COLLEGE OF INTEGRATIVE SCIENCES (CIS)

CIS101 Success in STEM Seminar
This weekly seminar series will provide participants with tools and skills helpful in the pursuit of STEM studies, especially with introductory courses in STEM fields (biology, chemistry, physics, and mathematics). In particular, this seminar series is designed to facilitate the transition from high school academics to collegiate-level studies, and it is available only for first-year students.
Offering: **Host**
Grading: **Cr/U**
Credits: **0.25**
Gen Ed Area: **NSM-CIS**
Prereq: **None**

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**

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 and metacognitive 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: **Crosslisting**
Grading: **Cr/U**
Credits: **0.50**
Gen Ed Area: **SBS-CIS**
Identical With: **CSPL135**
Prereq: **None**

CIS135Z Introduction to Mindfulness
In this retreat-style, experiential course, students delve into a set of practices meant to cultivate self-awareness, alleviate the impact of the stress response, and move attention to the present moment. During this 10-day class on contemplative practices, students will be introduced to various individual and relational techniques developed to cultivate non-judgemental attention and self-awareness in the present moment, as well as metacognitve learning strategies.
Offering: **Crosslisting**
Grading: **Cr/U**
Credits: **0.50**
Gen Ed Area: **SBS-CIS**
Identical With: **CSPL135Z**
Prereq: **None**

CIS154 Working with MATLAB
The content of this course focuses on learning the basics of utilizing MATLAB to program and solve basic problems. We will operate on the assumption that students have no prior experience with programming. The goals of the course will be to develop algorithmic thinking, problem solving, and quantitative skills within the context of MATLAB. The course will cover essential mechanics of programming, many of which are common to all programming languages, as well as some selected advanced topics. With the expectation that students with a broad background with various motivating factors lead them to enroll in the course, students will be invited to apply the skills learned in the course to completing the culminating final project related to their specific interests.
Offering: **Crosslisting**
Grading: **OPT**
Credits: **0.50**
Gen Ed Area: **NSM-QAC, SBS-QAC**
Identical With: **QAC154, IDEA154**
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 CO_2 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, BIOL160**
Prereq: **None**

CIS170 Introduction to Mechanical 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, PHYS205**
Prereq: **None**

CIS170Z 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: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-CIS**
Identical With: **IDEA170Z, PHYS170Z**
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: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-CIS**
Identical With: **IDEA173**
Prereq: **None**

CIS175 Introduction to Electrical Design & 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.
Offering: **Crosslisting**
Grading: **Cr/U**

Credits: **1.00**
Gen Ed Area: **NSM-CIS**
Identical With: **IDEA175, PHYS206**
Prereq: **None**

CIS185 Form and Code
This introductory survey explores practices in design and digital media through a sequence of design exercises, workshops, and hands-on projects. Advancing towards an independent final project, participants will hone their skills as makers and thinkers while developing a portfolio of original work for both print and web. While primarily concerned with visual experimentation and expression, this course exposes students to critical topics in media and design through readings, seminars and student presentations. Techniques surveyed in this course include: digital imaging and animation (Adobe Creative Cloud), creative coding (Processing), digital printing, and light fabrication.
Offering: **Crosslisting**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **HA-CIS**
Identical With: **IDEA185**
Prereq: **None**

CIS185Z Form and Code
This introductory survey explores practices in design and digital media through a sequence of design exercises, workshops, and hands-on projects. Advancing towards an independent final project, participants will hone their skills as makers and thinkers while developing a portfolio of original work for both print and web. While primarily concerned with visual experimentation and expression, this course exposes students to critical topics in media and design through readings, seminars, and student presentations. Techniques surveyed in this course include: digital graphics, creative coding, and digital fabrication (if taught in person).

Students will require access to a personal computer and Adobe Creative Cloud. If the course runs remotely, students are responsible for locating these resources individually.
Offering: **Crosslisting**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-CIS**
Identical With: **IDEA185Z**
Prereq: **None**

CIS210 How Things Fail: Mechanics and Materials
This lab/lecture engineering course is a foundational cornerstone of structural analysis and mechanical design. It will provide students with a theoretical and practical understanding of static equilibrium force systems, material response to loading, and analysis of failure modes for each of the fundamental types of stress and strain (axial, flexural, and torsional). These skills are vital for students from a range of disciplines, including mechanical engineering and architecture. The final project will require the design, implementation, and performance testing of an optimized structural system model, such as a truss bridge, building, or other structure.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-IDEA**
Identical With: **IDEA210, PHYS210**
Prereq: **IDEA170 AND (PHYS111 OR PHYS113)**

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**

CIS239 Proseminar: Machine Learning Methods for Audio and Video Analysis
In this course, students are introduced to machine learning techniques to analyze image, audio, and video data. The course is organized in three parts, and in each part we will first introduce how these nontraditional data can be converted into appropriate (mathematical) objects suitable for computer processing, and, particularly, for the application of machine learning techniques. Students then will learn and work with a number of machine learning algorithms and deep learning methods that are effective for image and audio analysis. We will also explore major applications of these techniques such as object detection, face recognition, image classification, audio classification, speaker detection, and speech recognition.

Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-QAC**
Identical With: **QAC239**
Prereq: **COMP112 OR QAC155 OR QAC156 OR COMP112Z**

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**

CIS251Z 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: **QAC251Z**
Prereq: **None**

CIS263 Demystifying Data: Introductory Data Analysis and Modeling
How do scientists make sense of the data they collect, especially as datasets grow in size and complexity? In this course, students will learn fundamental concepts in data collection, statistics, and modeling through hands-on analysis of publicly available datasets from the COVID-19 pandemic. We will cover the effects of biases in data collection, models of epidemic growth and spread, and the principles of studying a rapidly evolving pathogen. While we will use motivating examples from the life sciences, students can expect to learn techniques and ways of thinking that will form a foundation for evaluating and analyzing data across scientific disciplines. Students will learn the basics of using the R programming language to visualize, analyze, and model data, so no previous programming experience is expected.

Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-BIOL**
Identical With: **BIOL263**
Prereq: **MB&B181 OR BIOL182**

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]**

CIS270 Systems Biology with Programming

Systems--collections of entities that interact to form an interconnected whole--are present at every scale of organization in the life sciences. Biologists can take advantage of computational and mathematical tools to understand how these systems function and predict how they might change over time. This approach is critical in applications ranging from epidemic modeling to evolutionary theory. In this course, students will learn how simple rules and interactions can lead to complex behavior using examples from three main areas: regulatory networks, population genetics, and ecology. Students will spend the first part of the course learning how to program in Python in order to model, simulate, and visualize these systems. No previous programming experience is expected.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-BIOL**
Identical With: **BIOL270**
Prereq: **BIOL181 OR BIOL181Z AND BIOL182 OR BIOL182Z**

CIS271 Systems Biology with Programming

This course is similar to BIOL270, but only meets in the second half of the semester with BIOL270 and is designed for students with a solid background in programming in Python. Systems--collections of entities that interact to form an interconnected whole--are present at every scale of organization in the life sciences. Biologists can take advantage of computational and mathematical tools to understand how these systems function and predict how they might change over time. This approach is critical in applications ranging from epidemic modeling to evolutionary theory. In this course, students will learn how simple rules and interactions can lead to complex behavior using examples from three main areas: regulatory networks, population genetics, and ecology.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-BIOL**
Identical With: **BIOL271**
Prereq: **BIOL181 OR BIOL181Z AND BIOL182 OR BIOL182Z**

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 Digital Projects Lab

This intermediate course in design engages form and process as vital lineaments in digital images, systems, and objects today. Through a series of short, hands-on, thematic projects, students will move past the basics of digital technique and challenge themselves to articulate how and why things appear as they do. Rather than focus on specific tools or software, assignments will straddle creative platforms and media, incorporating methods such as live signal processing, data moshing, remixing, and interaction design. Early assignments will address narrow thematic concerns while a long-term final project driven by students' own directives will be developed and executed in the second half of term.
Offering: **Crosslisting**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **HA-CIS**
Identical With: **IDEA285**
Prereq: **None**

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. This course emphasizes hands-on computational methodology, bioinformatics data analysis, and interpretation of quantitative information. The primary method of evaluation is through written work and

weekly homework assignments and the course will increase students skill in scientific writing and scholarship. Classes will consist of lectures, discussion groups and cloud based computational projects designed to train transferable skills in big data analysis. Lectures, labs, assignments and assessments will promote deep knowledge in genomics and informatics, gaining understanding in the scientific process, thinking analytically and critically about biological questions, and formulating original ideas and testing them with big data. Skills gained during the course will include quantitative, statistical and graphical tools, scientific writing, oral communication and deep thinking about ethics in a genomics-enabled world.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-BIOL**
Identical With: **BIOL310, MB&B311**
Prereq: **MB&B181 OR BIOL181 OR BIOL181Z**

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 is a special topics course open to all Wesleyan students to explore subjects that are at the boundaries of the canonical scientific disciplines, that are complex, and that have paramount societal impact (e.g., pandemics and public health, climate change, the search for life in the universe, and artificial intelligence and automation). There are also societal issues that deeply impact and are vital for all the sciences (e.g., diversity, equity and inclusion of our communities, federal funding, and science policy). We will collectively identify one or two topics that we would like to focus on together as a class. With disciplinary humility, we will construct a syllabus that will include readings, classroom discussions, presentations, guest lectures, and writing that will integrate our knowledge, methodologies, and action across the sciences. This course is part of the CIS major, and it is expected that all senior CIS majors will be enrolled.
Offering: **Host**
Grading: **Cr/U**
Credits: **0.50**
Gen Ed Area: **NSM-CIS**
Prereq: **None**

CIS322 Senior Colloquium in Integrative Sciences
This is a special colloquium course focused on skills associated with science communication and, in particular, communicating student's own research to various audiences. Given the broad benefits that research has on society, and the federal funding derived from tax-payer dollars, scientists have an ethical obligation to communicate the results of their work to various stakeholders. In addition, scientists find that communicating and discussing their work with others is an invaluable method of idea generation. Finally, sharing our work with others is fun and gratifying, particularly at the end of a large project (e.g., a thesis)! These skills transcend our particular departments and are common across STEM fields. With disciplinary humility, we will engage in skill-building using various resources available to us on campus. There will be an opportunity for students to identify skill sets that they are particularly interested in, so that they can be incorporated into the course. There will be readings, classroom

discussions, presentations, guest lectures, and visits to centers on campus. This course is part of the CIS major, and it is expected that all senior CIS majors will be enrolled.
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**

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**

CIS350 Computational Media: Videogame Development

This course examines the interplay of art and science in the development of contemporary videogames using the Unity development platform and commercial artistic game tools. Students develop a comprehensive understanding of computational media, including legal and commercial aspects, combined with hands-on experience in a creative process that integrates design, art, and coding. 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 better understand the challenges and rewards of producing graphic interactive software within a professional context.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **2.00**
Gen Ed Area: **NSM-IDEA**
Identical With: **IDEA350, FILM250, COMP350**
Prereq: **None**

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 these 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&ES376**
Prereq: **E&ES101 OR E&ES115 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: **NSM-EES**
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**

CIS408 Senior Tutorial (downgraded thesis)

Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor. Only enrolled in through the Honors Coordinator.
Offering: **Host**
Grading: **A-F**

CIS409 Senior Thesis Tutorial

Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

CIS410 Senior Thesis Tutorial

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**

CIS419 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**

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**

CIS465 Education in the Field, Undergraduate
Students must consult with the department and class dean in advance of undertaking education in the field for approval of the nature of the responsibilities and method of evaluation.
Offering: **Host**
Grading: **A-F**

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**

CIS493 Research in Science Fellowship
Wesleyan has established a credit/uncredit course, CIS 493, for students to receive .25 credit upon successful completion of a summer research experience. Summer Research Fellows conduct independent scientific research with faculty mentors in one or more departments (Archaeology, Astronomy, Biology, Chemistry, Earth and Environmental Science, Integrated Design Arts and Engineering Studies, Mathematics and Computer Science, Molecular Biology Biochemistry and Biophysics, Neuroscience and Behavior, Physics, and Psychology). To complement the research experience, this summer program also includes weekly seminars, workshops, and a closing symposium. Students must satisfy the requirements of the fellowship and complete the course assignments in order to receive credit. For more information and application instructions, please visit the College of Integrative Sciences website: https://www.wesleyan.edu/cis/summer-program/research-fellowships.html If you have any questions, please email scienceresearch@wesleyan.edu.
Offering: **Host**
Grading: **Cr/U**
Credits: **0.25**
Gen Ed Area: **None**
Prereq: **None**

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**

CIS549 Advanced Research Seminar, Graduate
Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**
Grading: **OPT**

CIS550 Advanced Research Seminar, Graduate
Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**
Grading: **OPT**