

COLLEGE OF INTEGRATIVE SCIENCES

The College of Integrative Sciences (CIS) aims to equip students with the creative and quantitative skills needed to address current and emerging global challenges in science and technology. These challenges are multifaceted, requiring problem-solving approaches that integrate expertise from multiple perspectives.

The CIS promotes an interdisciplinary and integrative approach to scholarship and learning across mathematics and the life, physical, and behavioral sciences. By encouraging creative synergies among faculty and students of disparate disciplines, the CIS academic structure complements existing departments and has the flexibility to evolve with the needs of an ever-changing world.

Research is key to the CIS. With a faculty mentor, student researchers pursue inquiry-based learning that explores open questions and provides new perspectives. They develop the necessary problem-solving skills and build expertise at the frontiers of science. Through research, students are transformed from consumers into creators of knowledge.

Students interested in the CIS are advised to follow a course of study that emphasizes a core science background, achieved by pursuing a major in one of the departments or programs in natural science and mathematics (NSM). The linked major offered by the CIS combines the intellectual depth in one area (the major) with breadth achieved through courses and research in the linked major.

FACULTY

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VISITING FACULTY

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Visiting Scholar in the College of Integrative Sciences

Christopher S. Weaver

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- Undergraduate College of Integrative Sciences Major (catalog.wesleyan.edu/departments/cis/ugrd-cis)

CIS115 Experiential Design and Application

This course, co-taught with Director of Physical Plant Operations Mike Conte, will allow students to work directly with Facilities employees to design and execute modifications and repairs to existing Wesleyan spaces. The specific projects will change from semester to semester, but could include designing and building informal learning spaces, and planning and carrying out repairs and modifications to mechanical and plumbing systems. Students will learn design and engineering by carrying out projects to improve Wesleyan's facilities. Students must be willing to work with tools and machinery with supervision. The grading in this quarter-credit repeatable course will be based primarily on active participation, and the class meetings will be held on location and at times built around participants' schedules.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.25**

Gen Ed Area: **NSM-CIS**

Prereq: **None**

CIS116 Designing Books

This intensive course will help students to understand how books are physically designed and created. Students will learn to use the book format in their work as a means of expanding, preserving, and restructuring ideas. After a visit to Special Collections and Archives to look at examples of artists' books and a review of 1200 years of Eastern and Western book binding types, students will make at least eight books, including an accordion book, a long-stitch book, a Coptic stitch book, side-sewn bindings including a Japanese four-hole stitch books, variations on pamphlet binding and a map fold book, as well as a simple box. The properties of bookbinding materials will be discussed in detail. No prior experience is necessary.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.50**

Gen Ed Area: **NSM-CIS**

Prereq: **None**

CIS121 Wesleyan Mathematics and Science Scholars Colloquium I

This weekly colloquium of participants in the Wesleyan Mathematics and Science Scholars (WesMaSS) Program will provide participants with a framework for taking full advantage of the educational opportunities in the natural sciences and mathematics available at Wesleyan. Class sessions and assignments are designed to help students to develop effective individual and group study skills, to promote cohort-building, and to navigate the "hidden curriculum" in higher education.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.25**

Gen Ed Area: **NSM-CIS**

Prereq: **None**

CIS122 Wesleyan Mathematics and Science Scholars Colloquium II

This weekly colloquium of participants in the Wesleyan Mathematics and Science Scholars (WesMaSS) Program will be focused on strategies for success in science and math higher education.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.25**

Gen Ed Area: **NSM-CIS**

Prereq: **None**

CIS135 Mindfulness

During this course, students will be introduced to various techniques of mindfulness practice and awareness, including sitting meditation and yoga. These modalities are designed to aid in stress and anxiety reduction and, when practiced diligently, may also offer opportunities for greater self-awareness and personal development. The goal is to give students not only a peer community but also a contemplative toolbox that is portable, replicable, and sustainable. Students will gain an understanding of the roles these practices can play in leading a happier, healthier, and more fulfilling life.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.50**

Gen Ed Area: **SBS-CIS**

Prereq: **None**

CIS150 The Science Behind Popular Scientific Literature

The Science Behind Popular Scientific Literature. This course focuses on academic STEM writing and is an exploration of the scientific literature in the reference list of Elizabeth Kolbert's "The Sixth Extinction." Assignments will consist of numerous low-stakes writing prompts with extensive peer and instructor feedback, and a term project paper constructed along the lines of a STEM review paper. This course fulfills a key need in developing science literacy and teaching students how to find and use reliable sources to critically evaluate popular science writing.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-CIS**

Identical With: **WRCT150**

Prereq: **None**

CIS150F The Science Behind Popular Scientific Literature (FYS)

The Science Behind Popular Scientific Literature. This course focuses on how to present material to a scientific audience and is an exploration of the scientific literature in the reference lists of Rachel Carson's "Silent Spring." Assignments will consist of numerous low-stakes writing assignments with extensive peer and instructor feedback, and a term project paper constructed along the lines of a STEM review paper. This course fulfills a key need in developing science literacy

and teaching students how to find and use reliable sources to critically evaluate popular science writing.

Offering: **Host**

Grading: **OPT**

Credits: **1.00**

Gen Ed Area: **NSM-CIS**

Identical With: **WRCT150F**

Prereq: **None**

CIS160 Life in the Oceans in the Anthropocene and Beyond

Little is known about life in the deep sea, the largest habitat on Earth, even about the largest animals living there, such as the giant squid. Humans, however, are severely affecting even these most remote areas of our planet, and wildlife populations in the oceans have been badly damaged by human activity. We will look at the amazing diversity of ocean life and the disparate building plans of its animals, and see how oceanic ecosystems are fundamentally different from land ecosystems. Then we will explore how human actions are affecting oceanic ecosystems directly, for instance by overfishing (especially of large predators and filter feeders), addition of nutrients (eutrophication) and pollutants, and the spread of invasive species, as well as indirectly, through emission of carbon compounds into the atmosphere. Rising atmospheric CO₂ levels lead to ocean acidification and global warming, affecting the all-important metabolic rates of ocean life, as well as oceanic oxygen levels and stratification, thus productivity. We will try to predict the composition of future ecosystems by looking at ecosystem changes during periods of rapid warming in the geological past and see whether future ecosystems will become dominated by jellyfish, as they were 600 million years ago.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-EES**

Identical With: **E&ES160**

Prereq: **None**

CIS170 Introduction to Design and Engineering

This course will provide a hands-on introduction to design and engineering. Students will engage in individual and team projects in a studio environment where we seek to develop a shared practice and understanding of the engineering design process. We will study biological organisms to find inspiration for design of hoppers, swimmers, and climbers. Students will build skills using computer-aided design (CAD) software and using tools for fabrication and prototyping including laser cutting and 3D printing. We will also hone skills in identifying which scientific and engineering principles need to be understood to achieve design goals.

Offering: **Crosslisting**

Grading: **Cr/U**

Credits: **1.00**

Gen Ed Area: **NSM-CIS**

Identical With: **IDEA170, PHYS170**

Prereq: **None**

CIS173 Introduction to Sensors, Measurement, and Data Analysis

This course is an engineering fundamentals course supporting the Integrated Design, Engineering, and Applied Science (IDEAS) minor. It will involve a sequence of hands-on projects that introduce students to basic measurement devices and data analysis techniques using inexpensive modern sensors, a microprocessing platform (Arduino), and a computational software package (Matlab). The course will provide foundational knowledge of available resources and techniques that allow students to more confidently implement measurement systems in subsequent courses of the IDEAS minor and better understand experimental devices used in scientific research activities.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-CIS**

Identical With: **IDEA173**

Prereq: **None**

CIS175 Principles of Engineering

Students will learn about engineering mechanics, electronic control systems, and physical actuators (e.g., for movement) using a microprocessor platform, sensors and motors. The final project will require a student team to ideate, design, analyze, and optimize a mechatronic system. This course will allow students to better understand components, methods, and challenges in mechatronics systems commonly found in automation and robotics. This course fulfills the project-based Design & Engineering course requirement for the Integrated Design, Engineering and Applied Science (IDEAS) minor degree program.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-CIS**

Identical With: **IDEA175**

Prereq: **None**

CIS221 Research Frontiers in the Sciences I

This seminar is designed to introduce students to the exciting and cutting-edge research activity at Wesleyan across all the sciences and mathematics, and to introduce faculty with active research labs to students interested in working in a lab. The course showcases what research at the college level actually entails, and which projects Wesleyan faculty are actively researching. CIS 221 is scheduled in the fall, CIS 222 in the spring. Both are gateway classes to admission into the CIS, but also recommended to students broadly interested in the sciences who have not yet decided on a major. There is no overlap in speakers between CIS 221 and CIS 222, and students may take both.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.50**

Gen Ed Area: **NSM-CIS**

Prereq: **None**

CIS222 Research Frontiers in the Sciences II

This seminar is designed to introduce students to the exciting and cutting-edge research activity at Wesleyan across all the sciences and mathematics, and to introduce faculty with active research labs to students interested in working in a lab. The course showcases what research at the college level actually entails, and which projects Wesleyan faculty are actively researching. CIS 221 is scheduled in the fall, CIS 222 in the spring. Both are gateway classes to admission into the CIS, but also recommended to students broadly interested in the sciences who have not yet decided on a major. There is no overlap in speakers between CIS 221 and CIS 222, and students may take both.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.50**

Gen Ed Area: **NSM-CIS**

Prereq: **None**

CIS231 Modeling and Data Analysis: From Molecules to Markets

The development of models to describe physical or social phenomena has a long history in several disciplines, including physics, chemistry, economics, and sociology. With the emergence of ubiquitous computing resources, model building is becoming increasingly important across all disciplines. This course will examine how to apply modeling and computational thinking skills to a range of problems. Using examples drawn from physics, biology, economics, and social networks, we will discuss how to create models for complex systems that are both descriptive and predictive. The course will include significant computational work. No previous programming experience is required, but a willingness to learn simple programming methods is essential.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-PHYS**

Identical With: **PHYS221, QAC221**

Prereq: **None**

CIS239 Proseminar: Machine Learning Methods for Text, Audio and Video Analysis

In this course, students will learn machine learning techniques to analyze text, audio, and video data. The course consists of three parts: text analysis, audio analysis and video analysis. Each part will first introduce how these non-traditional data can be converted into mathematical objects suitable for computer processing and, particularly, for the application of machine learning techniques. Then students will learn a selection of supervised and unsupervised learning algorithms that are effective for text, audio, image/video analysis. Finally, students will explore major applications of these techniques such as sentiment analysis, speech emotion recognition, face recognition, pedestrian detection, keyframe extraction.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-QAC**

Identical With: **QAC239**

Prereq: **COMP112 OR QAC155 OR QAC156**

CIS241 Introduction to Network Analysis

This is an interdisciplinary hands-on course examining the application of network analysis in various fields. It will introduce students to the formalism of networks, software for network analysis, and applications from a range of disciplines (history, sociology, public health, business, political science). We will review the main concepts in network analysis and learn how to use the software (e.g., network analysis and GIS libraries in R) and will work through practice problems involving data from several sources (Twitter, Facebook, airlines, medical innovation, historical data). Upon completion of the course, students will be able to conduct independent research in their fields using network analysis tools.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **SBS-QAC**

Identical With: **QAC241**

Prereq: **None**

CIS251 Data Visualization: An Introduction

This course will introduce students to the principles and tools necessary to present quantitative information in a visual way. While tables and graphs are widely used in our daily lives, it takes skill to deconstruct what story is being told. It also takes a perceptive eye to know when information is being misrepresented with particular graphics. The main goals of the course are for students to learn how to present information efficiently and accurately so that we enhance our understanding of complex quantitative information and to become proficient with data visualization tools. Beginning with basic graphing tools, we will work our way up to constructing map visualizations and interactive graphs. This course will require a substantial amount of computation in R. No prior programming experience is necessary, but learning does require willingness and time.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-QAC, SBS-QAC**

Identical With: **QAC251**

Prereq: **None**

CIS265 Bioinformatics Programming

This course is an introduction to bioinformatics and programming for students with interest in the life sciences. It introduces problem areas and conceptual frameworks in bioinformatics. The course assumes little or no prior programming experience and will introduce the fundamental concepts and mechanisms of computer programs and examples (e.g., sequence matching and manipulation, database access, output parsing, dynamic programming) frequently encountered in the field of bioinformatics.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-BIOL**

Identical With: **BIOL265, MB&B265, COMP113**

Prereq: **[MB&B181 or BIOL181]**

CIS266 Bioinformatics

This course is an introduction to bioinformatics for students with interest in the life sciences. The course is similar to BIOL265 but only meets in the second half of the semester (with BIOL265) and is designed for students with programming background, ideally in Python. The course introduces problem areas and conceptual frameworks in bioinformatics and discusses programming approaches used in bioinformatics such as sequence matching and manipulation algorithms using dynamic programming, clustering analysis of gene expression data, analysis of genetic nets using Object Oriented Programming, and sequence analysis using Hidden Markov Models, Regular Expressions, and information theory.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **0.50**

Gen Ed Area: **NSM-BIOL**

Identical With: **BIOL266, COMP266, MB&B266**

Prereq: **[MB&B181 OR BIOL181]**

CIS284 Data, Art, and Visual Communication

This course looks at the ways the digital arts--broadly defined--can be used to explore the intersections of research, data, design, and art. Following a creative software "bootcamp," students will execute projects intended to help them generate, manipulate, and remix data for the purposes of visual communication and art. Students will use Adobe Creative Suite and Processing, an open source programming language, and integrated development environment (IDE) built for electronic arts, new media, and visual design. In addition to working in the studio, seminars, readings, and student presentations will explore the role of data visualization, "big data," and the web in culture and society today. No prior software knowledge or coding skills are required. Students working in STEM, humanities, and social sciences are encouraged to enroll.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **HA-ART**

Identical With: **ARST484**

Prereq: **None**

CIS285 Generative Art, Computational Media, and Creative Coding

In this course, students will learn to use computers and software as platforms for creative expression. Following a series of intensive coding workshops, students will learn to execute projects involving chance operations, rule-based systems, simulated autonomy, and interactivity. These projects will emerge as animations, drawings, prints, and screen-based artworks. Students will work primarily with the creative coding applications Processing and Grasshopper. These are coding environments designed by artists to facilitate the use of data, mathematics, and computation in visual practice. In addition to learning to program, students will translate their code into physical artifacts using computer-driven hardware such as a CNC router, a laser cutter, and Arduinos. Additionally, students will be exposed to the history and practice of generative and computational art through

lectures and student presentations. This conceptual work will emphasize the formal and critical paradigms of computational media and design beginning in the 1960s.

Offering: **Crosslisting**

Grading: **OPT**

Credits: **1.00**

Gen Ed Area: **HA-ART**

Identical With: **ARST285**

Prereq: **ARST131**

CIS307 Experimental Design and Causal Inference

The course provides the foundations and statistical thinking to design, collect, and analyze experimental data and introduces appropriate techniques for observational data when causal inference is the objective of the analysis.

Throughout the course, we introduce and compare various experimental designs.

We will discuss sample size and power calculations as well as the advantages and disadvantages of each of these designs. With observational data, we will explore difference-in-difference models, propensity score matching techniques, regression discontinuity designs. This course gives students the opportunity to develop further their computational skills as we learn how to describe, interpret, control, and draw inferences from experimental and observational data.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-QAC, SBS-QAC**

Identical With: **QAC307**

Prereq: **QAC201 OR PSYC200 OR MATH132 OR ECON300**

CIS310 Genomics Analysis

This course is an introduction to genomics and analysis for students with interest in life sciences. It introduces current applications of genomics techniques, covers how to build a genomics workflow, and introduces statistical analyses in R programming language. This course assumes little or no prior programming experience and will provide hands-on experience in taking raw next-generation sequencing data through a custom workflow and ending with analyses in R statistical software.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-BIOL**

Identical With: **BIOL310, MB&B311**

Prereq: **[MB&B181 or BIOL181]**

CIS320 Advanced Academic Writing

This course is designed to help students master the skills needed for thesis-level academic writing. The course uses an example-driven approach emphasizing an iterative revision process, with an emphasis on expository writing skills appropriate for publishable literature. Students will be encouraged to focus on their own independent research work as subject matter of writing exercises.

Offering: **Crosslisting**

Grading: **OPT**

Credits: **1.00**

Gen Ed Area: **NSM-CIS**

Identical With: **CIS520**

Prereq: **None**

CIS321 Special Topics in Integrative Sciences

This course is open to all Wesleyan students interested in learning about equity and inclusion in STEM. The first half of the semester will focus on providing an overview of topics related to STEM equity, including the demographics of STEM fields, relevant sociology/psychology research (implicit bias, stereotype threat, impostor syndrome, mindset, etc.), ethics, social justice, and best practices for inclusive departments and programs. Students will be required to develop and evaluate proposals for activities to increase STEM equity and inclusion at

Wesleyan, using the information provided during the seminar component of the course. In the second half of the course, we will discuss science topics with the goal of developing an integrative perspective of each topic. Initial discussions will focus on the Drake equation, an equation developed to understand the probability of finding intelligent life on another planet, and will move on to discuss other topics of interest. Classes will include guest lectures from faculty members who will discuss aspects of the Drake equation from the point of view of their own expertise. Students will also work on their presentation skills, oral and written, as this is a primary means for scientists to communicate with their peers and the public.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.50**

Gen Ed Area: **NSM-CIS**

Prereq: **None**

CIS322 Senior Colloquium II: Integrative Sciences

This colloquium provides students the opportunity to discuss and present their research to their peers and mentors, as well as explore current topics of interest to the group. A key goal will be developing students' presentation skills because this is the primary means of promoting research. Faculty and peers will provide insights and advice. Mentors from the primary department or programs will also be invited.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.50**

Gen Ed Area: **NSM-CIS**

Prereq: **None**

CIS323 Bayesian Data Analysis: A Primer

This course introduces the applied principles of Bayesian statistical analysis. The Bayesian paradigm is particularly appealing in research where prior research and historical data are available on parameters of interest. This course will teach students appropriate techniques for analyzing data of this nature as well as broaden computational skills in R. The course will lay the foundation for Bayesian data analysis that students can use to further develop skills in decision making.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **0.50**

Gen Ed Area: **NSM-QAC, SBS-QAC**

Identical With: **QAC323**

Prereq: **MATH132 OR ECON300 OR [GOVT367 or QAC302]**

CIS327 Evolutionary and Ecological Bioinformatics

Bioinformatic analysis of gene sequences and gene expression patterns has added enormously to our understanding of ecology and evolution. For example, through bioinformatic analysis of gene sequences, we can now reconstruct the evolutionary history of physiology, even though no traces of physiology exist in the fossil record. We can determine the adaptive history of one gene and all the gene's descendants. We can now construct the evolutionary tree of all of life. Bioinformatics is particularly promising for analysis of the ecology and biodiversity of microbial communities, since well over 99 percent of microorganisms cannot be cultured; our only knowledge of these organisms is through analysis of their gene sequences and gene expression patterns. For example, even when we cannot culture most of a microbial community, we can determine which metabolic pathways are of greatest significance through analysis of community-level gene expression. All these research programs are made accessible not only by breakthroughs in molecular technology but also by innovation in the design of computer algorithms. This course, team-taught by an evolutionary biologist and a computer scientist, will present how bioinformatics is revolutionizing evolutionary and ecological investigation and will present the design and construction of bioinformatic computer algorithms underlying the revolution in biology. Students will learn algorithms for reconstructing

phylogeny, for sequence alignment, and for analysis of genomes, and students will have an opportunity to create their own algorithms.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-BIOL**

Identical With: **BIOL327, COMP327, BIOL527, COMP527**

Prereq: **[BIOL182 or MB&B182] OR [BIOL196 or MBB196] OR COMP112 OR COMP211**

CIS331 Video Games as/and the Moving Image: Art, Aesthetics, and Design

Video games are a mess. As a relatively new medium available on a range of platforms and in contexts ranging from the living room to the line for the bathroom, video games make new but confusing contributions to the meaning and possibilities of the moving image. We will work to understand what games are, what they can do, and how successful games do what they do best. Students will complete game design exercises, create rapid prototypes, playtest their games, and iteratively improve their games with play and their players in mind. They will complete analyses of games and game design projects both alone and in groups and participate in studio-style critiques of one another's work. Experience with computer programming is helpful but not essential.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **HA-FILM**

Identical With: **FILM331**

Prereq: **None**

CIS340 STEM Equity and Inclusion

This course is open to all students at Wesleyan interested in learning about equity and inclusion in STEM. A weekly seminar will provide an overview of topics related to STEM equity, including the demographics of STEM fields, relevant sociology/psychology research (implicit bias, stereotype threat, impostor syndrome, mindset, etc.), ethics, social justice, and best practices for inclusive departments and programs. Students will be required to develop and evaluate proposals for activities to increase STEM equity and inclusion at Wesleyan, using the information provided during the seminar component of the course.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.50**

Gen Ed Area: **None**

Identical With: **CIS540**

Prereq: **None**

CIS342 Molecules to Medicine

This course will explore the process of drug development, including target selection, lead discovery using computer-based methods and combinatorial chemistry/high-throughput screening, organic synthesis, bioavailability, clinical trials, and other factors (some economics and politics) involved in bringing a drug to the marketplace. Critical consideration of the variables to contend with at each step will be described and discussed, including aspects of research ethics and patent law. The basic science of molecular recognition, computer-aided drug design, and the role of factors from synthetic chemistry to toxicology will be presented. Case studies of the development of drugs recently successful in making the journey from molecule to medicine will be discussed, as well as the story of some that did not, and why. Emerging new design strategies such as fusion-protein therapies, crisper technology, and enhanced use of rational design and combinatorial methods will be emphasized, and how pharmaceutical research is evolving in the postgenomic era, particularly with biologics. Job opportunities in the pharmaceutical industry will be discussed.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-CHEM**

Identical With: **CHEM342, BIOL342, MB&B342**

Prereq: **CHEM252 OR MBB208**

CIS375 Mass Extinctions in the Oceans: Animal Origins to Anthropocene

Geoscientists are debating whether we are living in the Anthropocene, defined as a period during which humans are having a significant effect on atmospheric, geologic, hydrologic, and biospheric earth system processes. There is considerable discussion whether we are indeed affecting the biosphere to such an extent that life on Earth will suffer an extinction similar in magnitude to those that have occurred during earth history. Studies of the fossil record provide unique evidence that is used to evaluate the large extinctions of the past and compare them to ongoing extinction processes, extinctions rates and patterns, and magnitude. Organisms with hard skeletons are most easily and most abundantly preserved in the rock record. Many of these are invertebrates that lived in the oceans (e.g., clams, sea urchins, corals). In the first part of this course, students will become familiar with the nature of the fossil record, the most common marine animals in the fossil record, and their evolution and diversification. Lectures will be combined with studying fossils. In the second part of the course, possible causes for mass extinction will be considered, together with their specific effects on environments and biota, and these predicted effects will be compared to what has been observed. Potential causes include asteroid and comet impacts, large volcanic eruptions, "hypercanes," and "methane ocean eruptions," and more exotic processes. Students will present in class on these topics, and we will compare rates and magnitude of environmental change with severity and patterns of extinction.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-EES**

Identical With: **E&ES236**

Prereq: **E&ES101 OR E&ES115 OR E&ES199 OR ASTR155 OR MB&B181**

CIS400 Professional Development and Graduate School Preparation Seminar

The objectives of this course are (1) to build a supportive cohort that will help students sustain their goals when they enter graduate school and (2) to provide students with skills they will need to succeed in graduate school. Students will work on writing, presentation, and discussion skills. This will be done by reading classic books on writing, critiquing the ability of different figures and graphs to convey information, reading and discussing scientific papers, and giving research presentations.

Offering: **Host**

Grading: **A-F**

Credits: **0.50**

Gen Ed Area: **None**

Prereq: **None**

CIS401 Individual Tutorial, Undergraduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

CIS402 Individual Tutorial, Undergraduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

CIS411 Group Tutorial, Undergraduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

CIS412 Group Tutorial, Undergraduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

CIS420 Student Forum

Student-run group tutorial, sponsored by a faculty member and approved by the chair of a department or program.

Offering: **Host**

Grading: **Cr/U**

CIS423 Advanced Research Seminar, Undergraduate

Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

CIS424 Advanced Research Seminar, Undergraduate

Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

CIS492 Teaching Apprentice Tutorial

The teaching apprentice program offers undergraduate students the opportunity to assist in teaching a faculty member's course for academic credit.

Offering: **Host**

Grading: **OPT**

CIS520 Advanced Academic Writing

This course is designed to help students master the skills needed for thesis-level academic writing. The course uses an example-driven approach emphasizing an iterative revision process, with an emphasis on expository writing skills appropriate for publishable literature. Students will be encouraged to focus on their own independent research work as subject matter of writing exercises.

Offering: **Host**

Grading: **OPT**

Credits: **1.00**

Gen Ed Area: **NSM-CIS**

Identical With: **CIS320**

Prereq: **None**

CIS540 STEM Equity and Inclusion

This course is open to all students at Wesleyan interested in learning about equity and inclusion in STEM. A weekly seminar will provide an overview of topics related to STEM equity, including the demographics of STEM fields, relevant sociology/psychology research (implicit bias, stereotype threat, impostor syndrome, mindset, etc.), ethics, social justice, and best practices for inclusive departments and programs. Students will be required to develop and evaluate proposals for activities to increase STEM equity and inclusion at Wesleyan, using the information provided during the seminar component of the course.

Offering: **Crosslisting**

Grading: **Cr/U**

Credits: **0.50**

Gen Ed Area: **None**

Identical With: **CIS340**

Prereq: **None**

IDEA170 Introduction to Design and Engineering

This course will provide a hands-on introduction to design and engineering. Students will engage in individual and team projects in a studio environment where we seek to develop a shared practice and understanding of the engineering design process. We will study biological organisms to find inspiration for design of hoppers, swimmers, and climbers. Students will build skills using computer-aided design (CAD) software and using tools for fabrication and prototyping including laser cutting and 3D printing. We will also hone skills in identifying which scientific and engineering principles need to be understood to achieve design goals.

Offering: **Host**

Grading: **Cr/U**

Credits: **1.00**

Gen Ed Area: **NSM-CIS**

Identical With: **PHYS170, CIS170**

Prereq: **None**

IDEA173 Introduction to Sensors, Measurement, and Data Analysis

This course is an engineering fundamentals course supporting the Integrated Design, Engineering, and Applied Science (IDEAS) minor. It will involve a sequence of hands-on projects that introduce students to basic measurement devices and data analysis techniques using inexpensive modern sensors, a microprocessing platform (Arduino), and a computational software package (Matlab). The course will provide foundational knowledge of available resources and techniques that allow students to more confidently implement measurement systems in subsequent courses of the IDEAS minor and better understand experimental devices used in scientific research activities.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-CIS**

Identical With: **CIS173**

Prereq: **None**

IDEA175 Principles of Engineering

Students will learn about engineering mechanics, electronic control systems, and physical actuators (e.g., for movement) using a microprocessor platform, sensors and motors. The final project will require a student team to ideate, design, analyze, and optimize a mechatronic system. This course will allow students to better understand components, methods, and challenges in mechatronics systems commonly found in automation and robotics. This course fulfills the project-based Design & Engineering course requirement for the Integrated Design, Engineering and Applied Science (IDEAS) minor degree program.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-CIS**

Identical With: **CIS175**

Prereq: **None**

IDEA190 Digital Art

This course introduces students to the digital arts: a diverse mix of ideas and techniques brought together by a shared interest in the use of computation and software in creative production. Emphasis is placed on the development of students' ability to problem solve, experiment, and iterate using computers. Assignments and lectures will consider questions of skill, authorship, and information in the digital age while engaging with the history and critique of digital and electronic media in the arts. Students will use Adobe Creative Suite, Rhinoceros 3D, and other tools to complete projects.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **HA-ART**

Identical With: **ARST190**

Prereq: **None**

IDEA233 Studies in Computer-based Modelling and Digital Fabrication

This course operates at the intersection of design and production, introducing students to digital tools critical to contemporary architecture and design. Throughout the semester, students will develop a series of projects that fluidly transition between design, representation, and fabrication with an emphasis on understanding how conceptual design interfaces with material properties. The course will offer a platform for students to research, experiment, and, ultimately, leverage the potential of digital tools toward a wide array of fields and disciplines. Students will be expected to utilize the Digital Design Studio's resources, including 3D printers, laser cutter, and 4-Axis CNC mill, as well a

selection of fabrication equipment housed in the school's metal and wood shops to represent, model, and realize a series of design projects.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **HA-ART**

Identical With: **ARST233**

Prereq: **None**

IDEA283 Physical Computing in Art and Design

This course aims to extend students' notions of the potential for the use of computers in the artist's studio by exploring opportunities in technology and art beyond familiar mouse, keyboard, and screen interactions. Moving away from these restrictions, students will learn basic electronics and programming using a microcontroller. The size of a postage stamp, these single-chip computers will provide students a window into the creative uses of computers in interactive, kinetic, and installation art. Combining microcontrollers with sensors placed on bodies, in physical objects, or in the environment, weekly projects will provide students with basic skills cumulatively leading to application in individual or collaborative projects. Through readings, discussions, and design of individual and collaborative work, students are expected to develop and articulate a theoretical basis for conceptualizing and discussing works presented in class, as well as their own creative projects. Students will maintain rigorous documentation of their process and progress in this course using blogs. No previous skills or software experience is required.

Offering: **Crosslisting**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **HA-ART**

Identical With: **ARST283**

Prereq: **ARST131**

IDEA350 Computational Media: Videogame Development

This course examines the interplay of art and science in the development of contemporary video games using "game tool" applications to achieve a variety of purposes. It combines a detailed understanding of computational media, including legal and commercial aspects, with hands-on experience in the creative process. There will be discussions with invited industry leaders in various subject areas. Students will have the opportunity to work as part of development teams and create working prototypes to understand the challenges and rewards of producing video games in a professional context.

Offering: **Host**

Grading: **A-F**

Credits: **2.00**

Gen Ed Area: **NSM-IDEA**

Identical With: **FILM250, COMP350**

Prereq: **None**

IDEA401 Individual Tutorial, Undergraduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

IDEA402 Individual Tutorial, Undergraduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

IDEA429 Senior Thesis Tutorial

Offering: **Host**

Grading: **OPT**

IDEA491 Teaching Apprentice Tutorial

The teaching apprentice program offers undergraduate students the opportunity to assist in teaching a faculty member's course for academic credit.

Offering: **Host**

Grading: **OPT**

IDEA492 Teaching Apprentice Tutorial

The teaching apprentice program offers undergraduate students the opportunity to assist in teaching a faculty member's course for academic credit.

Offering: **Host**

Grading: **OPT**