School of: Letters, Arts and Sciences

Department: Earth and Atmospheric Sciences

CIP Code: 40.0601

Prefix & Course Number: GIS 1710  Crosslisted With*: N/A

Course Title: Terrestrial Navigation

Check All That Apply:  
Required for Major:  
Required for Minor:  
Specified Elective: X

Required for Concentration: X  
Elective: X  
Service Course:  

Credit Hours: 2 (1 + 2)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 15  Lab 30  Internship 0  Practicum 0  Other (please specify type and hours): 0

Schedule Type(s): B  
Grading Mode(s): L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned*): N/A

*NOTE: This information must be included in the course description.

Restrictions (Variable Topics Course): N/A

Prerequisite(s): None

Corequisite(s): None

Prerequisite(s) or Corequisite(s): None

Banner Enforced:

Prerequisite(s): None
Corequisite(s): None
Prerequisite(s) or Corequisite(s): None

Catalog Course Description: This course is an introduction to the science of land navigation. Students will use celestial sights, maps, and Global Positioning System (GPS) to locate positions in the field. There are required field exercises.

APPROVED:

Department Chair OR Program Director

Date

Dean OR Associate Dean

Date

Associate VP, Academic Affairs

Date
Prefix and Course Number: GIS 1710

Required Reading and Other Materials will be equivalent to:

No text required.

Specific, Measurable Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:
1. plot courses on maps of various scales;
2. convert representative fractions to working units;
3. understand celestial positioning;
4. use a compass for field location;
5. convert magnetic readings to true and vice versa;
6. locate hidherself via map inspection;
7. locate hidherself via resection and triangulation;
8. locate spatial information using latitude and longitude, UTM (Universal Transverse Mercator), and other grids;
9. calculate ETA (Estimated Time of Arrival) for various routes;
10. become familiar with the workings of a GPS (Global Positioning System) unit;
11. use GPS for navigation; and
12. use a computer to plot a GPS course.

Detailed Outline of Course Content (Major Topics and Subtopics or Outline of Field Experience/Internship (experience, responsibilities and supervision)):

I. Topographic Maps
   A. Representative fractions and map scales
   B. Contour lines and intervals
   C. Grid systems
      1. Township and range
      2. Latitude and longitude
      3. UTM (Universal Transverse Mercator)
      4. State
II. Celestial Positioning
    A. Use of sextant
    B. Role of chronometers
    C. Solar noon sights
    D. Polaris sights
III. Compasses
    A. Declination: True versus magnetic headings
    B. Azimuths versus quadrant readings
    C. Correcting versus un-correcting calculations
IV. Global Positioning Systems (GPS)
    A. The satellite constellation
    B. Estimated position error
    C. Plotting of latitude and longitude
    D. Plotting of UTM coordinates
V. Field Exercises
   A. Dead reckoning and position estimation
   B. LOPS (Lines of Position) and triangulations
   C. Calculation of ETA (Estimated Time of Arrival) and ETE (Estimated Time En Route)
   D. GPS treasure hunt
VI. Computer Exercises
   A. Downloading waypoints to a computer
   B. Uploading waypoints to a GPS unit
   C. Converting GPS files to DXF format

Evaluation of Student Performance:

1. Class Participation
2. Written Examination
3. Field Examination
REGULAR COURSE SYLLABUS

School of: Letters, Arts and Sciences

Department: Earth and Atmospheric Sciences

CIP Code: 45.0702

Prefix & Course Number: GIS 2250  Crosslisted With*: N/A

Course Title: Introduction to Geographic Information Systems

Check All That Apply:  Required for Major: X  Required for Minor: ___  Specified Elective: X

Required for Concentration: X  Elective: X  Service Course: ___

Credit Hours: 3 (2 + 2)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 30  Lab 30  Internship 0  Practicum 0  Other (please specify type and hours): 0

Schedule Type(s): B  Grading Mode(s): L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned*): N/A

*NOTE: This information must be included in the course description.

Restrictions (Variable Topics Course): N/A

Prerequisite(s): CSS 1010 or CIS 101, with a grade of "C" or better; or permission of instructor;

MTH 1210 recommended

Corequisite(s): None

Prerequisite(s) or Corequisite(s): GEG 1220

Banner Enforced:

Prerequisite(s): None
Corequisite(s): None
Prerequisite(s) or Corequisite(s): None

Catalog Course Description: This is a foundation course that provides students with the basic knowledge of Geographic Information Systems (GIS) with regard to theoretical, technical, and application issues. It introduces and provides direct experience with the techniques used to analyze and display spatial data using GIS.

APPROVED:

[Signatures and dates]

Department Chair OR Program Director  4/18/08

Dean OR Associate Dean  4/9/08

Associate VP, Academic Affairs  7/15/08
Prefix and Course Number: GIS 2250

Required Reading and Other Materials will be equivalent to:


Specific, Measurable Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. select the appropriate projection for a mapping application.
2. discuss the practical and theoretical differences between raster and vector models.
3. determine raster and vector data requirements.
4. perform raster analysis using raster operations.
5. perform vector analysis using vector options.
6. produce cartographic products with required map elements.
8. document procedures, methods, results, and conclusions of geographic investigation.
9. operate the latest version of GIS software (ArcView GIS, or current equivalent).
10. determine the usefulness of GIS to various academic disciplines.
11. solve simple spatial problems in land use and/or natural resources using GIS.

Detailed Outline of Course Content (Major Topics and Subtopics or Outline of Field Experience/Internship (experience, responsibilities and supervision)):

I. Introduction
   A. What is a GIS?
   B. Brief history of GIS
   C. Where to find more information about GIS
   D. Data acquisition, processing, and analysis functions
   E. Interdisciplinary nature of GIS
   F. Current state of the art and market for GIS
   G. Trends in GIS

II. Map Projections and Processes
    A. Mapping processes
    B. Map projection definitions and selection
    C. Map scale representations

III. The Raster and Vector Formats for GIS Data
    A. The raster data model
    B. The vector data model
    C. Advantages and disadvantages of each model
    D. Appropriate use of raster and vector models to represent reality

IV. Data Acquisition
    A. Sampling reality
    B. Digitizing and scanning: Advantages, disadvantages, when to use either one
    C. Data entry
    D. Sources of digital data
    E. Data formats
    F. Remote sensing

V. Raster Analysis Functions
    A. Describing attributes
    B. Statistical analysis
    C. Spatial description
    D. Spatial analysis
    E. Example analysis using a raster GIS
Prefix and Course Number: GIS 2250

VI. Vector Analysis Functions
   A. The vector GIS analytical capabilities
   B. Describing attributes
   C. Statistical analysis
   D. Spatial description
   E. Spatial analysis
   F. Example analysis using a vector GIS

VII. Elements of Cartography
   A. Creating map output products with a GIS
   B. Types of maps
   C. Map design elements

VIII. GIS Application Areas
   A. GIS as a planning and decision support tool
   B. Natural resources management
   C. Urban planning and management
   D. Cadastral records and GIS
   E. Facilities management
   F. Demographic and network applications

IX. Data Quality and Data Standards
   A. Sources of mapping errors
   B. Metadata
   C. Data standards
   D. Map product standards
   E. Industry standards

Evaluation of Student Performance:

1. Labs, assignments, and quizzes
2. Lecture exams
3. Class participation
REGULAR COURSE SYLLABUS

School of: Letters, Arts and Sciences
Department: Earth and Atmospheric Sciences
CIP Code: 45.0702
Prefix & Course Number: GIS 2710 Crosslisted With*: N/A
Course Title: Global Positioning Systems

Check All That Apply: Required for Major: _____ Required for Minor: _____ Specified Elective: X
Required for Concentration: X  Elective: X  Service Course: _____

Credit Hours: 2 (1 + 2)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 15  Lab 30  Internship _____  Practicum _____  Other (please specify type and hours): _____

Schedule Type(s): B  Grading Mode(s): L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned*): N/A

*NOTE: This information must be included in the course description.

Restrictions (Variable Topics Course): N/A

Prerequisite(s): GEG 1220 with a grade of "C" or better; or permission of instructor
Corequisite(s): none

Prerequisite(s) or Corequisite(s): GIS 2250 recommended

Catalog Course Description: This course is an introduction to the science of land navigation using maps and a Global Positioning System (GPS). Students navigate positions in the field and apply cartographic principles to GPS lab and field exercises. Emphasis is given to the integration of GPS data with Geographic Information Systems (GIS).

APPROVED:

Department Chair OR Program Director  Date

Dean OR Associate Dean  Date

Associate VP, Academic Affairs  Date
Prefix and Course Number: GIS 2710

Required Reading and Other Materials will be equivalent to:

No text required.

Specific, Measurable Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. plot courses on maps of various scales.
2. convert representative fractions to working units.
3. understand celestial positioning.
4. use a compass for field location.
5. convert magnetic readings to true and vice versa.
6. locate his/herself via map inspection.
7. locate his/herself via resection and triangulation.
8. locate spatial information using latitude and longitude, UTM (Universal Transverse Mercator), and other grids.
9. calculate ETA (Estimated Time of Arrival) for various routes.
10. become familiar with the workings of a GPS (Global Positioning System) unit.
11. use GPS for navigation.
12. use a computer to plot a GPS course.

Detailed Outline of Course Content (Major Topics and Subtopics or Outline of Field Experience/Internship (experience, responsibilities and supervision)):

I. Topographic Maps
   A. Representative fractions and map scales
   B. Contour lines and intervals
   C. Grid systems
      1. Township and range
      2. Latitude and longitude
      3. UTM (Universal Transverse Mercator)
      4. State

II. Celestial Positioning
   A. Use of sextant
   B. Role of chronometers
   C. Solar noon sights
   D. Polaris sights

III. Compasses
   A. Declination: True versus magnetic headings
   B. Azimuths versus quadrant readings
   C. Correcting versus un-correcting calculations

IV. Global Positioning Systems (GPS)
   A. The satellite constellation
   B. Estimated position error
   C. Plotting of latitude and longitude
   D. Plotting of UTM coordinates

V. Field Exercises
   A. Dead reckoning and position estimation
   B. LOPS (Lines of Position) and triangulations
   C. Calculation of ETA (Estimated Time of Arrival) and ETE (Estimated Time En Route)
   D. GPS treasure hunt

VI. Computer Exercises
   A. Downloading waypoints to a computer
   B. Uploading waypoints to a GPS unit
   C. Converting GPS files to DXF format

Evaluation of Student Performance:

1. Class Participation
2. Written Examination
3. Field Examination
REGULAR COURSE SYLLABUS

SCHOOL: Letters, Arts and Sciences

DEPARTMENT: Earth and Atmospheric Sciences

SEMESTER(S) OFFERED: Fall, Annually

PREFIX & COURSE NUMBER: GEG 3210

COURSE TITLE: Introduction to Cartography

CREDIT HOURS: 4 (2 + 4)

CONTACT HOURS: Lecture 30  Lab 60  Internship 0  Practicum 0

RESTRICTIONS (VARIABLE TOPICS COURSES): None

PREREQUISITE(S): GEG 1220

COREQUISITE(S): None

CATALOG COURSE DESCRIPTION:

This course provides instruction in the use and interpretation of maps, as well as the tools and constructional techniques of maps. Students will construct a variety of maps at different map scales and projections and critique their effectiveness.

REQUIRED READING MATERIALS: (Title, Author, Publisher, Copyright Date)


APPROVED:

Department Chair

Dean

V.P., Academic Affairs

DATE:

2/16/99  2/16/99  5/20/99

DISTRIBUTION: Original to Vice President for Academic Affairs

Revised 9/94: Academic Affairs-Curriculum-Regular Course Syllabus

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SPECIFIC (MEASURABLE) STUDENT BEHAVIORAL LEARNING OBJECTIVES:

Upon completion of this course the student should be able to:

1. differentiate appropriate map projections for specific uses;
2. appraise map scales appropriately;
3. convert one map scale type to another type;
4. construct a larger map making necessary adjustments;
5. construct a smaller map making necessary adjustments;
6. compare and contrast various symbols used on maps;
7. demonstrate several methods of line and lettering;
8. prepare a choropleth map suitable for publication and analysis;
9. prepare a value-by-area cartogram for graphic analysis of a statistical distribution;
10. prepare a dot map presenting the concept of spatial variation; and
11. apply cartographic techniques and concepts to geographic information systems (GIS).

OUTLINE OF COURSE CONTENT: (Major Topics and Subtopics)

I. Map Projections
   A. Theory
   B. Historical development: Greek through computer cartography and applications to geographic information systems (GIS)
   C. Special purpose projections
II. Map Scale
    A. Significance of map scale
    B. Conversion of scale
    C. Problems of enlarging and reducing maps
III. Map Symbolism
     A. Topographic symbols
     B. Cultural symbols
     C. Statistical symbols and classification schemes for GIS
IV. Cartographic Techniques
    A. Line techniques
    B. Lettering techniques
    C. Preparing maps and GIS software for publication

EVALUATION OF STUDENT PERFORMANCE:

A series of 4 cartographic drafting projects will be produced for manuscript evaluation. A final examination will be administered to determine the student’s mastery of the theoretical concepts underlying sound cartographic design and their application to geographic information systems (GIS).
REGULAR COURSE SYLLABUS

SCHOOL: Letters, Arts and Sciences

DEPARTMENT: Earth and Atmospheric Sciences

SEMESTER(S) OFFERED: Spring, Annually

PREFIX & COURSE NUMBER: GEG 322

COURSE TITLE: Intermediate Cartography

CREDIT HOURS: 3 (1 + 4)

CONTACT HOURS: Lecture 15 Lab 60 Internship 0 Practicum 0

RESTRICTIONS (VARIABLE TOPICS COURSES): None

PREREQUISITE(S): GEG 321

COREQUISITE(S): None

CATALOG COURSE DESCRIPTION:

This course emphasizes the production of monochromatic, multitone, thematic maps using scribing and photographic techniques. Alternative methods of representing relief features will be explored including construction of physiographic block diagrams, pictorial maps, and contour maps.

REQUIRED READING MATERIALS: (Title, Author, Publisher, Copyright Date)


APPROVED:  
Department Chair  
Dean  
V.P., Academic Affairs  

DATE:

DISTRIBUTION: Original to Vice President for Academic Affairs  
Copies retained by Dean and Department Chair

Revised 9/94: Academic Affairs-Curriculum-Regular Course Syllabus  
(s:\wpform\acadaff\curriculum\regsyl.wp)
SPECIFIC (MEASURABLE) STUDENT BEHAVIORAL LEARNING OBJECTIVES:

Upon completion of this course the student should be able to:

1. develop skills in the photo mechanical mixing of map design components;
2. choose and set up proper photo mechanical cartography equipment;
3. develop scribing techniques and skills;
4. compare and contrast various methods of relief representation;
5. prepare a publishable four-color map;
6. evaluate and use different perceptual arrangements of map symbolization;
7. develop the skills needed in printing maps; and
8. apply photo techniques to reproduction of geographic information systems (GIS) output.

OUTLINE OF COURSE CONTENT: (Major Topics and Subtopics)

I. Production Cartography
   A. Photo mechanical transfer techniques and their application to geographic information systems (GIS) output
   B. Scribing methods
   C. Preparation of masks and screens
   D. Pin registry

II. Relief Representation
   A. Illuminated contour maps
   B. Theory of plastic shading
   C. Block diagrams
   D. Planimetrically correct pictorial maps

III. Color Symbolism
   A. Theory of color perception
   B. Photo mechanical color proofing
   C. Four-color map preparation

IV. Cartographic Printing
   A. Letter press
   B. Engraving
   C. Lithography

EVALUATION OF STUDENT PERFORMANCE:

1. Three projects
2. Final examination covering theoretical concepts
REGULAR COURSE SYLLABUS

School of: Letters, Arts and Sciences

Department: Earth and Atmospheric Sciences

CIP Code: 45.0702

Prefix & Course Number: GIS 3250 Crosslisted With*: N/A

Course Title: Cartography

Check All That Apply: Required for Major: _____ Required for Minor: X Specified Elective: _____

Required for Concentration: X Elective: X Service Course: _____

Credit Hours: 3 (2 + 2)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 30 Lab 30 Internship 0 Practicum 0 Other (please specify type and hours): 0

Schedule Type(s): B Grading Mode(s): L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned*): N/A

*NOTE: This information must be included in the course description.

Restrictions (Variable Topics Course): N/A

Prerequisite(s): GIS 2250 and MTH 1210 with grades of “C” or better; or permission of instructor

Corequisite(s): None

Prerequisite(s) or Corequisite(s): None

Banner Enforced:
Prerequisite(s): None
Corequisite(s): None
Prerequisite(s) or Corequisite(s): None

Catalog Course Description: This class focuses on basic cartographic and visualization concepts and techniques to convey spatial information. Students will critique and design basic cartographic products such as dot, choropleth, contour, and proportional symbol maps using Geographic Information Systems (GIS). They will explore advanced visualization techniques such as integrating data, text, and graphics, developing web maps, and animating maps to show temporal change. Cartographic applications for natural resource management and planning are stressed.

APPROVED:

[Signatures and dates]

Department Chair OR Program Director

Dean OR Associate Dean

Associate VP, Academic Affairs
Prefix and Course Number: GIS 3250

Required Reading and Other Materials will be equivalent to:


Specific, Measurable Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. determine cartographic requirements for a project.
2. transform datasets from one map projection to another.
3. select map types based on spatial data distribution and map purpose.
4. design and produce maps that are visually compelling based on color, symbology, and composition.
5. design and produce maps that clearly convey spatial information through appropriate classification schemes.
6. design and produce maps to represent both discrete and continuous phenomena.
7. design and produce maps that tell a complete story through the use of graphics and text which complement map figure.
8. acquire data from the internet.
9. convert GIS databases from one file format to another.
10. design and produce maps for use on the Internet.
11. design and produce cartographic products using GIS software (ArcView GIS or current equivalent).
12. design and produce web pages using media software (DreamWeaver or current equivalent).

Detailed Outline of Course Content (Major Topics and Subtopics or Outline of Field Experience/Internship (experience, responsibilities and supervision)):

I. What is GIS Cartography?
   A. Cartographic principles
   B. GIS capabilities
   C. How digital maps differ from manual map products
   D. Advantages and disadvantages of manual and automated map production

II. Elements of Map Design
   A. What information can be included on maps
   B. Map design
   C. Map elements

III. Principles of Color
   A. Color lookup tables
   B. Color schemes
   C. Color visual impairment

IV. Review of Map Projections
   A. Classes
   B. Conversions between projections
   C. Ellipsoids and datums

V. Discrete Versus Continuous Phenomena
   A. Phenomena versus data
   B. Data values
   C. Data standardization
   D. Impact of scale
   E. Use of tables and graphs
   F. Spatial statistics
   G. Correlation versus causation

VI. Map Compilation and Generalization
   A. Classification
   B. Inclusion of graphics and metadata
Prefix Number and Course: GIS 3250

VII. Thematic Maps
   A. Thematic versus general reference maps
   B. Types of thematic maps

VIII. Choropleth Maps

IX. Dot Maps

X. Proportional Symbol Maps

XI. Visualization of 3-D Surfaces
   A. Contour maps
   B. Slope, aspect, and relief

XII. Data Acquisition and Processing
   A. Internet sources
   B. Data conversion
   C. Data transfer
   D. Data integration

XIII. New Advances in Computer Cartography
   A. Electronic atlases
   B. Interactive maps
   C. Map animation
   D. Virtual reality

Evaluation of Student Performance:

1. Cartography exercises
2. Lecture exams, quizzes, and assignments
3. Class participation
METROPOLITAN STATE COLLEGE OF DENVER
Office of Academic Affairs

REGULAR COURSE SYLLABUS

School of: Letters, Arts and Sciences

Department: Earth and Atmospheric Sciences

CIP Code: 45.0701

Prefix & Course Number: GIS 4840  Crosslisted With*: N/A

Course Title: Remote Sensing

Check All That Apply: Required for Major: _____  Required for Minor: _____  Specified Elective: X

Required for Concentration: X  Elective: X  Service Course: _____

Credit Hours: 3 (2 + 2)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 20  Lab 20  Internship 0  Practicum 0  Other (please specify type and hours): 0

Schedule Type(s): B  Grading Mode(s): L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned*): N/A

*NOTE: This information must be included in the course description.

Restrictions (Variable Topics Course): N/A

Prerequisite(s): GEG 1220 and (MTH 1110 or MTH 1400 or MTH 1410) with grades of “C” or better; at least junior standing; or permission of instructor; GIS 2250 recommended

Corequisite(s): None

Prerequisite(s) or Corequisite(s): None

Banner Enforced:

Prerequisite(s): None

Corequisite(s): None

Prerequisite(s) or Corequisite(s): None

Catalog Course Description: This course provides an overview of photogrammetry and remote sensing principals as well as practical experience in the extraction of earth surface information from hardcopy and digital imagery. Topics include electromagnetic radiation principles, aerial cameras, photo interpretation and measurement, satellite collections systems, digital imagery characteristics, and image processing. The application of remote sensing technologies to land management fields and the integration of digital imagery within Geographic Information Systems (GIS) is emphasized.

APPROVED:

Department Chair OR Program Director  Date 4/8/08

Dean OR Associate Dean  Date 4/9/08

Associate VP, Academic Affairs  Date 7/6/08
Prefix and Course Number: GIS 4840

Required Reading and Other Materials will be equivalent to:


Additional readings from scientific journals, books, and trade magazines

Specific, *Measurable Student Behavioral Learning Objectives*:

Upon completion of this course the student should be able to:

1. explain the underlying principles of remote sensing.
2. demonstrate a high-level understanding of the five elements of remote sensing:
   a. data collection
   b. data processing
   c. exploitation
   d. dissemination
   e. tasking.
3. evaluate types of sensing and recording equipment.
4. set up and use selected equipment such as stereoscopes, etc.
5. analyze information on aerial photos and other readings, such as physical, cultural, topographic and other features.
6. derive positional information from aerial photos using photogrammetric principles.
7. process digital images (using Image Analysis software or current equivalent) for the purpose of image registration, enhancement, analysis, and classification.

**Detailed Outline of Course Content** (Major Topics and Subtopics or Outline of Field Experience/Internship (experience, responsibilities and supervision)):

I. Fundamentals
   A. Definitions and background of remote sensing
   B. The electromagnetic spectrum
   C. Solar radiation and atmospheric fundamentals
   D. Spectral reflectance characteristics of earth feature features

II. Photographic Systems, Photogrammetry, and Photo Interpretation
   A. Cameras and camera systems
   B. Films and filters
   C. Principles of photo interpretation
   D. Measurements from aerial photos
   E. Interpretation of color infrared photos
   F. Utilization of aerial photography in resource management
   G. Planning photographic missions

III. Scanner Systems, Image interpretation, and Data Analysis
   A. Multispectral and thermal scanner systems
   B. Landsat and other satellite scanner systems
   C. Interpretation of multispectral and thermal scanner data
   D. Computer-aided analysis of scanner data
   E. Utilization of scanner data in resource management

IV. Radar Systems and Image Interpretation
   A. Radar systems and data characteristic
   B. Interpretation of radar imagery
   C. Utilization of radar data in resource management

**Evaluation of Student Performance:**

1. Homework and lab assignments
2. Quizzes and exams
3. Class participation
METROPOLITAN STATE COLLEGE of DENVER  
Office of Academic Affairs 

REGULAR COURSE SYLLABUS

School of: Letters, Arts and Sciences

Department: Earth and Atmospheric Sciences

CIP Code: 45.0702

Prefix & Course Number: GIS 4850  
Crosslisted With*: N/A

Course Title: Spatial Modeling in Raster

Check All That Apply:  
Required for Major: X  
Required for Minor: _____  
Specified Elective: X  
Required for Concentration: X  
Elective: X  
Service Course: _____

Credit Hours: 4 (3 + 2)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 45  
Lab 30  
Internship 0  
Practicum 0  
Other (please specify type and hours): 0

Schedule Type(s): R  
Grading Mode(s): L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned*): N/A

*NOTE: This information must be included in the course description.

Restrictions (Variable Topics Course): N/A

Prerequisite(s): GIS 2250 and (MTH 1110 or MTH 1400 or MTH 1410) with grades of "C" or better; at least junior standing; or permission of instructor

Corequisite(s): None

Prerequisite(s) or Corequisite(s): GIS 3250

Banner Enforced:

Prerequisite(s): None
Corequisite(s): None
Prerequisite(s) or Corequisite(s): None

Catalog Course Description: This course emphasizes spatial analysis and modeling. The underlying foundations of map algebra are discussed along with practical exercises that allow the student to develop familiarity with those procedures. This course offers an opportunity to apply the analytical capabilities of this technology to model real-world situations in support of decision making. Application of GIS to the fields of land use planning and natural resource management are emphasized.

APPROVED:

Department Chair OR Program Director  
Date: 4/1/08

Dean OR Associate Dean  
Date: 4/9/08

Associate VP, Academic Affairs  
Date: 7/15/08
Prefix and Course Number: GIS 4850

Required Reading and Other Materials will be equivalent to:


Readings from different books, manuals, scientific and trade journals

Specific, *Measurable* Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. build a spatial database from various download sites providing free spatial data.
2. determine raster model and raster analytical capabilities including the use of Map Algebra Local, Focal, and Global Functions.
3. model spatial processes.
4. produce a professional technical report.
5. process and analyze raster data with ArcView Spatial Analyst software or current equivalent.
6. integrate spatial data from a variety of sources including spatial data datum reprojection.
7. apply raster analysis to simple and complex spatial problems in planning and decision making.
8. track inputs, outputs, and analysis sequences through flowcharting.

Detailed Outline of Course Content (Major Topics and Subtopics or Outline of Field Experience/Internship (experience, responsibilities and supervision)):

I. Introduction

II. Maps As Numbers

III. Introduction to Modeling and Flowcharting

IV. Calculations in Thematic Attribute Tables

V. Map Algebra - Operators and Operations

VI. Map Algebra - Local, Focal, Zonal, and Global Functions

VII. Modeling Essentials

VIII. Conceptualizing Models

IX. Model Formulation

X. Prescriptive Modeling

XI. Model Verification

Evaluation of Student Performance:

1. Quizzes
2. Exams
3. Assignments, lab exercises
4. Class participation
REGULAR COURSE SYLLABUS

School of: Letters, Arts and Sciences
Department: Earth and Atmospheric Sciences
CIP Code: 45.0702
Prefix & Course Number: GIS 4860 Crosslisted With*: N/A
Course Title: GIS Applications
Check All That Apply: Required for Major: ___ Required for Minor: ___ Specified Elective: X
Required for Concentration: X Elective: X Service Course: ___
Credit Hours: 4 (3 + 2)
Total Contact Hours per semester (assuming 15-16 week semester):
Lecture 45 Lab 30 Internship 0 Practicum 0 Other (please specify type and hours): 0
Schedule Type(s): B Grading Mode(s): L
Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned*): N/A
*NOTE: This information must be included in the course description.
Restrictions (Variable Topics Course): N/A
Prerequisite(s): GIS 2250 with a grade of “C” or better; at least junior standing; or permission of instructor
Corequisite(s): None
Prerequisite(s) or Corequisite(s): GIS 3250
Banner Enforced:
Prerequisite(s): None
Corequisite(s): None
Prerequisite(s) or Corequisite(s): None
Catalog Course Description: This course provides advanced theoretical and practical knowledge in Geographic Information Systems (GIS), with emphasis on vector data models. Students gain conceptual knowledge about the advantages and limitations of various vector GIS data models (shapefiles, coverages, geodatabases) in support of land management and scientific applications, as well as practical exercises using Arc/Info and ArcGIS software. Students gain advanced experience in spatial data management, spatial analysis, and project management. Students are responsible for a GIS application project of their own creation.
APPROVED:

[Signatures and dates]
Department Chair OR Program Director

Dean OR Associate Dean

Associate VP, Academic Affairs
Prefix and Course Number: GIS 4860

Required Reading and Other Materials will be equivalent to:


Readings from different books, manuals, and scientific trade journals

Specific, Measurable Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. describe the characteristics of vector data models and vector file formats.
2. recognize common vector formats within computer file systems.
3. digitize new vector file formats within computer file systems.
4. import, export and convert vector datasets between vector file formats such as shapefiles, coverages, and geodatabases.
5. set map projections for display and map production purposes.
6. create feature datasets with a common map projection.
7. transform and correct map projection parameters.
8. analyze and model spatial relationships using vector operations.
9. set metadata requirements.
10. create metadata.
11. determine data and analysis requirements for GIS projects.
12. manage a GIS project from inception to completion including data collection, data processing, data analysis, map production, and documentation.
13. determine and use GIS software (ArcGIS and Workspace Arc/Info or the current equivalent) to manage data and solve simple to complex spatial problems.

Detailed Outline of Course Content (Major Topics and Subtopics or Outline of Field Experience/Internship (experience, responsibilities and supervision)):

I. Vector Data Model Categories
   A. Geo-relational
   B. Object-relational

II. The Characteristics of Vector File Formats
   A. Shapefiles
   B. Coverages
   C. Geodatabases
   D. File management

III. The Process of Vector Dataset Creation
   A. Digitizing
   B. Raster conversion
   C. GPS importing
   D. Constructing topology
   E. Error Correction
   F. Database creation
   G. Database editing

IV. Map Projections
   A. Transforming of non-geographic datasets
   B. Defining and reading projection files
   C. Re-projecting datasets
V. Analysis and Modeling Using Vector Datasets
   A. Topological analysis functions
   B. Non-topological analysis functions
   C. The application of analysis functions for spatial problem solving

VI. Metadata Requirements
   A. Metadata standards
   B. Metadata creation and editing
   C. Cartographic metadata

VII. Project Management
   A. Determining goals and objectives
   B. Determine data and technical requirements
   C. Determining analysis requirements
   D. Determining milestone requirements
   E. Project implementation
   F. Project evaluation
   G. Project documentation

VIII. Presenting the Results of the Analysis
   A. ArcView
   B. Arc/Info
   C. ArcGIS

   Perform tabular analysis
   B. Tables

VIII. Software Systems
   A. ArcView
   B. Arc/Info
   C. ArcGIS

Evaluation of Student Performance:

1. Examinations and quizzes
2. Assignment and lab exercises
3. Original project
4. Class participation
REGULAR COURSE SYLLABUS

School of: Letters, Arts and Sciences

Department: Earth and Atmospheric Sciences

CIP Code: 45.0702

Prefix & Course Number: GIS 4870 Crosslisted With*: N/A

Course Title: Spatial Databases

Check All That Apply: Required for Major: ____ Required for Minor: ____ Specified Elective: X

Required for Concentration: X Elective: X Service Course: ____

Credit Hours: 3 (2 + 2)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 30 Lab 30 Internship 0 Practicum 0 Other (please specify type and hours): 0

Schedule Type(s): B Grading Mode(s): L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned*): N/A

*NOTE: This information must be included in the course description.

Restrictions (Variable Topics Course): N/A

Prerequisite(s): GIS 4860 with a grade of "C" or better; or permission of instructor

Corequisite(s): None

Prerequisite(s) or Corequisite(s): None

Banner Enforced:

Prerequisite(s): None
Corequisite(s): None
Prerequisite(s) or Corequisite(s): None

Catalog Course Description: This course emphasizes the challenges and uniqueness of spatial data organization from specific database models to national spatial data infrastructures. Students gain theoretical and practical experience designing, implementing, and managing georelational and object-relational databases for planning and natural resource applications. Practical experience in spatial database creation using Global Positioning Systems (GPS), Database Management Systems (DBMS) and Geographic Information Systems (GIS) is stressed.

APPROVED:

Department Chair OR Program Director Date

Dean OR Associate Dean Date

Associate VP, Academic Affairs Date
Prefix and Course Number: GIS 4870

Required Reading and Other Materials will be equivalent to:


Specific, Measurable Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. explain spatial data organization structures at various spatial scales.
2. create conceptual models of data using top down and bottom up approaches.
3. translate conceptual models to logical and physical data models using GIS database software.
4. discern differences between database structures of georelational versus object-relational databases in a GIS.
5. determine database and spatial data requirements for a project.
6. normalize databases.
7. create and query databases using structured query language (SQL).
8. collect spatial data with global positioning systems (GPS) and import it into a GIS.
9. utilize georelational and object-related databases with a GIS (ArcGIS or current equivalent).
10. design and create georelational and object-relational databases to meet spatial project requirements.

Detailed Outline of Course Content (Major Topics and Subtopics or Outline of Field Experience/Internship (experience, responsibilities and supervision)):

I. Spatial Databases Introduction
   A. Properties of spatial databases
   B. Relationship between spatial databases and GIS
   C. Data types
   D. Metadata
   E. Attributes

II. Databases Versus Database Management Systems
    A. Data independence
    B. Data structuring, validation and recovery, monitoring
    C. Distributed databases

III. Database Management System Architecture
     A. Conceptual model
     B. Logical model
     C. Physical model

IV. Database Design Approaches
    A. Top down - entity-relationship (ER) models first
    B. Bottom up - ER models last

V. Normalization
   A. Redundant verses duplicated data
   B. Determinants and identifiers
   C. Well-normalized tables

VI. ER Modeling
    A. Relationship types
    B. Degree of relationship

VII. Relational Databases
VIII. Entity-Relationship Diagrams

IX. Tables

X. Data Query
   A. Query optimization
   B. Structured Query Language

XI. Data Models for Spatial and Non-spatial Data
   A. Relational model
   B. Georelational model
   C. Object model
   D. Object-relational model

XII. Unified Modeling Language (UML)

XIII. Web Database Processing

IV. Distributed Databases

X. Geodatabases
   A. Structure
   B. Capabilities
   C. Models

Evaluation of Student Performance:

1. Exams and quizzes
2. Homework and labs
3. Class participation
REGULAR COURSE SYLLABUS

School of: Letters, Arts and Sciences

Department: Earth and Atmospheric Sciences

CIP Code: 45.0702

Prefix & Course Number: GIS 4880 Crosslisted With*: N/A

Course Title: Current Topics in GIS: Variable Topics

Check All That Apply: Required for Major: _____ Required for Minor: _____ Specified Elective: X

Required for Concentration: X Elective: _____ Service Course: ____

Credit Hours: 1-2 (1-3 + 0)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 15-45 Lab 0 Internship 0 Practicum 0 Other (please specify type and hours): 0

Schedule Type(s): L Grading Mode(s): L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned*): ____

*NOTE: This information must be included in the course description.

Restrictions (Variable Topics Course): maximum of 6 credit hours

Prerequisite(s): GIS 2250 with a grade of "C" or better

Corequisite(s): none

Prerequisite(s) or Corequisite(s): none

Banner Enforced:

Prerequisite(s): N/A
Corequisite(s): N/A
Prerequisite(s) or Corequisite(s): N/A

Catalog Course Description: This course covers important topics in GIS and remote sensing, emphasizing new concepts and technological developments. This course may be repeated for credit under different topics for a maximum of six credits.

APPROVED:

Department Chair OR Program Director Date 4/18/08

Dean OR Associate Dean Date 4/15/08

Associate VP, Academic Affairs Date 7/15/08
Prefix and Course Number: GIS 4880

Required Reading and Other Materials will be equivalent to:
Readings from different books, manuals, scientific and trade journals

Specific, *Measurable* Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. Evaluate relevant research and advancements in GIS and/or remote sensing concepts and techniques, with regard to scientific achievement, research quality, and documentation.
2. Determine the spatial and temporal context for interpreting research conclusions.
3. Discuss the impact of new concepts and technologies on the GIS and remote sensing disciplines.

Detailed Outline of Course Content (Major Topics and Subtopics or Outline of Field Experience/Internship (experience, responsibilities and supervision)):

I. Introduction to variable topic
II. Evaluation of reading materials
III. Student led discussions

Evaluation of Student Performance:

1. Topic presentations
2. Evaluation of peers
3. Class participation
ME1ROPOLITAN STATE UNIVERSITY OF DENVER
Office of Academic and Student Affairs

REGULAR COURSE SYLLABUS
VARIABLE TOPIC COURSE

School of: LAS __
Department: EAS __
Prefix & Course Number: GIS4880 488F Crosslisted With*: __
Course Title: Satellite Image Processing and Analysis __
Check All That Apply: Required for Major: ____ Required for Minor: ____ Specified Elective: Y ____
Required for Concentration: ____ Elective: Y ____ Service Course: ____
Credit Hours: 3 (3+0)
Total Contact Hours per semester (assuming 15-16 week semester):
   Lecture 45 Lab ____ Internship ____ Practicum ____ Other (please specify type and hours): ____
Schedule Type(s): L Grading Mode(s): L
Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned**):
   ** NOTE: This information must be included in the course description.
Restrictions (Variable Topics Course): __
Prerequisite(s): C or better grade in GIS 2250 with GIS4840 recommended __
Corequisite(s): N/A
Prerequisite(s) or Corequisite(s): N/A
Banner Enforced:
   Prerequisite(s): GIS2250
   Corequisite(s): N/A
   Prerequisite(s) or Corequisite(s): N/A
Catalog (Umbrella) Course Description:
This course covers important topics in GIS and remote sensing, emphasizing new concepts and technological developments. The course content will vary, and the course may be repeated for credit as the course topic changes with a maximum of six credits earned for the course

APPROVED:

[Signatures and dates]

*If crosslisted, attach completed Course Crosslisting Agreement Form
Variable Topic Course Description:
This course will focus on current techniques and concepts for processing digital satellite remote sensing imagery. The class will cover both theoretical and practical applications of image processing techniques for land cover classification and land condition analysis. Topics will include image preprocessing, enhancements, indices, and classification. Students will conduct an original research project in addition to reviews of current literature.

Required Reading and Other Materials will be equivalent to:

Readings from different books, manuals, scientific and trade journals

Specific, Measurable Student Behavioral Learning Objectives:
Upon completion of this course the student should be able to:

1. Evaluate relevant research and advancements in Remote Sensing concepts and techniques, with regard to scientific achievement, research quality, and documentation
2. Determine the spatial and temporal context for interpreting research conclusions.
3. Discuss the impact of new concepts and technologies on the Remote Sensing discipline.
4. Apply and analyze digital image processing techniques to satellite imagery using ENVI software.

Detailed Outline of Course Content (Major Topics and Subtopics) or Outline of Field Experience/Internship (experience, responsibilities and supervision)

I. Introduction to digital image processing techniques and concepts
II. Evaluation of reading materials and image processing software functions
III. Student led investigations and discussions into image processing applications to land use and land cover issues

Evaluation of Student Performance:

1. Topic presentations
2. Evaluation of peers
3. Class participation
REGULAR COURSE SYLLABUS

School of: Letters, Arts and Sciences

Department: Earth and Atmospheric Sciences

CIP Code: 45.0702

Prefix & Course Number: GIS 4890     Crosslisted With*: N/A

Course Title: Advanced GIS Project

Check All That Apply: Required for Major:     Required for Minor:     Specified Elective: X

Required for Concentration: X     Elective: X     Service Course: ___

Credit Hours: 3 (1 + 4)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 15     Lab 60     Internship 0     Practicum 0     Other (please specify type and hours): 0

Schedule Type(s): R     Grading Mode(s): L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned*): N/A

*NOTE: This information must be included in the course description.

Restrictions (Variable Topics Course): N/A

Prerequisite(s): GIS 4850 and GIS 4860 with grades of “C” or better; senior standing; or permission of instructor

Corequisite(s): None

Prerequisite(s) or Corequisite(s): GIS 4870

Banner Enforced:
Prerequisite(s): None
Corequisite(s): None
Prerequisite(s) or Corequisite(s):

Catalog Course Description: This is a senior-level capstone course for land use majors with a concentration in Geographic Information Systems (GIS). Students serve as GIS specialists working on individual or group projects with emphasis on land use applications. Students manage a project from inception to completion including databases and maps as well as a final report and presentation. (Senior Experience)

APPROVED:

[Signatures and dates]

Department Chair OR Program Director

Date

Dean OR Associate Dean

Date

Associate VP, Academic Affairs

Date
Prefix and Course Number: GIS 4890

Required Reading and Other Materials will be equivalent to:

Readings from different books, manuals, scientific and trade journals

Specific, Measurable Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. manage a GIS project from inception to completion.
2. work with clients, students, and/or faculty to determine project goals and objectives.
3. review scientific literature relevant to the project goals.
4. contrast and compare alternative approaches to spatial problem solving.
5. define project deliverables, timelines, and milestones.
6. determine spatial data requirements.
7. evaluate existing data quality through metadata parameters.
8. determine data processing sequences for achieving project goals and objectives.
9. produce high quality cartographic products in support of project goals.
10. produce high quality data and metadata in support of project goals.
11. produce high quality documents in support of project goals in scientific format including abstract, introduction, objectives, methods, results, conclusions, and literature cited.
12. present project findings to clients, students, and faculty.

Detailed Outline of Course Content (Major Topics and Subtopics or Outline of Field Experience/Internship (experience, responsibilities and supervision)):

I. Project Proposal
   A. Project outline
   B. Project purpose
   C. Project data
   D. Project methods

II. Progress Reports and Presentations
   A. Data collection and Data Summary Report
      1. Datasets
      2. Metadata
   B. Objectives and models

III. Data Organization
     A. Spatial datasets
     B. Metadata

IV. Final Report: Abstract, Introduction, Objectives, Methods, Results, Conclusions, Literature Cited

V. Final Presentation

VI. Final Maps

Evaluation of Student Performance:

1. Proposal and progress reports
2. Final report and maps
3. Final presentation
4. Class participation
REQUEST FOR NEW OR CONTINUED SENIOR EXPERIENCE DESIGNATION

Senior Experience

(To accompany old and new regular syllabus form and Curriculum Change Proposal forms)

Date: 9-30-2006
School: LAS
Department: EAS

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Course Number</th>
<th>Credit Hours</th>
<th>Contact Hours</th>
<th>CIP Number</th>
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<td>4890</td>
<td>3 (1 + 4)</td>
<td>15 lecture 60 lab</td>
<td>45.0702</td>
</tr>
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Title: Advanced GIS Project

Prerequisites: GIS 4850 and GIS 4860 with grades of “C” or better; senior standing; or permission of instructor

Corequisites: none

Recommended maximum enrollment per section: 20

Current Course Status (check all that apply)
☐ New course
☐ Existing Senior Experience Course

Criteria for Senior Experience

The following criteria must be addressed for all courses seeking Senior Experience designation. Please type on this form; it will expand to accommodate any length of text.

The Senior Experience must allow students to:

1. synthesize learning through critical analysis and logical thinking.

The course allows students to define spatial problems, determine important data sets, analyze possible cause and effect relationships, and design databases and methods to convey spatial information and to test theories about spatial relationships.

2. apply theoretical constructs to practical applications.

The course allows students to select the appropriate concepts of spatial association and methods of spatial analysis to apply to real-world situations.
3. critique philosophical tenets and current practices.

The course allows students to challenge current thinking through the presentation of empirical evidence to the contrary.

4. integrate and refine oral and/or written communication skills.

The course requires multiple deliverables such as written documents, maps, presentations, and web pages.

5. verify their expertise.

The course allows students to work on real projects for real clients in the community.

Approvals:

Department Curriculum Committee / Date

\[\text{Signature} \quad 4/27/02\]

Department Chair OR Program Director/ Date

\[\text{Signature} \quad 4-10-08\]

School Curriculum Committee / Date

\[\text{Signature} \quad 4/9/08\]

Dean or Associate Dean / Date

\[\text{Signature} \quad 4/10/08\]

Chair, Faculty Senate Curriculum Committee / Date

\[\text{Signature} \quad 7/15/08\]

Associate Vice President, Academic Affairs/Date