Degree: A.S. - Geographic Information Systems

Certificate: Geographic Information Systems (GIS) - Interdisciplinary Applications

Area: Science and Engineering
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Geographic Information Systems (GIS) Degree

Geographic Information Systems (GIS) is a technology used to capture, sort, transform, manage, analyze, model, and display spatial information. This technology has a wide range of applications in planning and management decisions by government agencies, business, and industry. The Associate of Science degree in GIS combines technical GIS coursework with courses in subject areas to which GIS is commonly applied such as biology, natural resources, marketing, and real estate. Refer to the department web site (http://www.arc.losrios.edu/~earthsci/GIS/GISindex.html) for a suggested sequence of courses.

Career Opportunities

According to an Environmental Sciences 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 in GIS include 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.

Requirements for Degree Major		36-41 units
GEOG 330	Introduction to Geographic Information Systems	3
GEOG 334	Introduction to Desktop GIS	4
GEOG 340	Cartographic Design for GIS	3
GEOG 344	Spatial Analysis and Modeling in GIS	3
GEOG 350	Data Acquisition in GIS	3
GEOG 354	Introduction to the Global Positioning System (GPS)	1
GEOG 360	Database Design and Management in GIS	3
GEOG 362	Advanced Database Design and Management in GIS (3)	3
or GEOG 386	Using GIS for Disaster Management (3)	
GEOG 370	Introduction to GIS Programming (2)	2 - 4
or GEOG 371	Intermediate GIS Programming (4)	
GEOG 380	Advanced Desktop GIS	4
GEOG 498	Work Experience in Geography	1 - 4
And a minimum of 6 units from the following:		6
ANTH 320	Introduction to Archaeology and World Prehistory (3)	
BIOL 300	The Foundations of Biology (3)	
BIOL 303	Survey of Biology (4)	
BIOL 310	General Biology (4)	
BIOL 352	Conservation Biology (3)	
BUS 110	Business Economics (3)	
CHEM 320	Environmental Chemistry (4)	
FT 300	Fire Protection Organization (3)	
GEOG 300	Physical Geography: Exploring Earth's Environmental Systems (3)	
GEOG 308	Introduction to Oceanography (3)	
GEOG 310	Human Geography: Exploring Earth's Cultural Landscapes (3)	
GEOL 300	Physical Geology (3)	
GEOL 305	Earth Science (3)	
GEOL 330	Introduction to Oceanography (3)	
MKT 300	Principles of Marketing (3)	
NATR 300	Introduction to Natural Resource Management (3)	
NATR 302	Introduction to Wildlife Biology (3)	
NATR 304	Introduction to Forestry (3)	
NATR 320	Principles of Ecology (3)	
PS 300	Introduction to Physical Science (3)	
RE 300	California Real Estate Principles (3)	

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) - Interdisciplinary Applications Certificate

Geographic Information Systems (GIS) is a powerful technology used to capture, sort, transform, manage, analyze, and display spatial information. This technology has a wide range of applications in planning and management decisions by government agencies, business, and industry. The certificate provides a solid technical background in GIS concepts, including spatial analysis, database design, the global positioning system (GPS), and cartography. Completion of the certificate requires an internship in GIS. Refer to the department web site (http://www.arc.losrios.edu/~earthsci/GIS/GISindex.html) for a suggested sequence of classes.

Career Opportunities

According to an Environmental Sciences 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 technology field.

Requirements for Certificate		30-35 units
GEOG 330	Introduction to Geographic Information Systems	3
GEOG 334	Introduction to Desktop GIS	4
GEOG 340	Cartographic Design for GIS	3
GEOG 344	Spatial Analysis and Modeling in GIS	3
GEOG 350	Data Acquisition in GIS	3
GEOG 354	Introduction to the Global Positioning System (GPS)	1
GEOG 360	Database Design and Management in GIS	3
GEOG 362	Advanced Database Design and Management in GIS (3)	3
or GEOG 386	Using GIS for Disaster Management (3)	
GEOG 370	Introduction to GIS Programming (2)	2 - 4
or GEOG 371	Intermediate GIS Programming (4)	
GEOG 380	Advanced Desktop GIS	4
GEOG 498	Work Experience in Geography	1 - 4

GEOG 300 Physical Geography: Exploring Earth's Environmental Systems 3 Units

Formerly: GEOG 1
Prerequisite: None
Advisory: MATH 100, ENGRD 116, ENGWR 51, or ESLW 310.
Course Transferable to UC/CSU
Hours: 54 hours LEC
This course presents a systematic survey of the physical earth and the natural processes that influence humankind. The course provides an introduction to the use of maps and other tools employed in the analysis of patterns of weather, climate, soils, landforms, and vegetation. (CAN GEOG 2) AA/AS area 3A; CSU area B1; IGETC area 5A.

GEOG 301 Physical Geography Laboratory 1 Unit

Prerequisite: None
Corequisite: GEOG 300.
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. AS area 3A; CSU area B1; IGETC area 5A.

GEOG 306 Weather and Climate 3 Units

Prerequisite: None
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. AA/AS area 3A; CSU area B1; IGETC area 5A

GEOG 307 Environmental Hazards and Natural Disasters 3 Units

Same As: GEOL 325.
Prerequisite: None
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; availability and exploitation of natural resources; waste disposal; and global climate change. Humans as a force in environmental change will be emphasized. The course addresses geology, engineering, environmental studies, geography, and science education. One field trip is required. Not open to students who have completed GEOL 325. AA/AS area 3A; CSU area B1.

GEOG 308 Introduction to Oceanography 3 Units

Same As: GEOL 330.
Prerequisite: None
Advisory: GEOG 300 or GEOL 300.
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 seafloor 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 GEOL 330. AA/AS area 3A; CSU area B1; IGETC area 5A.

GEOG 309 Introduction to Oceanography Lab 1 Unit

Same As: GEOL 331.
Prerequisite: None
Advisory: GEOG 300 or GEOL 300.
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 GEOL 331. CSU area B1; IGETC area 5A.

GEOG 310 Human Geography: Exploring Earth's Cultural Landscapes 3 Units

Formerly: GEOG 2
Prerequisite: None
Advisory: ENGRD 116 or ESLR 320; ENGWR 51 or ESLW 310; MATH 32.
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 societal 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. (CAN GEOG 4) AA/AS area 3C & 3F; CSU area D3; IGETC area 4.

GEOG 320 World Regional Geography 3 Units

Prerequisite: None
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, livelihood and economics, 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 throughout. Cultural and ethnic diversity, as it pertains to the expanding population of the United States, is also a major component. AA/AS area 3C & 3F; CSU area D3; IGETC area 4.

GEOG 322 Geography of California 3 Units

Prerequisite: None
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. AA/AS area 3F & 2C; CSU area D3; IGETC area 4.

GEOG 330 Introduction to Geographic Information Systems 3 Units

Prerequisite: None
Advisory: CISC 300.
Course Transferable to UC/CSU
Hours: 54 hours LEC
A Geographic Information System (GIS) is a computer-based data processing tool used to manage and analyze spatial information. Applications of GIS include environmental assessment, analysis of natural hazards, site analysis for business and industry, resource management, and land-use planning. This course introduces the concepts, techniques, and tools of GIS including data acquisition, management, manipulation, and analysis, and cartographic output. AA/AS area 3D

GEOG 334 Introduction to Desktop GIS 4 Units

Prerequisite: None
Advisory: CISC 300.
Course Transferable to CSU
Hours: 60 hours LEC; 36 hours LAB
This course provides the foundation for and experience with using desktop geographic information system software. It also provides the conceptual overview and practice needed to take advantage of the software's display and attribute querying functions. Emphasis is placed on basic GIS software functionality, beginning database construction, spatial analysis/querying, cartographic presentation, and management. Software capabilities for spatial analysis and network analysis are explored. This course may be taken four times on a different software package or version.

GEOG 340 Cartographic Design for GIS 3 Units

Prerequisite: GEOG 330 with a grade of "C" or better.
Advisory: CISC 300 (IBM Compatible Computers and Microsoft Windows).
Course Transferable to CSU
Hours: 54 hours LEC
This course provides a comprehensive study of GIS applicable cartography including cartographic principles. Data acquisition methods used in map production, and methods of base map development. The course will include the study of cartography to include history, principles, map projections, map scale, types of thematic maps, and map accuracy. Techniques used in GIS base map development (scanning, digitizing, and coordinate geometry) will be introduced using hands-on exercises. The course will include the production and presentation techniques of professional quality maps. The course will include hands-on work in computer-assisted mapping projects.

GEOG 344 Spatial Analysis and Modeling in GIS 3 Units

Prerequisite: GEOG 330 with a grade of "C" or better.
Advisory: CISC 300 (IBM compatible Computers and Microsoft Windows); STAT 301.
Course Transferable to CSU
Hours: 54 hours LEC
This course provides a general survey of the fundamentals of spatial information systems and a survey of quantitative techniques applicable to spatial data. This course is focused on the functionally of GIS as an effective tool for modeling and analyzing complex spatial relationships quantitative methods, to include measures of central tendency, dispersion, and density, are discussed. Applications of such methods will be presented using empirical data.

GEOG 350 Data Acquisition in GIS 3 Units

Prerequisite: GEOG 330 with a grade of "C" or better.
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 spatial data. Topics include acquisition of existing GIS data, metadata, formatting and format conversion of digital GIS data, creating digital data utilizing digital cameras and scanners, the utilization of remotely sensed data, and use of the Global Positioning System.

GEOG 354 Introduction to the Global Positioning System (GPS) 1 Unit

Prerequisite: None
Advisory: GEOG 300 and 301.
Course Transferable to CSU
Hours: 18 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, GIS software, and real-world applications.

GEOG 360 Database Design and Management in GIS 3 Units

Prerequisite: GEOG 330 with a grade of "C" or better.
Advisory: CISC 300, CISA 320, CISA 321.
Course Transferable to CSU
Hours: 54 hours LEC
This course examines the principles of database management and design including conversion fundamentals, modeling techniques and strategic planning. The needs, alternatives, and pitfalls of database development and conversion are discussed. In addition, this course also includes the examination of various types of data applicable to GIS and examines relevant issues including hardware and software requirements. Particular attention is paid to determining the appropriate methodology, developing a conversion plan, and data quality assurance. This course includes hands-on practical exercises in 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 2 Units

Prerequisite: GEOG 334 with a grade of "C" or better.
Course Transferable to CSU
Hours: 30 hours LEC; 18 hours LAB
This course is an introduction to GIS programming utilizing such programming languages as Avenue, Map Objects, and Arc Objects. GIS programming allows the user to modify and customize the software's graphic user interface (GUI), modify GIS tools and commands, create new GIS software tools, automate GIS operations, and integrate GIS functions with other software applications. This course may be taken up to four times on a different software package or version. AA/AS area 3D

GEOG 371 Intermediate GIS Programming 4 Units

Prerequisite: GEOG 330 with a grade of "C" or better.
Course Transferable to CSU
Hours: 62 hours LEC; 30 hours LAB
This course provides skills and concepts necessary to become a proficient GIS applications developer. The course utilizes a programming software (such as ArcObjects or Geoprocessing Tools) in conjunction with a programming language (such as Visual Basic for Applications or VB Script) to develop complex GIS procedures and functions. The course focuses on advanced methods for querying, symbolizing, displaying, and analyzing spatial data. This course may be taken up to four times on a different software package or version.

GEOG 380 Intermediate Desktop GIS with Applications 4 Units

Prerequisite: GEOG 330 and one course from the following: GEOG 340, 344, 350, or 360 with a grade of "C" or better.
Course Transferable to CSU
Hours: 54 hours LEC; 54 hours LAB
This course provides an overview of a full-feature, powerful desktop GIS software (such as ArcGIS 8.x). Software will be used to apply reprocessing concepts to solving geographic problems. Emphasis is placed on the software's topological data model, geodatabase model, creating and editing spatial data to produce map displays, working with attribute data, and the basics of grid processing. This course may be taken four times on a different software package or version.

GEOG 385 Introduction to Web Based GIS Application Development 4 Units

Prerequisite: GEOG 330 and CISW 300.
Advisory: CISW 310.
Course Transferable to CSU
Hours: 63 hours LEC; 27 hours LAB
This course introduces the development of web-based GIS solutions. Web-authoring tools and Internet map servers (such as ArcIMS) will be used to teach the techniques of Internet mapping and interactive user interface design for GIS applications. Focus will be on the theories and principles behind Internet mapping to perform spatial analysis, on GIS application development, and on web design for Internet mapping systems.

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

Prerequisite: None
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 will vary according to field 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. May be taken 4 times for a maximum of 6 units.

GEOG 498 Work Experience in Geographic Information Systems 1-3 Units

Formerly: GEOG 48
Prerequisite: Placement in an agency, private business, non-profit organization, or other entity.
Corequisite: GEOG 330 and student must be enrolled in a minimum of 7 units, including this course.
Course Transferable to CSU
Hours: 18 hours LEC; 75-225 hours LAB
This course is a directed field study program that provides students with an opportunity to apply classroom instruction in geographic information systems to real-world GIS projects in the community. Students will be under the supervision of an advisor from the college while participating in a short-term work experience program in business or government agency.