Area: Science and Engineering
Dean: Dr. Rina Roy
Assistant Dean: Dr. Derrick Booth
Phone: (916) 484-8107
Counseling: (916) 484-8572

Degree: A.S. - Geography
Certificate: A.S. - Geographic Information Systems

Geography Degree
The A.S. degree provides students with a solid foundation in geography as well as the standard prerequisites for upper division coursework leading to the baccalaureate degree. The required and elective coursework surveys a broad spectrum of physical geography, cultural geography, geographic information sciences, and related disciplines.

Student Learning Outcomes
Upon completion of this program, the student will be able to:
• Describe the general content and scope of collegiate geography studies.
• Compare and contrast the general biophysical and sociocultural differences and similarities among world regions.
• Interpret maps and mapped data utilizing basic map elements, including scales, common coordinate systems, and map symbols.
• Compare and contrast common geographic information technologies such as Geographic Information Systems (GIS), Global Positioning System (GPS), and remote sensing.
• Evaluate and analyze geographic problems and their solutions.
• List and describe at least three career options for geographers.

Career Opportunities
The opportunities for geographers are as varied as the scope of geography itself. Geographers are found throughout the public and private sector, though rarely in positions with the title of Geographer. When combined with appropriate internships and/or other work experience, a baccalaureate degree in geography is excellent preparation for careers such as natural resource management, environmental consulting, urban and regional planning, and elementary and secondary teaching.

Requirements for Degree 19 Units
GEOG 300 Physical Geography: Exploring Earth’s Environmental Systems ...........................................3
GEOG 301 Physical Geography Laboratory ...........................................1
GEOG 310 Human Geography: Exploring Earth’s Cultural Landscapes ...........................................3
GEOG 330 Introduction to Geographic Information Systems (3) ...........................................3
or GEOG 334 Introduction to Desktop GIS (3)
or CISC 310 Introduction to Computer Information Science (3)
PSYC 330 Introduction to Probability and Statistics (3) ...........................................3
or STAT 301 Statistical Analysis for the Behavioral Sciences (3)

And a minimum of 6 units from the following: ...........................................6

ANTH 310 Cultural Anthropology (3)
BIOL 352 Conservation Biology (3)
or BIOL 310 General Biology (4)
or BIOL 305 Natural History (4)
ECON 304 Principles of Microeconomics (3)
or ECON 302 Principles of Macroeconomics (3)
GEOG 306 Weather and Climate (3)

or GEOG 390 Field Studies in Geography (0.5 - 4)
GEOL 300 Physical Geology (3)
GEOL 301 Physical Geology Laboratory (1)
GEOL 330 Introduction to Oceanography (3)
GEOL 331 Introduction to Oceanography Lab (1)
HIST 300 History of Western Civilization (3)
or HIST 302 History of Western Civilization (3)
or HIST 327 History of the Chicano/Mexican American (3)
or HIST 325 History of Asian/Pacific Americans (3)
or HIST 320 History of the United States: African-American Emphasis (3)
or HIST 311 History of the United States (3)
or HIST 310 History of the United States (3)
HUM 320 Asian Humanities (3)
PHIL 350 Philosophy of Religion (3)
POLS 310 Introduction to International Relations (3)
SOC 300 Introduction to Sociology (3)

A maximum of 2 units from GEOG 390 will be counted toward the degree requirement.

Associate Degree Requirements: The Geography Associate in Science (A.S.) Degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

Geographic Information Systems (GIS) Degree
Geographic Information Systems (GIS) are collections of computers, software applications, and personnel used to capture, store, transform, manage, analyze, and display spatial information. This powerful technology has a wide range of applications in planning and management by government agencies, business, and industry. The A.S. Degree provides a solid technical background in GIS concepts and applications including database design, the Global Positioning System (GPS), cartography, GIS programming, spatial analysis, and interdisciplinary applications of the technology. The degree also includes ARC General Education and elective courses, which are required for graduation. Completion of the degree requires practical work experience in GIS. Refer to the department web site for examples of course sequencing.

Student Learning Outcomes
Upon completion of this program, the student will be able to:
• Assess and describe fundamental aspects of geographic information and scale, with specific reference to raster and vector digital spatial data models used to represent such information.
• Evaluate and compile various types of spatial data, with specific attention to geospatial metadata, data quality, and identification of the most appropriate data type for use in a specific GIS application.
• Compare and contrast the variety of available coordinate systems, map projections, and datums, and choose the appropriate variety for a specific GIS application.
Career Opportunities

According to an Environmental Systems Research Institute survey, over 80 percent of the data used for decision-making in government and industry has a spatial component. New areas of rapid growth are in criminal justice, homeland security, marketing, real estate, banking, health-care planning, disease control, insurance, and disaster preparedness, management, and response. Most local, state, and federal government agencies use GIS and maintain a staff of GIS technicians, analysts, and professionals. GIS is also commonly used in the private sector by businesses, planners, architects, foresters, geologists, environmental scientists, archaeologists, real estate professionals, marketers, sociologists, and bankers. The growth in application areas of GIS and of GIS as a specialized discipline represents a new way for individuals, agencies, and businesses to view the world. The expansion of jobs in GIS is anticipated to continue for many years to come. It is likely that all students, regardless of their particular field of interest, will at least be exposed to and probably use a GIS in some capacity in the years ahead. The purpose of American River College’s GIS program is to prepare students for careers in this expanding technological field.

Requirements for Degree  

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 330</td>
<td>Introduction to Geographic Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 334</td>
<td>Introduction to GIS Software Applications</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 340</td>
<td>Cartographic Design for GIS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 342</td>
<td>Introduction to Remote Sensing and Digital Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 344</td>
<td>Spatial Analysis and Modeling in GIS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 350</td>
<td>Data Acquisition in GIS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 354</td>
<td>Introduction to the Global Positioning System (GPS)</td>
<td>1.5</td>
</tr>
<tr>
<td>GEOG 360</td>
<td>Database Design and Management in GIS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 362</td>
<td>Advanced Database Design and Management in GIS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 375</td>
<td>Introduction to GIS Programming</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 380</td>
<td>Advanced GIS Software Applications</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 385</td>
<td>Introduction to Web Based GIS Application</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 498</td>
<td>Work Experience in Geography</td>
<td>1 - 4</td>
</tr>
</tbody>
</table>

Associate Degree Requirements: The Geographic Information Systems (GIS) Associate in Science (A.S.) Degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

Geographic Information Systems (GIS) - Certificate

Geographic Information Systems (GIS) are collections of computers, software applications, and personnel used to capture, store, transform, manage, analyze, and display spatial information. This powerful technology has a wide range of applications in planning and management by government agencies, business, and industry. The certificate provides a solid technical background in GIS concepts and applications including database design, the Global Positioning System (GPS), cartography, GIS programming, spatial analysis, and interdisciplinary applications of the technology. Completion of the certificate requires practical work experience in GIS. Refer to the department web site for examples of course sequencing.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- Assess and describe fundamental aspects of geographic information and scale, with specific reference to raster and vector digital spatial data models used to represent such information.
- Evaluate and compile various types of spatial data, with specific attention to geospatial metadata, data quality, and identification of the most appropriate data type for use in a specific GIS application.
- Compare and contrast the variety of available coordinate systems, map projections, and datums, and choose the appropriate variety for a specific GIS application.
- Originate, classify, edit, and manage digital spatial data using various techniques (e.g., manual, scan, and on-screen digitizing, computer-assisted drafting, GPS, etc.).
- Design, synthesize, validate, optimize, and manage spatial attribute tables and databases.
- Apply appropriate data normalization and classification schemes to attribute data.
- Formulate geoprocessing and analysis functions that are appropriate for specific applications, and be able to perform and evaluate the results of such processes (such as buffering, overlay, reclassification, address matching, and statistical analysis).
- Compare and contrast the effectiveness of various GIS output products, including maps, tables, charts, and other digital output for specific applications.
- Describe, assess, and compare common map elements and the cartographic design process.
- Synthesize, design, apply, and manage a GIS project, including estimates of time and labor requirements.
- Propose at least three examples of GIS applications that document spatial distributions or solve spatial problems.
Career Opportunities
According to an Environmental Systems Research Institute survey, over 80 percent of the data used for decision-making in government and industry has a spatial component. New areas of rapid growth are in criminal justice, homeland security, marketing, retail site location, resource allocation, banking, health-care planning, disease control, insurance, real estate, and disaster preparedness, management, and response. Most local, state, and federal government agencies use GIS and maintain a staff of GIS technicians, analysts, and professionals. GIS is also commonly used in the private sector by businesses, planners, architects, foresters, geologists, environmental scientists, archaeologists, real estate professionals, marketers, sociologists, and bankers. The growth in application areas of GIS and of GIS as a specialized discipline represents a new way for individuals, agencies, and businesses to view the world. The expansion of jobs in GIS is anticipated to continue for many years to come. It is likely that all students, regardless of their particular field of interest, will at least be exposed to and probably use a GIS in some capacity in the years ahead. The purpose of American River College’s GIS program is to prepare students for careers in this expanding technological field.

Requirements for Certificate 32.5-35.5 Units

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 330</td>
<td>Introduction to Geographic Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 334</td>
<td>Introduction to GIS Software Applications</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 340</td>
<td>Cartographic Design for GIS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 342</td>
<td>Introduction to Remote Sensing and Digital Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 344</td>
<td>Spatial Analysis and Modeling in GIS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 350</td>
<td>Data Acquisition in GIS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 354</td>
<td>Introduction to the Global Positioning System (GPS)</td>
<td>1.5</td>
</tr>
<tr>
<td>GEOG 360</td>
<td>Database Design and Management in GIS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 380</td>
<td>Advanced GIS Software Applications</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 498</td>
<td>Work Experience in Geography</td>
<td>1 - 4</td>
</tr>
</tbody>
</table>

And a minimum of 6 units from the following: 6

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 362</td>
<td>Advanced Database Design and Management in GIS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 375</td>
<td>Introduction to GIS Programming</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 385</td>
<td>Introduction to Web Based GIS Application Development</td>
<td>3</td>
</tr>
</tbody>
</table>

GEOG 300 Physical Geography: Exploring Earth’s Environmental Systems 3 Units
Advisory: MATH 32 or 39; and ENGRD 116 with a grade of “C” or better. General Education: AA/AS Area IV; CSU Area B1; IGETC Area 5A Course Transferable to UC/CSU Hours: 54 hours LEC
This course explores the processes and interrelationships which shape Earth’s natural landscapes. Key topics include solar energy balance, weather and climate, water resources, landforms, natural hazards, soil, and vegetation. Relevant application of these concepts is used to explain the evolving relationship between humans and Earth’s natural systems. Field trips may be required to relate course content to the real world.

GEOG 301 Physical Geography Laboratory 1 Unit
Corequisite: GEOG 300 General Education: AA/AS Area IV; CSU Area B1; CSU Area B3; IGETC Area 5A Course Transferable to UC/CSU Hours: 54 hours LAB
This course is a laboratory study of basic principles and concepts involved in understanding Earth’s environmental systems. Labs feature observation, collection, analysis and display of data related to the study of energy, weather and climate, vegetation, soils, landforms, and environmental hazards. Additionally, units feature geographic methods and technology, including interpretation of maps and other geographic imagery, weather instrumentation, the global positioning system (GPS), and relevant computer and Internet applications. Field trips may be required.

GEOG 305 Global Climate Change 3 Units
Same As: GEOL 320 Advisory: (ENGWR 102 or 103) or ESLW 320, (ENGRD 116 or ESLR 310), and MATH 100 with a grade of “C” or better. General Education: AA/AS Area IV Course Transferable to UC/CSU Hours: 54 hours LEC
General Education: AA/AS Area IV *This course explores the history and mechanisms of climate change in Earth’s past, as well as the methods that scientists use to investigate climate change. It also focuses on climate change in Earth’s recent history (the past few million years) and the role that humans have had in climate change, especially since the industrial revolution. Additionally, it investigates the effects of climate change in today’s world and discusses possible technological and political solutions to this vast and increasingly important problem. Field trips may be required. This course is not open to students who have completed GEOL 320.

GEOG 306 Weather and Climate 3 Units
General Education: AA/AS Area IV; CSU Area B1; IGETC Area 5A Course Transferable to UC/CSU Hours: 54 hours LEC
This course is an introduction to atmospheric processes including energy and moisture exchanges, atmospheric pressure, global circulation, precipitation processes, weather systems, severe weather, and world, regional, and local climate systems. Course content also includes observation and analysis of atmospheric data using charts, weather maps, and radar and satellite imagery from the Internet and other sources.
GEOG 307 Environmental Hazards and Natural Disasters 3 Units
Same As: GEOG 325
General Education: AA/AS Area IV; CSU Area B1; IGETC Area 5A
Course Transferable to UC/CSU
Hours: 54 hours LEC
This course covers the environmental effects and applications of Earth-related processes. It focuses on earthquakes, volcanic eruptions, landslides, and flooding. Topics also include the availability and exploitation of natural resources, waste disposal, and global climate change. Humans as a force in environmental change are emphasized. The course addresses geology, engineering, environmental studies, natural resources, geography, and science education. One field trip is required. Not open to students who have completed GEOG 325.

GEOG 308 Introduction to Oceanography 3 Units
Same As: GEOG 330
Advisory: GEOG 300 or GEOG 330
General Education: AA/AS Area A4; CSU Area B1; IGETC Area 5A
Course Transferable to UC/CSU
Hours: 54 hours LEC
This course is an integrated study of water on Earth emphasizing physical oceanography. Topics include ocean and shoreline processes, plate tectonics, sea floor morphology, types and distribution of sea floor sediment, ocean sediment transport, ocean chemistry, ocean currents, marine resources, and environmental concerns. Regional oceanographic features are emphasized and a field trip to gain familiarity with regional physical shoreline features is required. This course is not open to students who have completed GEOG 330.

GEOG 309 Introduction to Oceanography Lab 1 Unit
Same As: GEOG 331
Corequisite: GEOG 308 or GEOG 330
General Education: CSU Area B3; IGETC Area 5A
Course Transferable to UC/CSU
Hours: 54 hours LAB
This course is a laboratory investigation of water on Earth, emphasizing the shape of the sea floor, marine navigation, plate tectonics, sea floor materials and their utilization, the spatial distribution of ocean sediment, the physical and chemical nature of sea water, currents, tides, and marine weather. This course is not open to students who have completed GEOG 331.

GEOG 310 Human Geography: Exploring Earth’s Cultural Landscapes 3 Units
Advisory: ENGRD 116 or ESLR 320; ENGWR 51 or ESLW 310; MATH 32; or placement through assessment process
General Education: AA/AS Area V(b); AA/AS Area VI; CSU Area D5; IGETC Area 4E
Course Transferable to UC/CSU
Hours: 54 hours LEC
This course considers the diverse patterns of human development, attitudes, and movement on earth. People’s various social and economic systems and their different levels of interaction with nature are studied. World population and world food systems are surveyed and analyzed. The growth of cities and urban areas are considered, as are aspects of regional planning. The goal is to gain an understanding of people’s place on earth and, thus, improve human relations and also people’s relationship to the earth.

GEOG 320 World Regional Geography 3 Units
General Education: AA/AS Area V(b); AA/AS Area VI; CSU Area D5; IGETC Area 4E
Course Transferable to UC/CSU
Hours: 54 hours LEC
This course is a global survey of the world’s cultural regions. Basic geographic concepts and ideas are used to study and compare people, resources, landscapes, livelihoods, and economies, and origins across eight major geographic regions. The interaction of countries and regions, their global roles, and the conflicting pressures of cultural diversity versus globalization are presented. The widening gap between more developed and less developed countries is integrated through-out. Cultural and ethnic diversity, as it pertains to the expanding population of the United States, is also a major component.

GEOG 322 Geography of California 3 Units
General Education: AA/AS Area V(b); AA/AS Area VI; CSU Area D5; IGETC Area 4E
Course Transferable to UC/CSU
Hours: 54 hours LEC
This course is a study of the various natural and cultural environments of California, with special emphasis on the interaction of landforms, climate, natural vegetation, soils and resources with people. Historical, political, and economic development within this diverse environment is presented. The diversity of cultures which make up the state’s expanding population are studied and compared. Analysis of relevant issues of the day including those based on ethnic and cultural differences form an integral part of this course.

GEOG 330 Introduction to Geographic Information Systems 3 Units
Advisory: CISC 300
General Education: CSU Area II(b)
Course Transferable to UC/CSU
Hours: 54 hours LEC
This course provides an introduction to the concepts, methods, and applications of Geographic Information Systems (GIS). Emphasis is on the techniques used to capture, store, query, analyze, and display spatial data. Specific topics include applications of GIS, geographic information and scale, coordinate systems, geospatial data models, data classification and symbolization, query and selection, cartographic design, data acquisition, data quality, geoprocessing, relational databases, metadata, spatial analysis, and GIS software.

GEOG 334 Introduction to GIS Software Applications 3 Units
Advisory: CISC 300 and GEOG 330
Course Transferable to CSU
Hours: 50 hours LEC; 12 hours LAB
This course provides the conceptual and practical foundations for using Geographic Information Systems (GIS) software. It emphasizes basic GIS software functionality including map display, attribute and spatial query, address geocoding, spatial database management, spatial analysis, cartographic presentation, and spatial data management. This course may be taken four times using a different software package or version.

GEOG 340 Cartographic Design for GIS 3 Units
Prerequisite: GEOG 330 with a grade of “C” or better
Course Transferable to CSU
Hours: 54 hours LEC
This course provides an introduction to map design and production in the context of Geographic Information Systems (GIS). Emphasis is on the concepts and methods associated with designing and producing thematic maps. Specific topics include data standardization and classification, symbolization, map projections, map elements, typography, cartographic design, thematic mapping techniques
(choropleth, proportional symbol, dot, isarithmic, and multivariate), color in cartography, history of cartography, and map reproduction. Map critique sessions are also held.

**GEOG 342 Introduction to Remote Sensing and Digital Image Processing** 3 Units  
Course Transferable to CSU  
Hours: 48 hours LEC; 18 hours LAB

This course introduces the principles and concepts of remote sensing and digital image processing as it relates to Geographic Information Systems (GIS). Fundamentals of remote sensing, aerial photography, satellite imagery, photogrammetry, Radio Detection and Ranging (RADAR) and Laser Incidence Detection and Ranging (LIDAR) are taught. A variety of digital image processing techniques are presented to analyze various remote sensing platforms.

**GEOG 344 Spatial Analysis and Modeling in GIS** 3 Units  
Prerequisite: GEOG 330 with a grade of “C” or better  
Course Transferable to CSU  
Hours: 54 hours LEC

This course provides a survey of the various concepts, approaches, and tools involved in the analysis and modeling of spatial data using Geographic Information Systems (GIS). Emphasis is on the investigation of spatial distributions and relationships, and the methods used to answer spatial questions and solve spatial problems. Specific topics include statistical and spatial analysis, geoprocessing, spatial modeling, and map algebra. Additional topics include distance and density surfaces, cluster analysis, surface interpolation and resampling, hydrologic analysis, 3D display/animation, and regression analysis.

**GEOG 350 Data Acquisition in GIS** 3 Units  
Prerequisite: GEOG 330  
Course Transferable to CSU  
Hours: 54 hours LEC

This course is an introduction to the techniques, theory, and practical experience necessary to acquire, convert, and create digital spatial data. Topics include acquisition of existing Geographic Information Systems (GIS) data, metadata, formatting and conversion of GIS data, creating data utilizing digital cameras and scanners, the utilization of remotely sensed data, and use of the Global Positioning System (GPS).

**GEOG 354 Introduction to the Global Positioning System (GPS)** 1.5 Units  
Advisory: GEOG 300 and 301  
Course Transferable to CSU  
Hours: 27 hours LEC

This course introduces the Global Positioning System (GPS). Topics include the basic concepts of GPS and hands-on operation of the technology, computer interfaces, Geographic Information Systems (GIS) software, and its use in real-world applications.

**GEOG 360 Database Design and Management in GIS** 3 Units  
Prerequisite: CISA 320 and GEOG 330 with grades of “C” or better  
Course Transferable to CSU  
Hours: 54 hours LEC

This course examines principles of Geographic Information Systems (GIS) database management and design including conversion fundamentals, modeling techniques, and strategic planning. The needs, alternatives, and pitfalls of spatial database development and conversion are discussed. In addition, this course examines various types of spatial data applicable to GIS, and relevant issues including hardware and software requirements. Particular attention is paid to determining an appropriate methodology, conversion plan, and data quality assurance procedure. This course includes hands-on practical exercises in spatial database management skills.

**GEOG 362 Advanced Database Design and Management in GIS** 3 Units  
Prerequisite: GEOG 360 with a grade of “C” or better.  
Advisory: CISA 320, CISA 321, and CISC 300.  
Course Transferable to CSU  
Hours: 54 hours LEC

This course extends the concepts presented in GEOG 360. The advanced applications of organizing, inputting, and editing spatial data are examined and implemented, including topology, performance tuning, spatial service management, and data organization. Traditional spatial database topics are rigorously examined in a GIS context, including data integration, warehousing, complex SQL coding, metadata management, and multi-level security.

**GEOG 370 Introduction to GIS Programming** 3 Units  
Prerequisite: CISP 372 and GEOG 330 with grades of “C” or better  
Course Transferable to CSU  
Hours: 50 hours LEC; 12 hours LAB

This course is an introduction to Geographic Information Systems (GIS) programming using Visual Basic for Applications (VBA) and ArcObjects. These tools allow the user to customize the graphical user interface of popular GIS applications, to automate GIS tasks, and to create new GIS functionality. This course may be taken up to four times on a different software package or version.

**GEOG 375 Introduction to GIS Programming** 3 Units  
Prerequisite: GEOG 375 with a grade of “C” or better  
Course Transferable to CSU  
Hours: 45 hours LEC; 27 hours LAB

This course provides the concepts and skills necessary to become a proficient GIS applications developer using the Python scripting language, in conjunction with ArcObject, to develop complex GIS procedures and functions. It focuses on advanced methods for querying, selecting geographic features, working with selection sets, editing tables, and performing geoprocessing operations.

**GEOG 380 Advanced GIS Software Applications** 3 Units  
Prerequisite: GEOG 334 with a grade of “C” or better  
Course Transferable to CSU  
Hours: 50 hours LEC; 12 hours LAB

This course provides an overview of a full-featured, powerful Geographic Information Systems (GIS) software application (such as ArcGIS 9.x). GIS software is used to apply geoprocessing concepts to solve spatial problems. Emphasis is placed on the creation, modification, and analysis of spatial data; the creation of efficient maps; manipulation and interpretation of attribute data; and network analysis. This course may be taken four times on a different software package or version.

**GEOG 385 Introduction to Web Based GIS Application Development** 3 Units  
Prerequisite: GEOG 330 with a grade of “C” or better  
Advisory: CISW 300  
Course Transferable to CSU  
Hours: 50 hours LEC; 12 hours LAB

This course introduces the development of Web-based Geographic Information Systems (GIS) solutions. Web-authoring tools and Internet map servers (such as ArcIMS and ArcServer) are used to teach the techniques of Internet mapping and interactive user interface design for GIS applications. Focus is on the theories and principles behind Internet mapping to perform map display and spatial analysis, on GIS application development, and on Web design for Internet mapping systems. This course may be taken four times on a different software package or version.
GEOG 386 Using GIS for Disaster Management  3 Units
Prerequisite: GEOG 330 or 334 with a grade of “C” or better.
Course Transferable to CSU
Hours: 44 hours LEC; 30 hours LAB
This course provides an introduction to the use of GIS as a powerful tool in disaster management. Techniques and skills in the application of spatial information and analysis technologies to the problems of disaster and complex emergency management are investigated. GIS software and GPS technology are used to visualize, analyze, and represent spatial data in the protection of life, property, and critical infrastructure from natural disasters. Key GIS applications include natural hazard identification and mapping, multi-hazard analysis, shelter planning, mitigation, damage assessment, and recovery monitoring.

GEOG 390 Field Studies in Geography  .5-4 Units
Same As: GEOL 390
Course Transferable to CSU
Hours: 3-24 hours LEC; 18-144 hours LAB
This course involves field study of selected locations of geographic interest. Course content varies according to field trip destination but may include topics in physical geography (e.g., plant and animal communities, climate and weather, geology and geomorphology, natural hazards, environmental impacts, etc.), human geography (e.g., cultural landscapes, economic activities, transportation issues, land use patterns, etc.), and/or introduction to tools and techniques used for geographic field research (e.g., map and compass, the Global Positioning System (GPS), Geographic Information Systems (GIS), etc.). Field excursions are required and field trip expense fees may be required. This course may be taken 4 times using different field trip destinations.

GEOG 498 Work Experience in Geography  1-4 Units
General Education: AA/AS Area III(b)
Enrollment Limitation: Be in a paid or non-paid internship, volunteer opportunity, or job related to geography or Geographic Information Systems (GIS). Students are advised to consult with the Geography Department faculty to review specific certificate and degree work experience requirements.
Course Transferable to CSU
Hours: 60-300 hours LAB
This course provides students with opportunities to develop marketable skills in preparation for employment or advancement within the field of geography or Geographic Information Systems (GIS). It is designed for students interested in work experience and/or internships in transfer level degree occupational programs. Course content includes understanding the application of education to the workforce; completion of required forms which document the student’s progress and hours spent at the work site; and developing workplace skills and competencies. Rigor is ensured through the development of appropriate level learning objectives set between the student and the employer. During the course of the semester, the student is required to fulfill a weekly orientation and 75 hours of related paid work experience, or 60 hours of unpaid work experience for one unit. An additional 75 or 60 hours of related work experience is required for each additional unit. The weekly orientation is required for first time participants; returning participants are not required to attend the orientation but are required to meet with the instructor as needed to complete all program forms and assignments. GEOG 498 may be taken for a total of 16 units when there are new or expanded learning objectives. Students can earn a total of 16 Work Experience units.