GEOG-131: REMOTE SENSING

Effective Term
Fall 2023

CC Approval
3/17/2023

AS Approval
4/11/2023

BOT Approval
4/20/2023

COCI Approval
5/12/2023

SECTION A - Course Data Elements

Send Workflow to Initiator
No

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
131

Department
Geography (GEOG)

Division
Science and Engineering (SE)

Full Course Title
Remote Sensing

Short Title
Remote Sensing

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

Introduction to remote sensing of the Earth. Content includes physical principles on which remote sensing is based, history and future trends, sensors and their characteristics, image data sources, and image classification, interpretation and analysis techniques. An end of semester project will allow students to apply learned skills. Course material used are based upon the United States Department of Labor's Geospatial Technology Competency Model (GCTM).

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

Prerequisite(s)

Completion of GEOG-120 with a minimum grade of C.

Advisory Prerequisite(s)

Completion of GEOG-121 with a minimum grade of C.

Requisite Justification

Requisite Description

Course in a Sequence

Subject

GEOG

Course #

120

Level of Scrutiny

Content Review

Upon entering this course, students should be able to:

1. Describe and demonstrate proficiency in field data collection, and the construction of spatial data from known locations.
2. Proficient in collecting, recording, and utilizing spatial data and databases.
3. Develop and manage a GIS database.
4. Demonstrate an understanding of the fundamentals of GIS data storage and interface.

SECTION D - Course Standards

Is this course variable unit?

No

Units

3.00000

Lecture Hours

54

Outside of Class Hours
108

Total Contact Hours
54

Total Student Hours
162

Distance Education Approval

Is this course offered through Distance Education?
Yes

Online Delivery Methods

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

SECTION E - Course Content

Student Learning Outcomes

	Upon satisfactory completion of the course, students will be able to:
1.	Describe the basic physical concepts on which remote sensing is based.
2.	Describe characteristics of passive and active remote sensing systems (such as multispectral, LiDAR and Radar).
3.	Perform basic remote sensing analysis to solve problems.
4.	Interpret, analyze and assess the accuracy of the results of a remote sensing workflow.
5.	Select appropriate data for remote sensing applications based on spectral, temporal, radiometric and spatial resolution.
6.	Collect field data to assess remote sensing accuracy through ground truthing.
7.	Demonstrate proficiency in map creation and design principles, including thematic map display and use of map projections.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1.	Describe various data collection and GPS technology and its components and applications.
2.	Collect spatial data from known locations.
3.	Apply different types of remotely sensed data and sensor systems.
4.	Develop classification maps and 3D elevation surface model that can be used in a viewshed analysis.
5.	Make use of image-based web map service that can be used in web and mobile mapping applications

Course Content

1. Remote Sensing Defined
    a. Applications of Remote Sensing
    b. Basic Processes
2. History of remote sensing for earth observation
    a. History of photography
    b. Digital images
    c. Evolution of platforms
    d. Sensor Characteristics
3. Remote Sensing Basics
    a. Remote Sensing Data Collection
    b. Remote Sensing Process
    c. Earth Observations
    d. Electromagnetic Radiation
    e. Atmospheric Energy-Matter Interactions
4. Frame Captured Sensors and Line Scanners

a. Frame Capture
    i. Photographic Cameras
    ii. Digital Cameras
    iii. Videography
b. Scanners
    i. Across-track Scanners
    ii. Along-track Scanners
    iii. Hyperspectral Scanners

5. Satellite-based Sensors in Visible and Infrared Wavelength
    a. Low-spatial Resolution Sensors
    b. Medium-spatial Resolution Sensors
    c. High-spatial Resolution Sensors
6. Active Sensors: Radar and Lidar
    a. Active Microwave (RADAR) Remote Sensing
        i. Radar Interferometry
        ii. Passive Microwave Radiometers
    b. Lidar
        i. Lidar Principles
        ii. Lidar-derived Vegetation Information
        iii. Lidar-derived Urban Information
7. Sonar
    a. Side-scan sonar
    b. Multibeam sonar
    c. Global Seafloor Topography
8. Aerial Imagery – Visual Interpretation
    a. Nature of Aerial Images
    b. Ground Verification and Processing
        i. Control Points
        ii. Ground Truthing
9. GIS Integration
    a. Raster to Vector
    b. Image Formats
10. Remote Sensing Applications
    a. Agriculture
    b. Forestry
    c. Geology
    d. Oceanography
    e. Archaeology
    f. Military
    g. Urban Infrastructure

Methods of Instruction

Methods of Instruction

Types	Examples of learning activities
Activity	Land cover/land-use mapping, disaster management such as pre- and post-flood events, earthquakes, tsunamis, and other natural disasters as well as human impacts such as community and people displacement.
Lecture	Interactive lecture, introducing context and application of data collection tools and format.

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
Skills Demonstration	Skills demonstrated through capture and process imagery. Interpreting the imagery or the results of digital image processing routines.
Quizzes	Quizzes may be given throughout the course. Example questions: 1) What are various types of remotely sensed data and remote sensor systems used in remote sensing? 2)Describe the history and future trend applications of remote sensing.
Projects	Process remotely sensed imagery for forest and fire monitoring and present to class colleagues.

Assignments

Reading Assignments
Reading from the assigned textbooks.

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

1) Read through NASA feature article Remote Sensing.
2) Read through the MODIS Rapid Response System Image Gallery to browse recent and near real-time images taken from the Terra & Aqua satellites as the fly over the Earth's lands and coastal zones.

Writing Assignments
Writing assignments may have individual or collaborative research problems addressing current remote sensing issues. Examples include:

1) How might you use image stacks to teach change-related concepts or other processes to your students.
2) Explain the application of Landsat data in your project.

Other Assignments
Projects: Using feature-based mapping or object-based image classification, identify specific kinds of objects in high-resolution imagery.

SECTION F - Textbooks and Instructional Materials

Material Type
Textbook

Author
Tammy E. Parece , John A. McGee , James B. Campbell

Title
Remote Sensing with ArcGIS Pro

Publisher
Independently published

Year
2019

ISBN #
1797570986

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)?
No

Course Codes (Admin Only)

ASSIST Update
No

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

Reviewer Comments
Stacey Howard (showard) (Wed, 07 Dec 2022 05:38:04 GMT): Articulation Officer: GEOG 120 is appropriate for UC-TCA; this course is not offered at UC and not eligible for UC transfer.

Stacey Howard (showard) (Fri, 09 Dec 2022 05:06:56 GMT): Articulation Officer: GEOG 120 is appropriate for UC-TCA; this course is not offered at UC and not eligible for UC transfer

Stacey Howard (showard) (Fri, 09 Dec 2022 05:14:55 GMT): Articulation Officer: GEOG 131 is found at CCCs approved as transferable to UC. Submit for UC-TCA.

Seth Anderson (sethe.anderson) (Tue, 14 Feb 2023 18:20:30 GMT): Rollback: Review grading option and add specific entry skills (formatted like SLOs or objectives) under the Requisite Justification field