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.

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VISITING FACULTY

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EMERITI

Ellen Thomas
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Smith Curator of Paleontology of the Joe Webb Peoples Museum of Natural History; Harold T. Stearns Professor of Integrative Sciences, Emerita

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

Master of Arts in the College of Integrative Sciences (https://catalog.wesleyan.edu/departments/cis/grad-cis-ma/)

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
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, PHYS170
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: 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: 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
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: OPT
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

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: QAC251
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

**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: BIOL263, 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 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 AND BIOL182

**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: 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: MB&B311
Prereq: [MB&B181 or BIOL310]

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: CIS320
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 II: 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 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 MB&B208

**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,
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
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

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&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
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
IDEA110 Vectors to Volumes: The Fundamentals of Digital Fabrication
This project-based course will cover the fundamentals of digital fabrication in a hands-on introduction to software-driven object making. The central concern will be process rather than concept, with a firm focus on how instead of why, as well as best safety practices. Instruction will be given in four areas sequentially, each building on the last: Vector Design & Execution, 3D Modeling & Printing, CNC Wood Routing, and CNC Metal Milling. Machine setup and best practices will be taught alongside foundational knowledge of applications such as Adobe Illustrator, Adobe Photoshop, Vectric VCarve, Autodesk Fusion360, and Ultimaker Cura. Throughout the course, there will be a consistent emphasis on fabrication methods and finishing techniques.
Offering: Host
Grading: Cr/U
Credits: 0.50
Gen Ed Area: HA-ART, NSM-IDEA
Prereq: None
IDEA120 Ecological Design I: Being at Home in the World
Being at Home in the World is an introduction to the skills and thinking involved in the ecologically responsible creation of objects. This course is intended to provide a foundational understanding of the language of design, sources of materials, and energy systems. The studio encourages students to develop a rigorous, iterative working method to deeply analyze the nature of land and resources, explore options, and test ideas. This process of making is complemented and supported by an introduction to the history and theory of design, training with techniques and equipment, and active practice in keeping a sketchbook. Early exercises and projects in the course build familiarity and confidence with analytical drawing, making, and modeling techniques, which build toward the creation of a novel piece of design work presented at the final review.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: HA-ART
Identical With: ARST220, ENVS232
Prereq: None
IDEA154 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, CIS154
Prereq: None
IDEA160 Product Design I
In this introductory product design course, students will experience basic design processes such as problem identification and possible resolutions; the use of design development and communication skills via design observation and research; iterative process and prototyping; and representation and presentation in two and three-dimensional forms. Students will explore how design can play a role in our community and how it can impact our society. Students will work both individually and collaboratively in a studio environment. Field trips to New York City fabricators, galleries, and workshops may be expected as part of this course.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: HA-ART
Identical With: ARST270
Prereq: None
IDEA170 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: Host
Grading: Cr/U
Credits: 1.00
Gen Ed Area: NSM-CIS
Identical With: PHYS170, CIS170
Prereq: None
IDEA1702 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: OPT
Credits: 1.00
Gen Ed Area: NSM-CIS
Identical With: CIS170Z, PHYS170
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
IDEA180 Design Studies
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: Host
Grading: Cr/U
Credits: 1.00
Gen Ed Area: NSM-CIS
Identical With: CIS175
Prereq: None

IDEA185Z 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: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-CIS
Identical With: CIS185Z
Prereq: None

IDEA190 Digital Foundations
This course introduces the foundations of digital art through contemporary artistic practice. Students will research the history of digital art and examine relationships of digital media and contemporary art. The class has a theoretical focus on machine use within the process of art making while building foundational digital skills. Projects will focus on four key areas including: Digital Imaging, 3D Modeling and Virtual Design, Time Based Media, and Digital Fabrication. Building on these four areas the course will culminate in an individualized research based final project and presentation. Through experimentation, critical analysis, critique and peer review; students will generate a unique portfolio of digital art works.

Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: HA-ART
Identical With: ARST190
Prereq: None

IDEA190Z Digital Foundations
This introduction to the digital studio engages software and electronic media as an expanded field of creative production in contemporary art and design. Through a sequence of workshops, exercises, and hands-on digital projects, students will develop their critical and creative toolkits and learn to conceive, refine, and present original work. Open to all skill levels, this course prioritizes sustained and rigorous engagement with digital practice as well as conceptual and formal problem-solving.

Workshops in image manipulation, compositing, motion graphics, and visual communication will be led synchronously online by the instructor. This will be complemented with weekly online studio sessions, discussions, screenings, and reviews. Students will be provided access to all course materials using Google Drive and other digital platforms. Access to Adobe Creative Cloud software will be provided by Wesleyan, but individual licensing is also encouraged. Course assistants will offer peer mentoring and technical support in person through the DDS and online through Zoom.

Offering: Crosslisting
Grading: OPT
Credits: 1.00
Examples will include board games, tabletop role-playing games, escape games, and puzzles. Participants will discuss the application of gaming principles to various subjects and types of classrooms; then, they will engage in a final project in which they will either adapt existing games for specific learning outcomes or create brand new educational games. The course will be conducted in English and games will be created in English.

Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: SBS-EDST
Identical With: EDST210
Prereq: None

IDEA210 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: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-IDEA
Identical With: CIS210, PHYS210
Prereq: IDEA170 AND (PHYS111 OR PHYS113)

IDEA215 Introduction to Sensors, Measurement, and Data Analysis
This course is an engineering fundamentals course supporting the Integrated Design, Engineering, Arts, and Society (IDEAS) minor. It will involve a sequence of hands-on projects that introduce students to basic measurement devices and data analysis techniques using sensors, a microprocessing platform, and computational software. The course will provide foundational knowledge of available resources and signal processing 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. Students will complete a final team project of their choice (with approval) exploring areas of interest in measurement, data analysis, machine learning or other avenues. Some previous programming experience is expected. Prior experience in IDEA175 or with Arduino, Raspberry Pi or other physical computing platforms are preferred, but not required.

Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-CIS

IDEA221 A Thousand Years of Iteration: Design for an Uncertain Future
The climate emergency is a product of design. Centuries worth of aesthetic and industrial innovation have created extractive infrastructure, efficient machines, and disposable products that make it increasingly easy to consume energy and resources on a global scale. As new conversations about just transitions, a circular economy, and a Green New Deal have begun to proliferate among designers, the discipline’s troubled relationship to notions of “progress” remains largely unquestioned.

This reading- and research-intensive studio asks students to examine this history of technology and to critically evaluate shifting theoretical perspectives on nature and human development as they relate to design. Topics will include the lifespan of buildings and products, relationships with and obligations to materials.
IDEA235 Activism and Theories of Change
In this course we will explore strategies and theories of change that shape social justice movements, with particular reference to recent movements in the United States. We will discuss the benefits and risks of the many available strategies including direct action, grassroots mobilization, impact litigation, legislative campaigns, electoral campaigns, artistic protest, and public education. What strategic, ethical, or moral questions are raised by various types of protest and communications? The instructor will draw on her own experiences as an activist for women's rights, queer rights, and economic justice. In addition, the course will feature a guest teacher for a segment of the semester: Beverly Tillery, Executive Director of the Anti-Violence project in NYC will look at the ways BIPOC and Queer BIPOC communities are reshaping the social justice landscape by addressing the safety of trans women, challenging the gender binary and reforming and ending the carceral legal system. We will allow time to discuss events that may occur in real time over the course of the semester. This course will be relevant to students interested in public policy, feminism, gender and sexuality studies, and other social sciences, and will provide useful insight for future organizers and activists, lawyers, and public policy makers.
IDEA267 Engineering Biology: Cells and Tissues

This course explores the intersection of biology, medicine, and engineering, where scientists are developing novel platforms to promote understanding, diagnosis, and treatment of human diseases. We cover modern techniques for manipulating biological systems, spanning single molecules to ensembles of cells. We will examine the trajectory of the field from studying cells in a plastic dish to the advent of organ-on-a-chip and organoid models and discuss how this transition from 2D to 3D biology has propelled increased understanding of both normal physiological homeostasis and also the pathophysiology of disease. Topics will include controlling behavior of cells through cell-matrix interactions, learning through building via synthetic biology, and advances in regenerative medicine. These topics will be explored through the thematic lenses of transport processes (supply of nutrients and removal of waste) and mechanoreciprocity (the sensing of and response to the physical properties of the cellular microenvironment). Lectures will review fundamental concepts in cell biology and physiology before delving into topical examples from current literature. Lectures and assessments will include opportunities to develop skill in thinking analytically and critically about using engineering tools to study fundamental questions in human disease, formulating original ideas and experiments, and communicating science through written and oral formats.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: BIO1267
Prereq: M8&B181 AND M8&B182

IDEA271 Biodegradable Design: Soft and Hairy

In this course, we will develop an understanding of soft materials and how softness is explored in design. We will explore the notion of softness in design with particular focus on how soft, biodegradable materials can form our experience of a product. We will study how soft materials, plants, and living organisms can be utilized as a living material to form a built ecology. In particular, we will learn how mycelium used in novel ways can produce experiential affect in spaces, especially in relation to the human body. We will study how to design for impermanence—sometimes using waste materials—and develop an understanding for material recovery. The goal of the course is to introduce students to bio and living materials used in design as well as zero-waste design methodology, and develop digital and physical skills associated with the making of soft products. Students will work both individually and collaboratively in a studio environment. Field trips to New York City museums, fabricators, and galleries may be expected as part of this course.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: HA-ART
Identical With: ARST271, ENVS271
Prereq: ARST131 OR IDEA110 OR IDEA180

IDEA285 Digital Projects Lab

This intermediate course in design engages form and process as vital linkages 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: Host
Grading: OPT
Credits: 1.00

IDEA291 East Asian Archaeology

This course will introduce students to remarkable archaeological discoveries from East Asia, focusing on the archaeology of ancient China, but also including finds from Japan, Korea, and Mongolia. Beginning with "Peking Man" and Asia’s earliest hominin inhabitants, we will explore the lives of Paleolithic hunter gatherers, the origins of domestic rice and pigs, the emergence of early villages and cities, the origins of writing, ancient ritual systems, long-distance interactions through land and maritime Silk Roads, and the archaeology of Chinese diaspora populations living in the 19th-century United States. We will also consider the current state of archaeological research in East Asia, focusing on site preservation, cultural heritage management, and the political roles of archaeology.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: SBS-ARCP
Identical With: ARCP291, ANTH291, CEAS291, ENVS291
Prereq: None

IDEA292 Interdisciplinary Project Lab

Our world is largely governed by abstract systems and invisible forces. Consider the internet, evolution, or the Earth’s climate. What drives these systems? How do they work? While it’s hard to imagine such large concepts, breaking such big ideas down into manageable pieces is a skill practiced by scientists, engineers, and designers every day. How we translate ideas into knowledge can take many forms. In this interdisciplinary project-based course, students will work in collaborative teams to translate big ideas into something people of all ages and backgrounds can manipulate, interact with, and understand. Throughout the term we will explore how designers, engineers, and subject-specific experts work together in museums, zoological and botanical parks, science centers, and other public spaces to create interactive and engaging environments for learning. Students will apply what they learn about the creation of these spaces in their own self-directed projects. In doing so, students will expand their knowledge of materials and fabrication, develop skills for effective communication through visualizations and physical objects, and evaluate the efficacy of their designs.

Offering: Host
Grading: Cr/U
Credits: 1.00
Gen Ed Area: NSM-IDEA
Prereq: IDEA170 OR ARST190 OR IDEA285 OR IDEA175 OR ARST235

IDEA301 Unsettling Times: Clocks for Ghosts, Monsters, and Aliens

Tracking the rhythms, cycles, and ruptures of collective life is essential for studies of sociocultural and environmental dynamics. Yet such studies are mostly undertaken with the unquestioned assumption that Western apparatuses of time reckoning and historical periodization can be applied as universal and stable frames of reference for all kinds of phenomena. Temporal units of years, months, days, minutes are used, rendering insensible relations that do not align with such metrics. These simplifying moves limit our capacity to understand continuity and change, and places countless lives and landscapes at great risk.

This seminar draws from the social and natural sciences, humanities, and arts to unsettle these simplifications. Through readings and audio/video screenings, we will consider how apparatuses for time keeping (or clocks, broadly defined) become power tools, creating haunted, monstrous, and alienated subjects. Through exercises and field walks throughout the semester, students are invited to notice, record, and engage with multiple temporalities of more-than-human
worlds. The final project will involve research and design of a speculative clock for futures otherwise.

**Offering: Crosslisting**

**Grading:** A-F  
**Credits:** 1.00  
**Gen Ed Area:** SBS-SISP  
**Identical With:** SISP301  
**Prereq:** None

### IDEA308 Comparative Urban Policy

Cities are home to more than half of the world’s population, generate more than 80% of world GDP, and are responsible for 75% of global CO2 emissions. Once viewed as minor political players with parochial concerns, they are now—individually and collectively—major players on the global stage. This course will examine how cities are coping with the major policy issues governing our lives—from waste management and public safety to energy and housing policy. We will be examining how policies differ between big cities and small cities, what cities in the global north are learning from the cities in the global south, and how cities are bypassing toxic partisan politics in their nations’ capitals to form global networks promoting positive change. The class will involve local field trips and participant observation to see how some of these urban issues are playing out in the city of Middletown.

**Offering: Crosslisting**

**Grading:** A-F  
**Credits:** 1.00  
**Gen Ed Area:** SBS-GOVT  
**Identical With:** GOVT308, CEAS308, ENV5308  
**Prereq:** None

### IDEA320 Ecological Design II: Worn Out/Broken In

This course will function as a design studio that examines the afterlife of material production. While designers have traditionally focused their attention on the creation, distribution, and consumption of new products, this course asks students to carefully consider everything that follows those acts. By scrutinizing the use, care, maintenance, repair, and eventual demise of designed objects, students come to understand the intended and unintended consequences of making. Rigorous observation and research lead to the creation of analytic drawings and models for presentation at project reviews.

**Offering: Crosslisting**

**Grading:** A-F  
**Credits:** 1.00  
**Gen Ed Area:** HA-ART  
**Identical With:** ARST320, ENV5321  
**Prereq:** ARST270 OR ARST235 OR ARST220

### IDEA350 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:** Host  
**Grading:** A-F  
**Credits:** 2.00  
**Gen Ed Area:** NSM-IDEA  
**Identical With:** FILM250, COMP350, CIS350  
**Prereq:** None

### IDEA360 Media for Performance

This course examines the use of media and technology as it relates to dramaturgy and design for performance. Class time will be used for lecture, discussion, and experimentation, during which we will explore new technologies used in the industry, including projections, motion tracking, and software such as After Effects and Isadora. Throughout the semester, students will use the skills learned to create their own digital performances.

**Offering: Crosslisting**

**Grading:** A-F  
**Credits:** 1.00  
**Gen Ed Area:** HA-THEA  
**Identical With:** THEA360, DANC364  
**Prereq:** None

### IDEA370 Product Design II

This course builds on the exploration and knowledge learned in Product Design I to discover opportunities for systems thinking in product design. Students will study systemic challenges related to aging, education, food, and mobility to investigate potential opportunities through the lens of product design. The course will support students in developing digital modeling skills as well as rapid prototyping and fabrication techniques. Students will work both individually and collaboratively in a studio environment. Field trips to New York City design ateliers, fabricators, and workshops may be expected as part of this course.

**Offering: Crosslisting**

**Grading:** A-F  
**Credits:** 1.00  
**Gen Ed Area:** HA-ART  
**Identical With:** ARST370  
**Prereq:** ARST270 OR ARST235

### 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