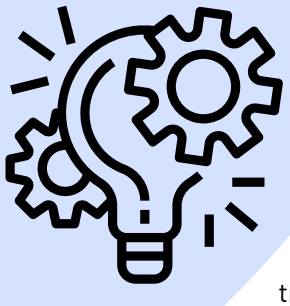

Middle and High School

Science and Engineering

Mount Madonna School offers a comprehensive grade 6 through grade 12 science program based on the recommendation of current research, The Ocean Literacy Principles, the Next Generation Science Standards, and the school's commitment to building equity and strong habits of mind. In high school, students follow a traditional three-year cycle starting with biology, followed by chemistry and then physics. In addition, all students complete an in-depth Marine Science program and choose between AP Physics or Science with Humanities, an honors laboratory capstone course in life sciences and bioethics. Middle school science serves as the foundation to high school science.

High school students will also take a full grade 9 through grade 11 series of courses in engineering in addition to the traditional science cannon and the Marine Science Program. All students graduate with a minimum of five years total of high school science.

Mount Madonna School students study engineering through the T.E.A. (Technology, Engineering and Art) programs staring in grade 1 through grade 9. Students in grades 10-12 are offered courses in Engineering Principles, Oceanographic Engineering, Biomedical Engineering, and Computer Principles. This grade 1 through grade 12 engineering program emphasizes the school's dedication to equity-building in technical careers and in delivering measurable and innovative problem-solving to communities from the classroom level up to the global scale.

Middle School Science

Middle school science is designed to prepare students for more advanced mathematics and science in high school. Laboratory experiments are designed as an introduction to scientific equipment, and to spark curiosity, imagination and inquiry in science. Middle school students learn through guided practice, modeling projects, hands-on laboratory experiments, from textbooks and in the field utilizing our 375 acre mountaintop campus that includes a lake, ponds, native flora and fauna, it's very own microclimate and is home to wildlife.

6th Grade

Students learn fundamental concepts of water and atmospheric science, geology, ecology, and environmental science. This course includes a solar car design project and hand-on science lab work.

7th Grade

Students are introduced to chemistry and life science. Laboratory experiments include higher level write-ups and an introduction to microscopy.

8th Grade

Students are introduced to the concepts of physics, astronomy, human anatomy/physiology and sexual health. This course takes place in our high school science lab, giving students an opportunity to become comfortable with the lab equipment used in high school.

Computer Science

6th and 7th Grades

This class covers the science and engineering behind computers and introduces and introduces functional text-based coding in HTML, Python, CS, JavaScript. It also covers conceptual and algorithmic topics in coding. Finally the students study the ethics of Artificial Intelligence. Students learn about an innovative computer scientist twice a month and learn about careers in computer science and technology through Equity-in-Technology spotlights. Students produce a personal website, a functioning personality quiz, a text-based role-playing game, an activist website, and a simple video game. Students demonstrate their learning at the end of the course by completing a hacking challenge.

T.E.A.

8th Grade

This class is designed to give students hands-on experience designing, planning and making things using perspectives and tools from art, engineering and technology. The faculty and students work together to build an environment that fosters creativity and the safety to explore, make and learn from mistakes. Students will get a feel for different materials and techniques and will learn about different aspects of the design process. This class is taught in collaboration between an art teacher and engineering teacher.

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Grade 9

Biology with Honors option

The two goals of this course are to help students develop a conceptual framework for modern biology and to help students gain an appreciation for science as a process. The ongoing information explosion in biology makes these goals even more challenging and vital. The primary emphasis in biology is on developing an understanding of the topics rather than on memorizing terms and technical details. Essential to this conceptual understanding are the following: grasp of science as a process rather than as an accumulation of facts; personal experience in scientific inquiry; an understanding that certain "key concepts" keep popping up as we learn about life; and finally how a strong understanding of biology can benefit you and your community. In addition to a thorough reading of the textbook, students will complete many labs and hands-on activities to better support and extend what they will be responsible for learning. Students will write up lab reports, complete daily activities, summarize scientific articles and journals, conduct research and complete projects. Topics covered include: Cellular and Molecular Biology, Beginnings of Life on Earth, Ecology, Evolution, Animal Diversity and Human Body Systems. Honors students will complete an in-depth project for each unit of study as well as more analysis questions on each exam.

T.E.A.

TEA 9 is a year-long course in Technology, Engineering and Art offered to all ninth grade students. It is a UC elective in the G-college preparatory elective category. This class is offered alongside the traditional high school college preparatory science cannon (Biology-Chemistry-Physics) and Fine Art classes to give students a space to use their creative and artistic skills alongside newly developing engineering skills. This class builds skills in computer science, coding, fabrication, design and electronics. It is also a space for open-ended creativity and exploring technology tools. Students practice the engineering design process as they design solutions to problems for other programs around the school, and for problems relating to sustainability and equity on a global scale.

Grade 10

Marine Biology and Oceanography with Honors option

Marine Biology and Oceanography provides one year of science credit. It is aligned with the Ocean Literacy Principles and with the MMS emphasis on ocean ecosystems and conservation offered at all levels of the school. In Marine Biology students learn field science underwater as well as microscopy. techniques Marine Biology is a one-semester laboratory science elective. Oceanography is a one-semester honors-level physical science class. Together these classes prepare students for their 9th-grade learning journey to Yosemite and 10th grade learning journey to Catalina Island.

Marine Biology focuses on the lives of animals and plants in the ocean, from microscopic plankton to the largest and most unusual animals on the planet. Students learn the techniques scientists use to study these animals and also have many opportunities in the lab and field to get up close and personal with them. The course finishes with a study of the ecosystems and biomes of the worldwide ocean.

The Oceanography course builds on the students' lab and field skills. Units include the origin, discovery, and mapping of the ocean, earth science, and astronomy. Four integrated lab and field studies completed on campus are modified from AP Environmental Science to maximize the advantage of the 375 acre of lakes, ponds, forests, and seasonal rivers on which the school is situated. The course includes study, building, and use of real remote operated vehicles and taking ethograms in the field.

Health

Health is a scientifically accurate, age-appropriate course in skills and knowledge that promotes physical, emotional, mental and social health. This is a one-semester elective spear over the course of the academic year. The course covers health literacy as a consumer, risk assessment, stress management and coping with loss, healthy relationships, conflict resolution, nutrition and physical activity as well as personal care and body systems, growth and development, drugs and alcohol, diseases and disorders, and safety and environmental health. This course will include the Habits of Mind and cover the Health Connected High School Sex Education curriculum.

Chemistry with Honors option

This course begins with subatomic particles and ends with large biomolecules. Students study a traditional Algebra-based course in Inorganic Chemistry; topics include atomic structure and quantum mechanics, stoichiometry, reaction dynamics, solutions, acid/base reactions, nuclear chemistry, solid states and solutions, reaction kinetics, organic chemistry, and biochemistry. Students progress through traditional analytical glassware-based lab techniques and tools, and acquire modern lab skills by the end of the year, including spectrophotometry and electrophoresis. Students are introduced to MMS' college preparatory laboratory report format and begin quantitative data analysis in their lab work. The course includes a project-based STEAM component that challenges students to approach the topic deeply as they each study one meaningful molecule through the lens of the year-long topic progression. Critical thinking is invited when considering the implications of quantum mechanics and the applications of chemistry in healthcare, equity and environmental sustainability.

Engineering Principles

This course samples from Project Lead the Way's Principle of Engineering course designed by the college board, which includes kinetics, statistics, control systems, materials, manufacturing, and the engineering design cycle. This class also emphasizes engineering solutions and equity in engineering careers aligned with the United Nations Sustainable Development Goals. Students analyze and problem-solve on current issues such as housing. Over the semester, students develop a design portfolio with summative projects from each unit that have the potential to create measurable change for the good of their community. Students learn how to integrate physics, mathematics, and real-world engineering tools and methods.

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Grade 11

All students in grade 11 will take Physics with Honors option in addition to choosing one of the two electives below.

Physics with Honors option
Physics 11 covers fundamental concepts of classical physics. The course offers traditional labs in linear motion, thermodynamics, electronics, energy transfer, and magnetics. During laboratory experiments, students collect, analyze data, and draw conclusions about concepts that were derived during the course. The course includes theoretical discovery of relativity, quantum mechanics and the goal of creating a theory of everything. Each unit requires that the students produce multiple measurable, deliverable results as they work with a new and diverse collaborative group. The goals of this course are to give students a fundamental understanding of scientific concepts and an awareness of current theories of the universe.

Biomedical Engineering (elective)
In this course, students are presented with a survey of topics in Biomedical Engineering that deepen their knowledge of the physics, chemistry, and biology considered when engineering medical technology solutions. Students study CRISPRs in gene editing, an emerging technology poised to transform medicine. Materials science is studied as a gateway to design and prototyping of prosthetic limb with optional robotics. Students review Chemical Engineering as they design tablet coatings and consider small molecule production. In an electronics unit, students examine types of medical imaging and learn to read diagnostic images. In addition, students apply their knowledge and skills to answer questions or solve problems related to the biomedical sciences. Students design innovative solutions for the health challenges of the 21st century as they work through progressively challenging open-ended problems, addressing topics such as clinical medicine, physiology, biomedical engineering, and public health. The content of this course combines a survey of Biomedical Engineering with select activities and problems written for Project Lead the Way capstone course, Biomedical Innovation. The lab series in the course includes labs designed by Biorad for Life Science Education in their Biotechnology Explorer series.

Computer Principles (elective)
The course introduces students to the foundational concepts of computer science and challenges them to explore how computing and technology can impact the world. The program carries a goal of creating leaders in computer science fields and attracting and engaging those who are traditionally underrepresented with essential computing tools and multidisciplinary opportunities. The course includes a basic introduction to coding in Python and exposure to basic fundamentals of Artificial Intelligence.

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Grade 12

Students in grade 12 may choose between Science with Humanity Honors or AP Physics in addition to choosing between the two elective courses of Biomedical Engineering and Computer Principles.

Science with Humanity Honors
This class is a survey of college-level topics in Life Science. It is an honors laboratory course with Physics, Chemistry, and Biology as prerequisites. The unifying context for the course is what science has to tell us about the human species and about ourselves as we interact with modern society. Bioethics is the topic that ties the units together. Specific units includes Biomedical Technology, Feeding the Human Race, Environmental Science, Physical Anthropology, the Human Brain, and Toxicology of Drugs.

AP Physics
Advanced Physics follows the current College Board recommendation on the topics and content for AP Physics. This course is a college-level calculus-based course. Students must have taken or be currently enrolled in Calculus AB. Students in this class are eligible to take the AP Physics exam in the spring. The course covers kinematics, Newton's Laws of Motion, work, energy, and power, systems of particles and linear momentum, circular motion and rotation, oscillations, and gravitation. Each student completes a portfolio of lab reports, where students make observations, predictions, design experiments, analyze data and construct arguments in a collaborative setting that is directed and monitored by the course instructor. This course is designed to give students interested in studying science and engierering at the college level and introduction to the above topics.

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