GEOG-120: INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Effective Term
Fall 2023

CC Approval
3/17/2023

AS Approval
4/11/2023

BOT Approval
4/20/2023

COCI Approval
4/21/2023

SECTION A - Course Data Elements

CB04 Credit Status
Credit - Degree Applicable

Discipline

Minimum Qualifications	And/Or
Earth Science (Master's Degree)	Or
Geography (Master's Degree)	Or
Computer Information Systems (Any Degree and Professional Experience)	

Subject Code
GEOG - Geography
Course Number
120

Department
Geography (GEOG)

Division
Science and Engineering (SE)

Full Course Title
Introduction to Geographic Information Systems (GIS)

Short Title
Introduction to GIS

CB03 TOP Code
2206.10 - *Geographic Information Systems

CB08 Basic Skills Status
NBS - Not Basic Skills

CB09 SAM Code
D - Possibly Occupational

Rationale
To develop new GIS courses and develop a 12 unit Certificate of Achievement program to meet the skills needed in entry-level and advanced workforce as indicated by current Labor Market Data.

SECTION B - Course Description

Catalog Course Description

Fundamental study of Geographic Information Systems (GIS) and its applications to spatial data management. Introduces identification and acquisition of GIS data, assessment of vector and raster systems, scale, resolution, map projection, coordinate systems, georeferencing and Global Positioning Systems (GPS), spatial analysis and modeling with GIS project to apply skills and build a map portfolio.

SECTION C - Conditions on Enrollment

Open Entry/Open Exit

No

Repeatability

Not Repeatable

Grading Options

Letter Grade or Pass/No Pass

Allow Audit

Yes

Requisites

SECTION D - Course Standards

Is this course variable unit?

No

Units

3.00000

Lecture Hours

36.00

Lab Hours

54.00

Outside of Class Hours

72

Total Contact Hours

90

Total Student Hours

162

Distance Education Approval

Is this course offered through Distance Education?

Yes

Online Delivery Methods

DE Modalities	Permanent or Emergency Only?
Hybrid	Permanent
Entirely Online	Permanent

SECTION E - Course Content

Student Learning Outcomes

	Upon satisfactory completion of the course, students will be able to:
1.	Describe the fundamental concepts and applications of Geographic Information Systems and how industry uses GIS.
2.	Apply cartographic principles of scale, resolution, projection and data management to create maps and visualizations
3.	Demonstrate proficiency in acquisition, analysis, and interpretation of spatial data for geospatial application.
4.	Apply GIS principles to solve spatial issues in the context of data model, data structure, and analytical techniques.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1.	Define Geographic Information Systems
2.	Identify and evaluate GIS data sources and the importance of metadata.
3.	Demonstrate the process of converting analogue data to digital data for use in a GIS
4.	Evaluate the capabilities of various GIS software programs
5.	Apply cartographic principles of scale, resolution, projection and data management to a problem of a geographic nature
6.	Apply spatial analysis functions on a GIS to solve a Geospatial problem

Course Content

1. Fundamental Concepts in Geographic Information Systems & Geospatial
    a. What is GIS, what is geospatial, and how they are related
        i. FOSS4G and COTS
        ii. Geospatial “family tree”
    b. Exploring geospatial tools and platforms
        i. Desktop GIS
        ii. Online GIS
        iii. Geospatial tools
    c. Applications of GIS and geospatial
    d. Vector and raster formats
    e. Scale and resolution
    f. Map projections and coordinate systems
    g. Basics of cartographic design
    h. Build a simple map in QGIS
2. Data
    a. Overview of the geospatial data universe
        i. Data formats
            1. Spatial
                a. Vector, raster, tabular
                    i. Vector storage options
                    ii. Raster storage options
                    iii. Tabular storage options
                b. Geometry types
                c. Global Positioning Systems (GPS)
            2. Non-spatial
        ii. The structure of GIS data
        iii. Sources of GIS data
            1. “Canned” spatial data
            2. “Scrape and gather” data (data that can be joined to existing spatial)
        iv. Data processing and manipulation

1. Georeferencing
2. Converting digital data to a uniform projection and scale
3. Vector-to-raster and raster-to-vector data conversions, error propagation

b. Schema, data design, and best practices
   i. Schema / data design
      1. Field types, their uses and limitations
   ii. Designing a GIS layer from scratch

c. Best practices
   i. Naming conventions
   ii. Storage methods
   iii. Open data, licensed data, sensitive data
   iv. Domains: controlling attribute entry and other methods to minimize error

3. Working with vector data
   a. Editing geometry vs. attributes
      i. Anatomy of a vector layer
         1. Ends, edges, vertices, centroids
         2. Know where your data falls: intersecting, crossing, within, etc.
      ii. Editing geometry
         1. Adding new features (and attributes)
         2. Snapping
         3. Extending, trimming
         4. Clipping, merging, reshaping
         5. Selecting data (by location, by attribute)
            a. Create a new layer using select by location
            b. Create a new layer by select by attribute
      iii. Updating and editing attributes
         1. Working within the attribute table
         2. Field calculations
         3. Geometry calculations
            a. Performing calculations: QGIS vs ArcGIS Pro
4. Working with raster data
   a. Raster format types
   b. Projected vs unprojected rasters
   c. Georeferencing raster data
      i. Georefencing an Assessor's parcel map
   d. Raster math
      i. Create a NBR (normalized burn ratio) image from the 2020 fires
5. Spatial operations and analysis
   a. Spatial operations
      i. Buffer, clip, intersect, merge, union
   b. Spatial analysis
      i. Interpolation
      ii. Surface analysis
      iii. Working with elevation data
         1. Sources
         2. Units and raster calculations

Utilize GIS software in laboratory activities to meet objectives of course content. Laboratory activities include, but are not limited to:

1. Plan, evaluate and execute a GIS project:
   a. Identify a problem of a geospatial nature
   b. Outline a strategy to solve the problem
   c. Locate relevant data sources

d. Design and evaluate a plan to acquire the relevant data sources
e. Incorporate data sources into a Geographic Information System and execute strategy to solve a geospatial problem
f. Apply principles of spatial analysis
g. Present results

Methods of Instruction

Methods of Instruction

Types	Examples of learning activities
Activity	Create layers within GIS software program. Explore and compare open and closed source GIS software programs. Describe the advantages/disadvantages of each software, as well as 3rd-party add-ins.
Lecture	Computer enhanced lectures course content topics, including core concepts, terminology and historical development of GIS.
Lab	Computer-based lab, compare open and closed source GIS software programs. Describe the advantages/disadvantages of each software, as well as 3rd-party add-ins.
Other	Projects: Weekly projects related to projecting data, database fundamentals, and cartographic design.

Instructor-Initiated Online Contact Types

Announcements/Bulletin Boards
Discussion Boards
E-mail Communication
Video or Teleconferencing

Student-Initiated Online Contact Types

Discussions
Group Work

Course design is accessible

Yes

Methods of Evaluation

Methods of Evaluation

Types	Examples of classroom assessments
Projects	Weekly projects related to projecting data, database fundamentals, and cartographic design.
Portfolios	Develop an end of course GIS portfolio to be presented to peers in a simulated work environment.
Exams/Tests	Quizzes and/or exams throughout the semester.
Skills Demonstration	Weekly activities using current GIS software to build a final project and/or portfolio.
Lab Activities	Weekly lab activities using current GIS software to build a final project and/or portfolio.

Assignments

Reading Assignments

Reading from the assigned textbooks.

Reading professional publications, internet research, and class handouts provided by the instructor. Examples:

1) Excerpts from professional publications and ESRI ArcNews.

2) Reading assigned topics such as "Constructing a Personal Geodatabase."

3) Internet research on data models for Earthquake Risk Assessment.

Writing Assignments

Each weekly assignment will have individual or collaborative research problems that will initiate compiling of data from a variety of sources and then performing GIS analysis to solve a problem presented for study. Examples:

1) Explain the difference between raster and vector and demonstrate the differences in a map view.

2) Construct a spatial model that includes at least one query using standard map algebra and SQL language.

SECTION F - Textbooks and Instructional Materials

Material Type

Textbook

Author

Law, M.; Collins, A.

Title

Getting to know ArcGIS (ESRI)

Edition/Version

5th

Publisher

ESRI

Year

2018

ISBN #

9781589487017

Proposed General Education/Transfer Agreement

Do you wish to propose this course for a Local General Education Area?

No

Do you wish to propose this course for a CSU General Education Area?

No

Do you wish to propose this course for a UC Transferable Course Agreement (UC-TCA)?

Yes

Do you wish to propose this course for an IGETC General Education Area?

No

Course Codes (Admin Only)

CB10 Cooperative Work Experience Status

N - Is Not Part of a Cooperative Work Experience Education Program

CB11 Course Classification Status

Y - Credit Course

CB13 Special Class Status

N - The Course is Not an Approved Special Class

CB23 Funding Agency Category

Y - Not Applicable (Funding Not Used)

CB24 Program Course Status

Program Applicable

Allow Pass/No Pass

Yes

Only Pass/No Pass

No

Faculty Author's Comments

This course proposal has been reviewed by a committee comprised of California GIS professionals.

Reviewer Comments

Seth Anderson (sethe.anderson) (Mon, 05 Dec 2022 20:00:30 GMT): Added Earth Science, Geography, and Computer Information Systems to discipline field. -Seth Anderson

Stacey Howard (showard) (Tue, 06 Dec 2022 04:56:05 GMT): Articulation Officer comments/questions: -Faculty intent to only allow letter grade as opposed to letter grade or pass/no pass option? -Remove partial sentence from course description (last line) -Needs to separate lecture content from lab content with headers distinguishing lecture from lab -Aligns to C-ID GEOG 155 (https://www.c-id.net/descriptors/final/show/203) -- plan to submit -Submit for C-ID GEOG 155 (Introduction to Geographic Information Systems and Techniques, with Lab) -Submit for UC transferability (pending CSU/UC Fa '23 per faculty request)

Stacey Howard (showard) (Wed, 07 Dec 2022 05:22:04 GMT): Articulation Officer: GEOG 120 is appropriate for UC-TCA but this course is not offered at UC, as an Interm Level. No C-ID exists.

Stacey Howard (showard) (Fri, 09 Dec 2022 04:42:52 GMT): Rollback: Confirm letter grade only option. Separate lecture from lab content for C-ID and UC-TCA submissions. Course description edit (last line?).

Seth Anderson (sethe.anderson) (Tue, 14 Feb 2023 18:17:36 GMT): Rollback: Under the Course Content field, please add headers to clearly distinguish between the lecture content of the course and the lab content. This is something external reviewers will be looking for in the COR.

Seth Anderson (sethe.anderson) (Wed, 01 Mar 2023 16:47:09 GMT): Rollback: Please add separate lab content under Course Content field (for UC articulation)