**SCIENCE - TECHNOLOGY - ENGINEERING**

At Winthrop High School, we believe that all students are curious about the world around them and benefit from understanding and engaging in learning about science and technology/ engineering in various, differentiated ways.  We seek to develop scientific literacy and critical thinking skills in a supportive and challenging environment for all of our students by offering multiple pathways to learn, engage, and experience science theory and technology/engineering practice throughout their careers at Winthrop High School.  Winthrop High School students will be prepared to apply scientific literacy and technology/engineering practice to their everyday lives and future careers due to the impact of their education at Winthrop High School.

Course offerings and the curricula therein are designed to meet or exceed the core requirements of the Massachusetts Science and Technology/Engineering Frameworks as well as the Next Generation Science Standards, NGSS, established by the federal government.

WHS Science Department offers 2 programs of study with multiple options:

|  |  |  |
| --- | --- | --- |
| **Program** | **Honors****(H)** | **College Preparatory****(CP)** |
| **General Description** | The Honors Program of Studies offers a rigorously paced, comprehensive course aligned to Massachusetts and NGSS standards. Concepts are investigated, discovered and presented in depth. | The College Preparatory Program of Studies offers appropriately paced science courses aligned to Massachusetts and NGSS standards. Concepts are investigated, presented and repetitively practiced to meet the needs of the students. |
| **Options** | *1* | *2* | *1* |
| **Program****Sequence by Year** | 1 | Honors Biology | Honors Biology | CP Biology |
| 2 | Honors ChemistryandAP Enviro Science | Honors Chemistry | CP Chemistry |
| 3&4 | Honors Physicsand a choice of:AP Environmental ScienceAP Chemistry AP BiologyHonors Science ElectiveAP Physics (must be concurrent with Calculus) | CP Science Elective |
| **Student Profile** | Designed for the student who is motivated or interested in science, technology and or engineering.Courses highly recommended for admission to college are biology, chemistry and physics. | Designed for the student who benefits from a curriculum designed to give an overview of science concepts and skills from multiple perspectives. |

 **CORE SCIENCE OFFERINGS**

**Course Title: Biology**

**Course No: 3023 Offered: Full Year**

**Grade: 9 Level: Honors Credits: 5.0**

**Dept: Science**

**Description:** Honors Biology explores six main topics through a variety of teaching methods such as labs, models, interactive websites, and class discussions. The 6 main topics are: The Chemistry of Life, Cell Biology, Genetics, Anatomy and Physiology, Evolution and Biodiversity, and Ecology. This course will incorporate scientific inquiry skills and introduce proper laboratory procedures and the use of instruments, equipment, and materials. All students will be expected to recognize common themes among living organisms. Honors students are expected to work independently and at a high academic level. DOE# 03051

*Prerequisites: Recommendation by 8th grade science teacher.*

**Course Title: Biology**

**Course No: 3024 Offered: Full Year**

**Grade: 9 Level: College Preparatory Credits: 5.0**

**Dept: Science**

**Description:** College Prep Biology explores six main topics through a variety of teaching methods such as labs, models, interactive websites, and class discussions. The 6 main topics are: The Chemistry of Life, Cell Biology, Genetics, Anatomy and Physiology, Evolution and Biodiversity, and Ecology. This course will incorporate scientific inquiry skills and introduce proper laboratory procedures and the use of instruments, equipment, and materials. All students will be expected to recognize common themes among living organisms. College Prep students will have more classroom support and guidance from the teacher. DOE# 03051

*Prerequisites: Recommendation by 8th grade science teacher*

**Course Title: Chemistry**

**Course No: 3033 Offered: Full Year**

**Grade: 10, 11, 12 Level: Honors Credits: 5.0**

**Dept: Science**

**Description:** This is a first year survey course for highly motivated students that will rely largely on individual responsibility for personal education. Students will analyze patterns in laboratory data to develop an understanding of fundamental topics in chemistry including, but not limited to laboratory procedures, atomic theory, chemical bonding, stoichiometry, phases of matter, and chemical reactions. Students will be assessed on their ability to apply fundamental chemical principles to broader situations. By the completion of the course, students will develop laboratory techniques and refine their analytical and critical thinking skills. DOE # 03101

*Prerequisites: Teacher recommendation and successful completion of Honors Biology and Accelerated or Honors Algebra I*

**Course Title: Chemistry**

**Course No: 3034 Offered: Full Year**

**Grade: 10, 11, 12 Level: College Preparatory Credits: 5.0**

**Dept: Science**

**Description:** This is a survey course designed to expose students to fundamental topics in chemistry including laboratory procedures, atomic theory, chemical bonding, stoichiometry, phases of matter, and chemical reactions. Students will be expected to demonstrate their understanding of the material through projects and laboratory experiments. Students will also develop skills in, organization and use of reference materials, qualitative and quantitative analysis, and critical thinking. By the completion of the course, students will be able to explain simple daily phenomena in the context of fundamental chemical principles. DOE# 03101

*Prerequisites: Successful completion of Biology and Algebra I.*

**Course Title: Physics**

**Course No: 3043 Offered: Full Year**

**Grade: 11, 12 Level: Honors Credits: 5.0**

**Dept: Science**

**Description:** An introduction to the study of Physics for the motivated, college bound student. The course is lab-based and is focused on developing modeling skills, problem solving, and quantitative reasoning. Both conceptual understanding and mathematical problem solving will be emphasized for topics including mechanics, electromagnetism, sound, light, heat, and atomic physics. DOE# 03151

*Prerequisites: Successful completion of Honors Chemistry, Accelerated or Honors Algebra 2, and Accelerated or Honors Geometry.*

**ELECTIVE OFFERINGS**

**SCIENCE - TECHNOLOGY - ENGINEERING**

Science electives will be offered to students as an open honors course.

An open honors course offers students the choice to take the science elective for College Prep or Honors level credit towards their GPA calculation. The following table outlines expectations for each curriculum level within course.

|  |  |
| --- | --- |
| **College Prep** | **Honors** |
| Open Note Assessments |  |
| Modified Project Requirement |  |
| Grade distribution40% Assessments/ Projects40% Completion20% Content | Grade distribution60% Assessments/ Projects10% Completion30% Content |
|  | Recommendation Required |

Procedure for running an Open Honors elective courses.

* + Students will register for the elective science course in the spring.
	ALL ELECTIVES WILL REQUIRE A FIRST AND SECOND CHOICE SELECTION
	+ During the first two weeks of September, students will designate the curriculum level they wish to enroll in the course. A letter will be sent home for parent/ guardian approval and signature. Any student who does not have a returned letter will automatically be designated as College Prep for grading and GPA calculation purposes.

**Course Title: Environmental Science**

**Course No: Offered: Full Year**

**Grade: 11, 12 Level: Honors Credits: 5.0**

**Dept: Science**

**Course No: 3354 Offered: Full Year**

**Grade: 11, 12 Level: College Preparatory Credits: 5.0**

**Dept: Science**

**Description:** Environmental science will address global issues facing our planet. We will start by learning the basic principles and apply them to real life situations. This course will be a combination of activities, case studies, current events, and field work. Discussion topics for the class will include: climate change, ecosystems, human population, energy sources, resource management, pollution, and sustainable futures. This course will explore the consequences of human activity and its impact on the natural world. This class will appeal to students who are interested in connecting science to society. DOE # 03003

*Prerequisites: Successful completion of Biology and Chemistry* (*can be concurrent)*

**Course Title: Anatomy and Physiology**

**Course No: 3583 Offered: Full Year**

**Grade: 11, 12 Level: Honors Credits: 5.0**

**Dept: Science**

**Course No: Offered: Full Year**

**Grade: 11, 12 Level: College Preparatory Credits: 5.0**

**Dept: Science**

**Description:** Human Anatomy and Physiology is a one-year course designed for college-bound students who desire to develop an understanding and appreciation of the human body. Students will learn the structures, functions, and the regulation of human body systems through a variety of strategies. This advanced life-science course is helpful for those students who expect to continue in a curriculum for medicine, nursing, sports medicine, physical therapy, biology or physical education. DOE# 03053

*Prerequisites: Successful completion of Biology and Chemistry*

**Course Title: Marine Science**

**Course No: 3593 Offered: Full Year**

**Grade: 11, 12 Level: Honors Credits: 5.0**

**Dept: Science**

**Course No: Offered: Full Year**

**Grade: 11, 12 Level: College Preparatory Credits: 5.0**

**Dept: Science**

**Description:** Seventy-five percent of the Earth is covered in water teeming with life. This course will explain how oceans operate and affect life on land. During the first semester we will focus on oceanography; we will learn about plate tectonics, water chemistry, waves, tides, and currents - all of the chemical and physical features of the oceans that in turn affect the biological features of the oceans. During the second semester we will focus on the various forms of life found in oceans from the microbial to marine mammals. We will learn about various kinds of marine ecosystems, and explore our environmental impacts on the oceans. An ongoing focus throughout the year will be the impacts of climate change on the oceans. This course will consist of outreach with Belle Isle Marsh and will be academically rigorous. This course will conduct several dissections and other fieldwork.

*Prerequisites: Successful completion of Biology and Chemistry*

**Course Title: Forensics**

**Course No: Offered: Full Year**

**Grade: 11, 12 Level: Honors Credits: 5.0**

**Dept: Science**

**Course No: 3353 Offered: Full Year**

**Grade: 11, 12 Level: College Preparatory Credits: 5.0**

**Dept: Science**

**Description:** This course is designed to introduce students to a variety of topics related to forensics. Topics to be studied in this course will include crime scene investigation, collection and preservation of evidence, fingerprinting, blood typing, DNA identification, fire scene analysis, eyewitness identification, composite sketches, drug identification, post mortem examination, toxicology, criminal behavior, psychopathology, law enforcement, corrections, criminal law, court proceedings, and legal considerations at a crime scene. Students will be introduced to representative areas of forensics including technology for evaluating evidence, criminology, legal proceedings, and case law through laboratory experiments and various readings. The course will incorporate the use of contemporary research articles, case studies, criminal law, chemistry, biology and environmental sciences. Students will develop an understanding and appreciate for the scientific method and need for careful scientific analysis.

*Prerequisites: Successful completion of Biology and Chemistry* (*can be concurrent)*

**Course Title: STEAM**

**Course No: 3564 Offered: Full Year**

**Grade: 10, 11, 12 Level: Honors Credits: 5.0**

**Dept: Science**

**Course No: 3365 Offered: Full Year**

**Grade: 11, 12 Level: College Preparatory Credits: 5.0**

**Dept: Science**

**Description: STEAM** is a course that integrates components of **S**cience & **T**echnology through **E**ngineering and **A**rtistic design all based in **M**athematical elements. Students will learn and then apply technology skills to solve problems, communicate with others, locate information, teach, entertain and inspire. The contextual curriculum coordinates each subject area to support one another in a formal educational structure. The STEAM curriculum is a standard based NGSS curriculum with a focus on science and engineering practices and core concepts in science education. The curriculum will be delivered through FUSE, an interest-driven learning experience developed at Northwestern University and through a two year grant with the Winthrop Public Schools. The course includes individual as well as group project based learning.

*Prerequisites: Biology and Chemistry (can be concurrent), teacher recommendation required.*

**ADVANCED PLACEMENT SCIENCE OFFERINGS**

**Course Title: Advanced Placement - Environmental Science**

**Course No: 3941 Offered: Full Year**

**Grade: 10, 11, 12 Level: AP Credits: 5.0**

**Dept: Science**

**Description:** Advanced Placement (AP) Environmental Science is designed to provide students with the scientific theories, models, and techniques that will allow them to analyze local, regional and global environmental issues. A strong emphasis is placed on principles of science, environmental stewardship, and sustainability. Students will utilize critical, creative, logical and reflective thinking to study and evaluate natural and human-induced environmental problems. The course requires an interdisciplinary view that ranges across the social sciences, ethics, politics and many scientific fields - including biology, chemistry, and physics. Students who take the AP Environmental Science course must take the AP exam; and the nonrefundable examination fee must be paid upon entrance into the class. DOE # 03003

*Prerequisites: Teacher recommendation required and successful completion of Honors Biology, and Honors Chemistry (can be concurrent).*

**Course Title: Advanced Placement: Biology**

**Course No: 3921 Offered: Full Year**

**Grade: 11, 12 Level: AP Credits: 5.0**

**Dept: Science**

**Description:** This is an advanced second-year biology course designed to follow a first year college level curriculum. This course will focus on 4 big ideas of biology: evolution, energy, information, and interactions. With each big idea, students will learn the intricate details of the major concepts as well as specific examples to support the understanding of the main concepts. The topics covered in this course will include: biochemistry, cell biology, energy processes, cellular communication among body systems, molecular heredity, genetics, evolution, and ecology. Students taking this course will be expected to complete a daily reading, inquiry-based laboratory work, and modeling. Student may earn college credit and possibly become exempt from an introductory biology course based on successful completion of the exam. Every student is required to take the College Board administered exam in May; this exam has a nonrefundable fee. DOE# 03056

*Prerequisites: Teacher recommendation required and successful completion of Honors Biology, and Honors Chemistry.*

**Course Title: Advanced Placement Chemistry**

**Course No: 3931 Offered: Full Year**

**Grade: 11, 12 Level: AP Credits: 5.0**

**Dept: Science**

**Description:** This is an advanced second-year chemistry course designed to follow a college level curriculum. Students will develop a deep conceptual and quantitative understanding of fundamental chemical principles using advanced analytical techniques. Topics include atomic theory, chemical bonding, stoichiometry, phases of matter, kinetics, equilibrium, acid-base chemistry, thermodynamics, and electrochemistry. Students will be expected to engage in productive peer-collaboration to understand the interlocking nature of topics in chemistry. Achieving a successful score on the AP Chemistry examination may lead to exemption from a first year college chemistry course. There is a nonrefundable examination fee that must be paid upon entrance to the course. DOE# 03106

*Prerequisites: Teacher recommendation required and successful completion of Honors Biology, and Honors Chemistry.*

**Course Title: Advanced Placement Physics C: Mechanics**

**Course No: 3051 Offered: Full Year**

**Grade: 11, 12 Level: AP Credits: 5.0**

**Dept: Science**

**Description:** AP Physics provides a systematic introduction to the main principles of physics and emphasizes the development of conceptual understanding and problem-solving ability using algebra and trigonometry, and the basics of calculus. The equivalent of a first-semester college-level Physics course for scientists and engineers, AP Physics will cover five major content areas: kinematics, Newton's laws, conservation of energy and momentum, rotational dynamics, and gravitational physics. Where appropriate, laboratory work will be a central component of the course. Students who take the AP Physics course must take the AP exam and the nonrefundable examination fee must be paid upon entrance into the class.

*Prerequisites: Teacher recommendation required, Honors Biology and Honors Chemistry as well as concurrent enrollment in Calculus or Pre-Calculus with* *Calculus preferred.*