INTEGRATED DESIGN, ENGINEERING & APPLIED SCIENCE MINOR

The broad and deep challenges of society demand nimble minds that can utilize an integrated skill set that includes design, engineering, and applied science. The Integrated Design, Engineering & Applied Science (IDEAS) program prepares students to succeed at the intersection of design, the arts, and engineering. Students develop foundational knowledge in design and engineering by working in collaborative groups on project-based studies. The core courses of the IDEAS minor provide a basis in both the technical and aesthetic aspects of design. These courses serve as the basis for more focused studies in a broad array of elective modules that span design and engineering disciplines.

ADMISSION TO THE MINOR

Students should complete two required courses, one focusing on Design & Engineering (CIS170, CIS173, CIS175, or CIS250), and one on Design & Arts (ARST190, ARST233, or ARST283) to be admitted to the IDEAS minor. Declare the IDEAS minor through your WesPortal.

MINOR REQUIREMENTS

A minor in IDEAS requires six credits. Students must complete two project-based design courses, one focusing on engineering, and one on the arts. The remaining four elective courses come from course “modules.” Some courses offered on an irregular basis are not listed in modules, but may be used for electives, subject to approval from the minor advisor. In addition, students will assemble a digital or physical portfolio of their work from project-based courses to complete the minor.

STUDENT PORTFOLIO

Regardless of the module completed, students pursuing the minor will assemble a portfolio of their work from the courses completed to fulfill the minor. It will be expected that each student in the minor will begin the design of an online and/or physical portfolio in the required project-based minor courses. In consultation with an advisor, projects will be added to this portfolio and reviewed before completion of the minor. The portfolio will be used for both for the assessment of individual students, as well as the success of the minor.

REQUIRED PROJECT-BASED DESIGN COURSES

Students must complete one course from each group below.

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIS170</td>
<td>Introduction to Design and Engineering</td>
<td>Design</td>
<td>1</td>
</tr>
<tr>
<td>CIS173</td>
<td>Introduction to Sensors, Measurement, and Data Analysis</td>
<td>Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CIS175</td>
<td>Principles of Engineering</td>
<td>Design</td>
<td>1</td>
</tr>
<tr>
<td>CIS250</td>
<td>Computational Media: Videogame Design and Development</td>
<td>Engineering</td>
<td>1</td>
</tr>
</tbody>
</table>

ELECTIVE COURSES FROM MODULES:

The course modules provide topical focus in the wide array of areas in Design, Engineering, and Applied Sciences. The IDEAS modules consist of four courses above the two required courses, to make the total of six courses in the minor.

Some of the proposed modules include courses listed among those that will satisfy the two-course distribution requirement listed above. Students will most efficiently complete such a module by selecting a required course that also contributes to the module. Students will work with an advisor to help them achieve the appropriate depth of study in the module area. Related courses that are not offered on a regular basis may be approved for minor credit, subject to review by the minor advisor. Students may propose substitutions or alternate modules, which must have approval from the advisor of the minor. Typically, introductory (100-level) courses may not be counted toward the elective requirement.

2D DESIGN

The study of communication design ranging from letterpress printing and the history of books to contemporary graphic design and on to web design, always referencing production and its technology.

If not completed in the general requirements, three of the following design courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARST131</td>
<td>Drawing I</td>
</tr>
<tr>
<td>ARST190</td>
<td>Digital Art</td>
</tr>
<tr>
<td>ARST242</td>
<td>Typography</td>
</tr>
<tr>
<td>ARST243</td>
<td>Graphic Design</td>
</tr>
</tbody>
</table>

One course in the History of Design:

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARHA260</td>
<td>History of Prints</td>
</tr>
</tbody>
</table>

3D DESIGN

The study of objects, their design, and technologies of production. This module consolidates project-based learning in architecture, product design and furniture design.

If not completed in the general requirements, two of the following design courses:

<table>
<thead>
<tr>
<th>Course</th>
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</tr>
</thead>
<tbody>
<tr>
<td>ARST233</td>
<td>Studies in Computer-based Modelling and Digital Fabrication</td>
</tr>
<tr>
<td>ARST235</td>
<td>Architecture I</td>
</tr>
<tr>
<td>ARST336</td>
<td>Architecture II</td>
</tr>
<tr>
<td>THEA359</td>
<td>Design and the Performative Space</td>
</tr>
<tr>
<td>THEA185</td>
<td>Text and the Visual Imagination</td>
</tr>
</tbody>
</table>

One course in the History of Architecture:

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>ARHA151</td>
<td>European Architecture to 1750</td>
</tr>
<tr>
<td>ARHA244</td>
<td>European Architecture and Urbanism, 1750-1910</td>
</tr>
<tr>
<td>ARHA246</td>
<td>American Architecture and Urbanism, 1770–1914</td>
</tr>
<tr>
<td>ARHA254</td>
<td>Architecture of the 20th Century</td>
</tr>
<tr>
<td>ARHA352</td>
<td>Energy and Modern Architecture, 1850–2015</td>
</tr>
</tbody>
</table>

One additional course from the following list, for a total of six courses:

<table>
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<tr>
<th>Course</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>ARST131</td>
<td>Drawing I</td>
</tr>
</tbody>
</table>
### APPLIED MATH

Mathematical methods applied in science, engineering, computer science, and social science.

If not completed in the general requirements, two of the following engineering design courses:

- **CIS170** Introduction to Design and Engineering
- **CIS173** Introduction to Sensors, Measurement, and Data Analysis
- **CIS175** Principles of Engineering

**One course in computing and programming foundations:**

- **COMP112** Introduction to Programming
- **COMP211** Computer Science I
- **PHYS340** Computational Physics

**Two additional courses from the following list, for a total of six courses:**

- **MATH229** Differential Equations
- **MATH231** An Introduction to Probability
- **MATH232** Mathematical Statistics
- **PHYS213** Waves and Oscillations
- **PHYS217** Non-linear Dynamics and Chaos
- **PHYS565** Mathematical Physics

### BIOLOGICAL OR BIOCHEMICAL

Applications of biology and biochemistry to solve challenges in life and health sciences.

If not completed in the general requirements, two of the following engineering design courses:

- **CIS170** Introduction to Design and Engineering
- **CIS173** Introduction to Sensors, Measurement, and Data Analysis
- **CIS175** Principles of Engineering

**One course in computing and programming foundations:**

- **COMP112** Introduction to Programming
- **COMP211** Computer Science I
- **PHYS340** Computational Physics

**Two additional courses from the following list, for a total of six courses:**

- **BIOL212** Principles and Mechanisms of Cell Biology
- **BIOL265** Bioinformatics Programming
- **BIOL310** Genomics Analysis
- **MB&B228** Introductory Medical Biochemistry
- **MB&B325** Introduction to Biomolecular Structure
- **MB&B377** Advanced Genetics
- **MB&B381** Physical Chemistry for the Life Sciences

### CHEMICAL

Applications of chemistry to the design of new chemicals, materials, and energy production.

If not completed in the general requirements, two of the following engineering design courses:

- **CIS170** Introduction to Design and Engineering

### COMPUTER

Applications of computer science to the design of new computer hardware and software.

If not completed in the general requirements, two of the following engineering design courses:

- **CIS170** Introduction to Design and Engineering
- **CIS173** Introduction to Sensors, Measurement, and Data Analysis
- **CIS175** Principles of Engineering

**One course in computing and programming foundations:**

- **COMP112** Introduction to Programming
- **COMP211** Computer Science I
- **PHYS340** Computational Physics

**Two additional courses from the following list, for a total of six courses:**

- **ARST283** Physical Computing in Art and Design
- **ARST289** Computer Vision
- **CIS250** Computational Media: Videogame Design and Development
- **COMP212** Computer Science II
- **COMP312** Algorithms and Complexity
- **COMP321** Design of Programming Languages
- **COMP331** Computer Structure and Organization
- **COMP342** Software Engineering

### DIGITAL DESIGN

Design whose final form is the web or virtual space.

If not completed in the general requirements, the following design courses:

- **ARST131** Drawing I
- **ARST190** Digital Art
- **THEA185** Text and the Visual Imagination

**One course in the History of Design:**

- **ARHA151** European Architecture to 1750
- **ARHA244** European Architecture and Urbanism, 1750-1910
- **ARHA254** Architecture of the 20th Century
- **ARHA260** History of Prints
Two additional courses from the following list, for a total of six courses:

- ARST233 Studies in Computer-based Modelling and Digital Fabrication
- ARST283 Physical Computing in Art and Design

**ELECTRICAL**
Applications of electrical and magnetic systems to the design of new devices and communications.

If not completed in the general requirements, two of the following engineering design courses:

- CIS170 Introduction to Design and Engineering
- CIS173 Introduction to Sensors, Measurement, and Data Analysis
- CIS175 Principles of Engineering

One course in computing and programming foundations:

- COMP112 Introduction to Programming
- COMP211 Computer Science I
- PHYS340 Computational Physics

Two additional courses from the following list, for a total of six courses:

- ASTR240 Radio Astronomy
- PHYS213 Waves and Oscillations
- PHYS214 Quantum Mechanics I
- PHYS324 Electricity and Magnetism
- PHYS342 Experimental Optics
- PHYS345 Electronics Lab

**ENVIRONMENTAL**
Application of environmental and ecological knowledge to the protection of ecosystems and human population.

If not completed in the general requirements, two of the following engineering design courses:

- CIS170 Introduction to Design and Engineering
- CIS173 Introduction to Sensors, Measurement, and Data Analysis
- CIS175 Principles of Engineering

One course in computing and programming foundations:

- COMP112 Introduction to Programming
- COMP211 Computer Science I
- PHYS340 Computational Physics

Two additional courses from the following list, for a total of six courses:

- BIOL216 Ecology
- E&ES244 Soils
- E&ES246 Hydrology
- E&ES250 Environmental Geochemistry
- E&ES280 Introduction to GIS

**GEOMECHANICS/GEOSYSTEMS**
Applications of geology and earth science to the development and preservation of subterranean resources.

If not completed in the general requirements, the following engineering design courses:

- CIS170 Introduction to Design and Engineering
- CIS175 Principles of Engineering

One course in computing and programming foundations:

- COMP112 Introduction to Programming
- COMP211 Computer Science I
- PHYS340 Computational Physics

Two additional courses from the following list, for a total of six courses:

- CSCI233 Studies in Computer-based Modelling and Digital Fabrication
- CSCI283 Physical Computing in Art and Design

**MATERIALS SCIENCE**
Discovery, design, and properties of new materials.

If not completed in the general requirements, two of the following engineering design courses:

- CIS170 Introduction to Design and Engineering
- CIS173 Introduction to Sensors, Measurement, and Data Analysis
- CIS175 Principles of Engineering

One course in computing and programming foundations:

- COMP112 Introduction to Programming
- COMP211 Computer Science I
- PHYS340 Computational Physics

Two additional courses from the following list, for a total of six courses:

- CHEM377 Chemistry of Materials and Nanomaterials
- CHEM379 Nanomaterials Lab
- PHYS316 Thermal and Statistical Physics
- PHYS358 Condensed Matter

**MECHANICAL**
Application of mechanics, kinematics, and thermodynamics to design and develop new mechanical systems.

If not completed in the general requirements, two of the following engineering design courses:

- CIS170 Introduction to Design and Engineering
- CIS173 Introduction to Sensors, Measurement, and Data Analysis
- CIS175 Principles of Engineering

One course in computing and programming foundations:

- COMP112 Introduction to Programming
- COMP211 Computer Science I
- PHYS340 Computational Physics

Two additional courses from the following list, for a total of six courses:

- CHEM338 Physical Chemistry II: Thermodynamics, Statistical Mechanics, and Kinetics
- PHYS213 Waves and Oscillations
- PHYS217 Non-linear Dynamics and Chaos
- PHYS313 Classical Dynamics
- PHYS316 Thermal and Statistical Physics
PHYS358 Condensed Matter

**PERFORMANCE DESIGN**
Stage design for theater or dance, sets, costumes, and lighting.

One course in the History of Design: 1

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<tr>
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<tbody>
<tr>
<td>ARHA151</td>
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<td>ARHA254</td>
<td>Architecture of the 20th Century</td>
</tr>
<tr>
<td>ARHA260</td>
<td>History of Prints</td>
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Two additional courses from the following list: 2

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEA185</td>
<td>Text and the Visual Imagination</td>
</tr>
<tr>
<td>THEA305</td>
<td>Lighting Design for the Theater</td>
</tr>
<tr>
<td>THEA360/DANC364</td>
<td>Media for Performance</td>
</tr>
<tr>
<td>THEA359</td>
<td>Design and the Performative Space</td>
</tr>
<tr>
<td>THEA383</td>
<td>Introduction to Costume Design for Performance</td>
</tr>
</tbody>
</table>

One additional credit from the following list, for a total of six credits: 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEA434</td>
<td>Applied Scenography: From Idea to the Stage</td>
</tr>
<tr>
<td>and</td>
<td></td>
</tr>
<tr>
<td>THEA435</td>
<td>Performance Practice in Design A</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>THEA437</td>
<td>Performance Practice in Design B</td>
</tr>
</tbody>
</table>

**ADDITIONAL MINOR INFORMATION**

- There may be prerequisite courses required for some of the courses listed above. These prerequisites do not count towards the minor.
- Some of the courses may be cross-listed with other departments; students can enroll in any listing for the specified course.
- Students may propose an alternate course module or a different combination of elective courses, in consultation with the IDEAS advisor.
- Some courses may overlap with existing major requirements. A student may only count two course credits toward the IDEAS minor that are also counted towards a major, linked major, certificate, or other minor, unless receiving explicit approval from the IDEAS minor administrator to waive this requirement.