

MULTIDISCIPLINARY COURSES

REVERSE ENGINEERING: HOW THINGS WORK

Spring term; 1 course credit
MD230

This course introduces students to general principles of product design and function and examines some of the engineered items all around us. Students learn to take apart various mechanical and electrical devices and examine how component parts work together. Engineering skills such as sketching, 3D modeling, prototyping, testing, and clear communication are emphasized. An introduction to microcontrollers and programming is included and students build several devices of their own design. Hands-on experimentation is emphasized and students learn to use some 3D modeling software (Google SketchUp), 3D printers, and Arduino microcontrollers. Third and fourth formers have priority enrollment for this course; fifth and sixth formers may enroll with permission of the Science department.

TOPICS IN ENGINEERING

Winter, Spring terms; 1 course credit
MD310

This introductory course is designed to provide students with an overview of some major engineering principles and applications, as well as an opportunity to implement those principles through experimentation, design-based projects, and presentations. Topics to be covered include graphical communication and drafting, basic material science, beam mechanics and deformation, and micro-engineering. The course will provide an interdisciplinary outlet for the mathematical skills and general scientific knowledge students have already acquired and also introduce new mathematical concepts to improve their understanding of how real-world systems are designed, modeled, and fabricated. Open to students who have completed one year of physics and Algebra II.

COGNITIVE NEUROSCIENCE, HONORS

Winter, Spring terms; 1 course credit
MD330HO

One of the fastest growing research areas in science is neuroscience. Cognitive and behavioral studies have attracted considerable popular and scientific attention in recent years and new techniques have opened up novel avenues for exploration. This course provides an introduction to the cellular and molecular mechanisms of neuronal function, and examines how cognitive processes can be explained by the structure and function of the brain. Beyond foundational knowledge and empirical methodology in neuroscience, this class also explores data from current studies in neurobiology and cognitive sciences. Open to fifth and sixth formers.

Prerequisite: Anatomy and Physiology or Introduction to Psychology.

START-UP DESIGN LAB AND INNOVATION STUDIO

All terms; 1 course credit
MD340

There are many ways to bring an idea from imagination to reality, and this course lets students try these out by rigorously applying design processes toward solving problems in the real world. We start by considering techniques for effective ideation, collaborating in teams, and developing an understanding of the design process itself. Coursework includes an introduction to 21st-century digital fabrication tools and technologies, as we learn to work with diverse materials and computer-generated designs. We also use traditional hands-on arts and crafts methods that encourage students to bring their ideas to life quickly. The goals of the class include developing the practice of quick sketching and modeling, making an action plan that results in a final product, finding resources and communities online that can be helpful with design and production tips, and fostering the patience to fail as part of an iterative process where ideas grow and improve through multiple versions. We also focus on storytelling and narrating what we do, documenting projects and generating a shared dialogue of what is observed and learned along the way. In short, the class is a maker's studio: it provides students a platform for self-directed learning, a laboratory for hands-on experimentation, and is the starting point for developing foundational life-long habits as a maker. Course meetings consist of a combination of roundtable discussions, reflective writing, group "critiques," 5-minute presentations, design thinking exercises, and focused topic-and-tool-specific workshops. Student projects may include: origami designs and paper models, interactive electronic devices, DIY video game controllers, experimental electronic musical instruments, 3D designed and printed prototypes, and student-created VR worlds. Open to fifth and sixth formers, and fourth formers with permission of the instructor.

CLIMATE CHANGE: FROM KNOWLEDGE TO ACTION

Winter term; 1 course credit
MD370

Climate change is a defining global problem of the 21st century, touching all aspects of human and nonhuman life. In this course, we grapple with the challenges posed by climate change by exploring its social dimensions. What are the impacts of climate change on communities, both locally and around the world? What are the psychological and ideological drivers of climate denial? What are the ethical dimensions of climate change and what is "climate justice"? Most importantly, what can we, as individuals and as members of communities, do to address climate change? In answering these and other questions, we look at journalism, religious documents, documentary film, performance art, philosophical essays, and literature (including fiction and poetry) about climate change. And while we begin with a basic overview of climate science, the bulk of the course draws on ideas, approaches, and sources from many humanities and social science disciplines, including history, philosophy, sociology, psychology, geography, the arts, and English. In so doing, we discover new ways to think and talk about climate change. The dominant modes of discussing climate change are often unsatisfying, veering between doomsday ecological scenarios and depressing descriptions of our current society with its rampant apathy, skepticism, and

denial. Environmental journalist Carrie Saxifrage evocatively describes this as “a relentless combination of terrifying data and the lack of political will to address it, with some small bright spots along the way.” In response to the despair, fear, apathy, and other demotivating emotions that arise when learning about climate change, this course explores how writers, artists, activists, academics, scientists, and students are responding creatively to the challenges of climate change. There are people around the world working with their local communities—using, for example, documentary film and persuasive writing, digital storytelling and time-lapse photography, theater and dance, new media and creative tactics of climate activism—to bring about a better world. In this course, we join this growing group of engaged citizens and contribute to the project of imagining a world that is resilient, sustainable, and just. Open to fifth and sixth formers, and fourth formers with permission of the instructor. *This course fulfills the requirement in contemporary global studies.*

JOURNALISM AND NONFICTION STORYTELLING

Year; 3 course credits

MD375

Nonfiction storytelling, whether it is daily journalism, long-form magazine writing, personal essays, opinion pieces, radio broadcasts, or another variety, is invariably based in fact. The creator is circumscribed by what actually happened, and yet these works can be as gripping and nuanced as any work of fiction. Unlike a novelist, a nonfiction storyteller can't invent a character or fabricate a cliff-hanging plot twist. Like a novelist, a nonfiction storyteller is free to experiment with form, detail, diction, syntax, metaphor, and the like. Understanding that dynamic is key to the work of this course. Students study the foundational elements of a fact-based story. What makes such a story compelling, provocative, or, simply, fun? How does one go about uncovering and relaying such a narrative? How can elements like rhetoric, structure, and data enhance a story? How can stories change the world? Students analyze short and long nonfiction, both contemporary and canonical, and work individually and collaboratively on storytelling projects that address current issues. They engage in a diversity of narrative forms—the written word, as well as infographics, podcasts, photojournalism, and video—and study a group of writers that likely includes James Baldwin, Joan Didion, Ian Frazier, Janet Malcolm, John McPhee, Dorothy Parker, David Foster Wallace, Tom Wolfe, and others. Students also practice accepted data-gathering techniques, employing statistics to strengthen the stories they tell. They should be prepared to share their work with their classmates regularly, providing and receiving appropriate feedback. Open to sixth formers.

Note: This year-long course satisfies the sixth form English diploma requirement.

PUBLIC SPEAKING

All terms; 1 course credit

MD400

Effective oral expression is the first pillar of communication. In this course, students work toward expressing themselves with skill and purpose in all basic modes of public speaking: extempore, from

notes, and from a formal text. The basics of good public speaking are discussed initially, and models from excellent addresses are observed frequently. Students also evaluate speakers on campus throughout the term. However, the majority of the class is spent speaking before one's peers. Students are responsible not only for planning and delivering as many as eight or nine speeches of different types, but also for both providing and profiting from the suggestions of one another. This experiential and analytic approach is the heart of the course. The iPad is used to further support the effort to help students “see” and imagine themselves as public speakers. Mixed among their more formal presentations, extemporaneous speaking is designed as both a fun and challenging change of pace. Confidence in and enthusiasm for self-expression are the twin goals. Open to all students.

INTRODUCTION TO LOGIC

Spring term; 1 course credit

MD406

Virtually every human activity involves reasoning and argumentation. We use reasoning and argumentation whenever we solve problems, make decisions, unravel mysteries, or interpret works of art. Logic seeks to clarify reasoning, to separate good reasoning from bad, and to analyze and appraise arguments. In this course, students approach logic from both formal and informal perspectives. Students study the principles of correct reasoning, construct proofs, and develop the skills that are required to apply these principles in everyday life. During the term, students work to solve many “brain teaser” type problems and answer practice questions from the Law School Admission Test. Issues of proof, meaning, and semantics that are found in introductory college-level philosophy and logic courses are also considered. Open to fifth and sixth formers, and fourth formers with permission of the instructor.

VISUAL MATHEMATICS

Spring term; 1 course credit

MA417

Mathematical concepts are embedded in many art forms—whether they were intended by the artist or as a result of what was aesthetically pleasing to the eye. This course offers students the opportunity to explore these connections from a mathematical perspective. Topics from geometry, such as constructions, proofs, the Golden Ratio, similarity, and polygons are explored. From analytic geometry and algebra, students work with transformations, compositions, vectors, matrices, fractals, and the Fibonacci sequence. Three dimensional constructs, including polyhedra, Platonic and Archimedean solids are included. Students complete art projects in relation to each topic throughout the term. Creations will include mandalas, friezes, and tessellations, as well as three-dimensional and computer-generated pieces. Open to students who have completed Geometry.

STRATEGIC DECISIONMAKING

All terms; 1 course credit

MA418

This case study-driven course examines leadership, strategy and negotiation techniques responsible for successful boardroom

turnarounds and perilous Mt. Everest summit failures. Simulating a practical environment, student teams apply a problem-based learning system to research and present conclusions throughout the term. Another course component exposes students to basic financial statement analysis and an introduction to industry recognized corporate valuation techniques. As the course concludes, teams apply these skills through an exploration of the energy markets, specifically targeting alternative and renewable energy companies. Specific case studies may vary across sections. Open to students who have completed Algebra II. *This course earns one quantitative credit.*

ISLAMIC CIVILIZATIONS OF THE MIDDLE EAST, HONORS

Spring term; 1 course credit

MD458HO

This course helps students understand and appreciate the beauty and complexity of the Islamic civilizations of the Middle East. Starting with the rise of Islam in the Arabian Peninsula and concluding with the fall of the Ottoman empire at the end of World War One, students read a college-level text, study primary sources, and explore visual materials, to discover the history of Islamic thought and socio-political institutions as well as Islam's many forms of art, literature, and architecture. The course culminates in a student project on the art and architecture of a particular Islamic dynasty or city such as Mecca, Damascus, Baghdad, Istanbul, and Isfahan. On occasion, however, students have chosen to pursue topics as diverse as Palestinian hip hop, calligraphy, Umayyad rock crystal, and Central Asian textiles. Open to fifth and sixth formers, and fourth formers with the permission of the HPRSS department.

Note: This course is required for students in the Arabic and Middle Eastern Studies Program.

THE GREENING OF AMERICA: THE ENVIRONMENTAL MOVEMENT, HONORS

Fall term; 1 course credit

MD521HO

The environmental movement in the United States has been motivated by a wide range of factors, including the natural beauty of the country, the destruction of some of that beauty, the work of naturalists, ethicists, theologians, historians and authors, catastrophic events that have captured the public's attention, and activists schooled and fueled by the sweeping changes in the 1960s. This multi-disciplinary course weaves together all of these perspectives as it traces the development of the environmental movement in the United States and the impact of key people and events on this movement and on the environment itself. The course draws from many disciplines as it examines historical, political, ethical, religious, economic and cultural aspects of the environmental movement. This course includes an experiential component that involves contact with the natural world at Choate and potentially beyond. Open to fifth and sixth formers, and fourth formers with the permission of the HPRSS department.

SEMINAR IN ART HISTORY, HONORS

Spring term; 1 course credit

MD625HO

This seminar considers the architecture of Choate Rosemary Hall and its historical antecedents from Italy, England, and America. Considerable study is devoted to Ralph Adams Cram's Seymour St. John Chapel and Archbold Hall, I.M. Pei's Paul Mellon Arts Center and Icahn Center for Science, and Pelli Clarke Pelli's Lanphier Center. Students acquire an understanding of the principles of these buildings, their place in the history of architecture, and their impact on teaching and learning at our school. From examining the architectural components of a structure to appreciating the structure's physical and emotional impact on its surroundings, students learn to how to analyze a building critically. Students are expected to play an active role in seminar discussions, to read scholarly material, to complete a creative assignment, and to lead class discussions from time to time. While no prior knowledge of art history is required, students should have a strong interest in the subject and excellent analytical skills. This course earns one visual arts credit. Open to sixth formers, and fifth formers with permission of the instructor.