GEOGRAPHIC INFORMATION SCIENCE UNDERGRADUATE CERTIFICATE

Introduction
Please click here (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/geography-environmental-sciences/) to see Geography and Environmental Sciences department information.

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The Geographic Information Science (GISci) Certificate in the Department of Geography and Environmental Sciences is designed to provide CU Denver undergraduates and graduates, as well as non-degree seeking students interested in professional development, with proficiency in the application of spatial thinking, geographic information science, and geo-technologies in the social and physical sciences, spanning the natural, built and human environments and emphasizing human-environment interconnections. The GISci Certificate core establishes a broad foundation in spatial technologies and methodologies, including geographic information systems, remote sensing, cartography, spatial extensions to database management systems, and statistics. From this base, students can delve into various specialization areas depending on their interests.

Upon successful completion of the certificate, students will be able to:

• articulate and apply basic theoretical underpinnings of spatial analytical principles, methodologies, and techniques;
• effectively utilize at least three different types of software used for spatial analysis;
• apply geospatial thinking, geographic information science, and geo-technologies appropriately; and
• analyze diverse real-world problems that have a spatial dimension and develop alternative solutions to them.

These degree requirements are subject to periodic revision by the academic department, and the College reserves the right to make exceptions and substitutions as judged necessary in individual cases. Therefore, the College strongly urges students to consult regularly with their major advisor and CLAS advisor to confirm the best plans of study before finalizing them.

Program Delivery
• This is an on-campus program.

Declaring This Certificate
• CU Denver undergraduate students in any discipline or major may be admitted to the program.
• Of the four core requirements, only the statistics class has prerequisites, including algebra and introductory calculus. Because of the technical nature of the GIS and remote sensing course work, however, some mathematical experience is desirable prior to beginning the program.

• Students may begin the program in any semester or during the summer by making arrangements with the GISci certificate coordinator, and completing and signing the Application for GISci Certificate. This application is required to be formally registered in the GISci Certificate program, and must be completed no later than the semester prior to the scheduled completion of the certificate.

General Requirements
Students must satisfy all requirements as outlined below and by the department offering the certificate.

• Click here (http://catalog.ucdenver.edu/cu-denver/undergraduate/academic-policies-procedures/) for information about Academic Policies.

Certificate Requirements
1. Students must complete a minimum of 18 GEOG credit hours from the approved courses below.
2. Students must complete a minimum of 15 upper division (3000-level and above) GEOG credit hours.
3. Students must earn a minimum grade of C (2.0) in all certificate courses taken at CU Denver and must achieve a minimum cumulative certificate GPA of 3.0. All graded attempts in required and elective courses are calculated in the certificate GPA. Students cannot complete certificate or ancillary course requirements as pass/fail.
4. Students must complete all 18 credit hours with CU Denver faculty.

Program Restrictions, Allowances and Recommendations
1. The certificate will be awarded when the student graduates with the bachelor's degree.
2. To obtain the certificate, students must complete five core courses and one elective course from the approved list below, totaling 18 hours.
3. Although the five core courses may be taken in any order, it is advisable to begin with GEOG 2080 Introduction to Mapping and Map Analysis followed by GEOG 4080 Introduction to GIS, since these courses familiarize students with many key concepts used in the other classes.
4. All core courses are offered on a yearly basis. Any alterations to the program must be approved by the GISci Coordinator. Any changes to the standard curriculum program must be approved in writing by the GISci Certificate Coordinator and filed with the GISci Certificate Application Form.
5. Because a certificate is a CU Denver certification of a student’s specialized knowledge in an advanced subject matter, all courses in a certificate program are expected to be taken in residency at CU Denver. Only in rare circumstances will exceptions be made regarding this policy. Courses taken within the GISci Certificate Program may be used towards one other degree requirement.
6. Please pay attention to prerequisites for specific courses.

Required Geographic Information Science Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>GEOG 2080</td>
<td>Introduction to Mapping and Map Analysis</td>
<td>3</td>
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Take all of the following 15
GEOG 4060  Remote Sensing I: Introduction to Environmental Remote Sensing  3
GEOG 4080  Introduction to GIS  3
GEOG 4081  Cartography and Computer Mapping  3
Statistics course approved by GIS Certificate Coordinator.  3

Elective

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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CVEN 5382</td>
<td>Geospatial Data Development</td>
<td>3</td>
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<tr>
<td>CVEN 5385</td>
<td>GIS Relational Database Systems (or an elective approved by the GISci Certificate Coordinator)</td>
<td>3</td>
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<tr>
<td>GEOG 4070</td>
<td>Remote Sensing II: Advanced Remote Sensing</td>
<td>3</td>
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<tr>
<td>GEOG 4085</td>
<td>GIS Applications for the Urban Environment</td>
<td>3</td>
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<tr>
<td>GEOG 4090</td>
<td>Environmental Modeling with Geographic Information Systems</td>
<td>3</td>
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<tr>
<td>GEOG 4091</td>
<td>Open Source Software for Geospatial Applications</td>
<td>3</td>
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<tr>
<td>GEOG 4092</td>
<td>GIS Programming and Automation</td>
<td>3</td>
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<tr>
<td>GEOG 4095</td>
<td>Deploying GIS Functionality on the Web</td>
<td>3</td>
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<tr>
<td>GEOG 4235</td>
<td>GIS Applications in the Health Sciences</td>
<td>3</td>
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Or an elective course approved by GIS Certificate Coordinator.

Although only one elective is required to complete the Undergraduate GISci Certificate, it is strongly recommended that additional elective courses are taken to broaden the experience and knowledge of the student in GIS analysis and applications. A three-credit hour internship with a geospatial faculty sponsor is highly recommended.

To learn more about the Student Learning Outcomes for this program, please visit our website (https://clas.ucdenver.edu/ges/programs/certificates/gis-certificate/#learning_outcomes-280).