	---------------------------	------------	-------------

Prerequisite: Foundations of Scientific Inquiry

This course will cover ecological principles and how humans have impacted them. Topics for investigation will include ecosystem analysis, population studies and biomes. This class will put all of the knowledge gained in prior science courses together to look at the big picture. Emphasis on problems in the environment will include land use, pollution and energy conservation.

ATOM & EVE: AN INTERDISCIPLINARY LOOK AT THE WORLD IN WHICH WE LIVE – COLLEGE PREP

#4121	Junior, Senior	.33 credit	Term Course
-------	----------------	------------	-------------

From the very first pages of Genesis, we see that God has charged humanity with being stewards of creation. Drawing deeply from both the theological and scientific disciplines we will explore exactly what that means. What is our role in creation? How do we live in our world in a way that is as sustainable as it is holy? This course will explore the ways we can answer those questions and many others as we look how best to embrace and honor God's call.

ENGINEERING

INTRODUCTION TO MODERN ENGINEERING – COLLEGE PREP

#4201 Sophomore, Junior, Senior 1.00 credit Yearlong

Prerequisite: Foundations of Scientific Inquiry

This elective class may be taken as a yearlong course or by terms. One term will focus on The Design Process, one term will deal with Engineering Disciplines, and one term involves students in Capstone Design. For more details on each class, please see the course description below the individual course listings. Students who sign up for this yearlong course should not also request one of the term components as an elective.

INTRODUCTION TO MODERN ENGINEERING (BY TERMS) (#4203, #4205, #4207)

INTRO TO MODERN ENGINEERING: THE DESIGN PROCESS – COLLEGE PREP

#4203 Sophomore, Junior, Senior .33 credit Term Course

Prerequisite: Foundations of Scientific Inquiry

This term course will introduce students to a scientific and methodical approach to solving problems. Utilizing engineering principles over a wide range of challenge-based tasks, students will build fundamental skills applicable to all facets of human involvement within modern society.

INTRO TO MODERN ENGINEERING: ENGINEERING DISCIPLINES – COLLEGE PREP

#4205 Sophomore, Junior, Senior .33 credit Term Course

Prerequisite: Intro to Modern Engineering: The Design Process

This term course will continue constructing skills developed in the first term study by providing opportunities to expand knowledge of the major engineering disciplines. Students will research and experience project-based tasks centered on Mechanical, Chemical, Electrical and Civil Engineering. Experienced members of our Erie engineering community will provide in-class lectures as well as on-site visits to several engineering facilities.

INTRO TO MODERN ENGINEERING: CAPSTONE DESIGN – COLLEGE PREP

#4207 Sophomore, Junior, Senior .33 credit Term Course

Prerequisite: Intro to Modern Engineering: The Design Process & Engineering Disciplines

This term course will finalize the engineering trifecta by providing the students an opportunity to research and develop their own design project. This term-long project will be centered on improving Mercyhurst Preparatory School in some way. A strong focus of 3D modeling or CAD design will be used to implement and create physical components of this project. A well-documented design journal will highlight all steps taken during the design process. The final design will be presented to a board of faculty members for evaluation.