I. CATALOG INFORMATION

A. Discipline: GEOGRAPHIC INFORMATION SYSTEMS (GIS)

B. Subject Code and Number: GIS M22

C. Course Title: Raster GIS and Spatial Analysis

D. Credit Course units:

Units: 3

Lecture Hours per week: 3

Lab Hours per week : 0

Variable Units : No

E. Student Learning Hours:

Lecture Hours:

Classroom hours: 52.5 - 52.5

Laboratory/Activity Hours:

Laboratory/Activity Hours

Total Combined Hours in a 17.5 week term: 52.5 - 52.5

F. Non-Credit Course hours per week

G. May be taken a total of: [X] 1 [ ] 2 [ ] 3 [ ] 4 time(s) for credit

H. Is the course co-designated (same as) another course: No [X] Yes [ ]
If YES, designate course Subject Code & Number:

I. Course Description:

Uses the ArcGIS software along with the Spatial Analyst and 3D extensions to explore the use of raster GIS data in analysis and visualization. Includes terrain analysis, hydrologic analysis, suitability analysis, and 3D modeling.

J. Entrance Skills

*Prerequisite: No [ ] Yes [X] Course(s)
GIS M01

*Corequisite: No [X] Yes [ ] Course(s)

Limitation on Enrollment: No [X] Yes [ ]

Recommended Preparation: No [X] Yes [ ] Course(s)

Other: No [X] Yes [ ]

K. Other Catalog Information:

II. COURSE OBJECTIVES

Upon successful completion of the course, a student will be able to:

		Methods of evaluation will be consistent with, but not limited by, the following types or examples.
1	recognize which basic data structures (raster and vector) is useful for specific analysis.	In-class exercises Summative abstracts on in-class exercises Written and practical exams Capstone project
2	derive information from GIS layers by on-screen queries and by using report modules.	In-class exercises Summative abstracts on in-class exercises Written and practical exams Capstone project
3	perform reclassification functions; create and use a "mask."	In-class exercises Summative abstracts on in-class exercises Written and practical exams Capstone project
4	understand and perform basic mathematical manipulations of raster maps (i.e., map addition, subtraction, etc.).	In-class exercises Summative abstracts on in-class exercises Written and practical exams Capstone project
5	create digital elevation models by importing US Geological Survey (USGS) digital elevation model (DEM) files; patch digital elevation files together in a larger layer; create slope and aspect maps from those data.	In-class exercises Summative abstracts on in-class exercises Written and practical exams Capstone project
6	import and register digital images; use filtering techniques to enhance the image; perform unsupervised and supervised classification of the image.	In-class exercises Summative abstracts on in-class exercises Written and practical exams Capstone project

7	recognize the problems associated with statistical analysis and quantification of spatial features.	In-class exercises Summative abstracts on in-class exercises Written and practical exams Capstone project

III. COURSE CONTENT

Estimated %	Topic	Learning Outcomes
Lecture (must total 100%)		
10.00%	Statistical reports. On screen and other querying operations	2, 4, 7
20.00%	Single-layer Operations: - feature manipulation (boundary operations, logical operations, proximity analysis) - feature identification and selection - feature classification (equal interval, natural breaks, quantile, equal area, progressions, clustering, fragmentation index)	1, 2, 3, 4, 7
5.00%	Raster vs. vector GIS - basic GIS functions - raster GIS applications	1
10.00%	Fundamental cartographic principles: - map projections - scale - coordinate systems	1, 6, 7
5.00%	Raster display functions: - changing resolution and scale - vector overlays - color selection	1, 5, 6, 7
10.00%	Raster data management: - data conversion - import and export formats - patching - merging - geoprocessing operations	1, 2, 5, 6, 7
10.00%	3D operations: - slope and aspect generation - DEM processes	1, 5, 7
10.00%	Satellite and aerial imagery: - creating composites - image enhancement - classification techniques - ortho-corrections	1, 2, 4, 6, 7
20.00%	Multi-layer Operations: - overlay analysis (Boolean algebra, union, intersection, identity, frequency/density) - proximity analysis (near, point distant) - analysis of spatial correlation (contingency table and X2 test of goodness-of-fit, correlation coefficient. simple regression)	1, 2, 3, 4, 5, 6, 7

IV. TYPICAL ASSIGNMENTS

A. Writing assignments

Writing assignments are required. Possible assignments may include, but are not limited to:	
1	summarize the results of in-class exercises that use spatial analysis in a professional abstract format.
2	write an essay describing the uses and limitations of raster-basted cartography.
3	communicate the results of an applied research project that utilizes spatial analysis in the technical writing style required by the industry.
4	write personal user manuals about how to perform spatial analysis workflows.

B. Appropriate outside assignments

Appropriate outside assignments are required. Possible assignments may include, but are not limited to:	
1	create a paper raster map and vector map of the land cover of the western part of the campus.
2	visit the CSU Northridge's GIS department, tour the facility, and write a summary of the experience.
3	keep a log of times outside of class you encounter the results of spatial analysis in news reports, other class topics, in movies/TV shows, or any other form of media.

C. Critical thinking assignments

Critical thinking assignments are required. Possible assignments may include, but are not limited to:	
1	select and execute the proper contouring technique given a shapefile of crime locations in an urban environment.
2	create distance and density maps of hospital locations. Evaluate these maps to suggest new hospital locations.
3	model snow depth of a drainage in the southern Sierra Nevada and evaluate possible water content of the snowpack.
4	design, as part of a capstone project, a GIS campaign that evaluates a problem using spatial analysis. The project must include some form of quantitative spatial analysis (interpolation, density mapping, digital elevation model manipulation, etc.)

V. METHODS OF INSTRUCTION

Methods of instruction may include, but are not limited to:

☐ Distance Education – When any portion of class contact hours is replaced by distance education delivery mode (Complete DE Addendum, Section XV)

☒ Lecture/Discussion

☐ Laboratory/Activity

☒ Other (Specify)
Lecture time will be interspersed with hands-on computer exercises demonstrating the topic
Class activities
Guest speakers

Collaborative group work will also be applied.

[X] Optional Field Trips

[ ] Required Field Trips

VI. METHODS OF EVALUATION

Methods of evaluation may include, but are not limited to:

[X] Essay Exam	[X] Classroom Discussion	[X] Skill Demonstration
[X] Problem Solving Exam	[ ] Reports/Papers/ Journals	[X] Participation
[X] Objective Exams	[X] Projects	[X] Other (specify)

- Capstone project in which students evaluate a problem that can be solved with remote sensing techniques. They will access the appropriate data, post-process and analyze it, and present the results to the class.
- Quizzes

- Summative papers

VII. REPRESENTATIVE TEXTS AND OTHER COURSE MATERIALS

Oyana, Tonny, and Florence Margai. Spatial Analysis: Statistics, Visualization, and Computational Methods. CRC, 2015.

Steinberg, Sheila Lakshmi, and Steven Steinberg. GIS Research Methods. Esri Press, 2015.

Allen, David. GIS Tutorial 2: Spatial Analysis Workbook (GIS Tutorials). 4th ed. Esri Press, 2016.

VIII. STUDENT MATERIALS FEES

[X] No [ ] Yes

IX. PARALLEL COURSES

College	*Course Number*	*Course Title*	*Units*
Sacramento State University	GEOG 181	Quantitative Methods in Geography (formerly Spatial Analysis)	3
Santa Barbara City College	GEOG 175	Raster GIS Applications	2
LA Pierce College	GIS 38	Spatial Analysis and Modeling	3
Columbia College	GEOGR 70	Introduction to Raster-Based GIS	3
CSU Chico	GEOG 119A	Introductory ArcGIS	1

X. MINIMUM QUALIFICATIONS

Courses Requiring a Masters Degree:
Master's degree in geology, geophysics, earth sciences, meteorology, oceanography, or paleontology OR bachelor's degree in geology AND master's degree in geography, physics, or geochemistry OR the equivalent.

XI. ARTICULATION INFORMATION

A. Title V Course Classification:

1. This course is designed to be taken either:

   ☐ Pass/No Pass only (no letter grade possible); or
   ☒ Letter grade (P/NP possible at student option)

2. Degree status:
   Either ☒ Associate Degree Applicable; or ☐ Non-associate Degree Applicable

B. Moorpark College General Education:

1. Do you recommend this course for inclusion on the Associate Degree General Education list?
   Yes: ☐ No: ☒ If YES, what section(s)?

   ☐ A1 - Natural Sciences - Biological Science
   ☐ A2 - Natural Sciences - Physical Science
   ☐ B1 - Social and Behavioral Sciences - American History/Institutions
   ☐ B2 - Social and Behavioral Sciences - Other Social Behavioral Science
   ☐ C1 - Humanities - Fine or Performing Arts
   ☐ C2 - Humanities - Other Humanities
   ☐ D1 - Language and Rationality - English Composition
   ☐ D2 - Language and Rationality - Communication and Analytical Thinking
   ☐ E1 - Health/Physical Education
   ☐ E2 - PE or Dance
   ☐ F - Ethnic/Gender Studies

C. California State University(CSU) Articulation:

1. Do you recommend this course for transfer credit to CSU? Yes: ☒ No: ☐

2. If YES do you recommend this course for inclusion on the CSU General Education list?
   Yes: ☐ No: ☒ If YES, which area(s)?

   A1 ☐ A2 ☐ A3 ☐ B1 ☐ B2 ☐ B3 ☐ B4 ☐

   C1 ☐ C2 ☐ D1 ☐ D2 ☐ D3 ☐ D4 ☐ D5 ☐

   D6 ☐ D7 ☐ D8 ☐ D9 ☐ D10 ☐ E ☐

D. University of California (UC) Articulation:

1. Do you recommend this course for transfer to the UC? Yes: ☐ No: ☒

2. If YES do you recommend this course for the Intersegmental General Education Transfer Curriculum (IGETC)? Yes: ☐ No: ☒

   IGETC Area 1: English Communication

- [ ] English Composition
- [ ] Critical Thinking-English Composition
- [ ] Oral Communication

IGETC Area 2: Mathematical Concepts and Quantitative Reasoning

- [ ] Mathematical Concepts

IGETC Area 3: Arts and Humanities

- [ ] Arts
- [ ] Humanities

IGETC Area 4: Social and Behavioral Sciences

- [ ] Anthropology and Archaeology
- [ ] Economics
- [ ] Ethnic Studies
- [ ] Gender Studies
- [ ] Geography
- [ ] History
- [ ] Interdisciplinary, Social & Behavioral Sciences
- [ ] Political Science, Government & Legal Institutions
- [ ] Psychology
- [ ] Sociology & Criminology

IGETC Area 5: Physical and Biological Sciences (mark all that apply)

- [ ] Physical Science Lab or Physical Science Lab only (none-sequence)
- [ ] Physical Science Lecture only (non-sequence)
- [ ] Biological Science
- [ ] Physical Science Courses
- [ ] Physical Science Lab or Biological Science Lab Only (non-sequence)
- [ ] Biological Science Courses
- [ ] Biological Science Lab course
- [ ] First Science course in a Special sequence
- [ ] Second Science course in a Special Sequence
- [ ] Laboratory Activity
- [ ] Physical Sciences

IGETC Area 6: Language other than English

- [ ] Languages other than English (UC Requirement Only)
- [ ] U.S. History, Constitution, and American Ideals (CSU Requirement ONLY)
- [ ] U.S. History, Constitution, and American Ideals (CSU

Requirement ONLY)

XII. REVIEW OF LIBRARY RESOURCES

A. What planned assignment(s) will require library resources and use?

The following assignments require library resources: None

B. Are the currently held library resources sufficient to support the course assignment?

YES: [X] NO: [ ]

If NO, please list additional library resources needed to support this course.

XIII. PREREQUISITE AND/OR COREQUISITE JUSTIFICATION

Requisite Justification for GIS M01

[ ] A. Sequential course within a discipline.

[X] B. Standard Prerequisite or Corequisite required by universities.

CSU Northridge
Sacramento State University
Fresno State University
Cal Poly Pomona

[ ] C. Corequisite is linked to companion lecture course.

[ ] D. Prerequisite or Corequisite is authorized by legal statute or regulation.
Code Section: _____

[ ] E. Prerequisite or Corequisite is necessary to protect the students' health and safety.

[ ] F. Computation or communication skill is needed.

[ ] G. Performance courses: Audition, portfolio, tryouts, etc. needed.

XIV. WORKPLACE PREPARATION

Required for career technical courses only. A career technical course/program is one with the primary goal to prepare students for employment immediately upon course/program completion, and/or upgrading employment skills.

Detail how the course meets the Secretary of Labors Commission on the Achievement of Necessary Skills (SCANS) areas. (For a description of the competencies and skills with a listing of what students should be able to do, go to: http://www.ncrel.org/sdrs/areas/issues/methods/assment/as7scans.htm)

The course will address the SCANS competency areas:

1. Resources: the students will retrieve raster data from governmental or academic sources, organize those data using proper data management techniques, and analyze their data according to a time schedule established at the start of the semester.

2. Interpersonal: the students will work in groups of 2-3 students to create and execute a workflow that will answer a geospatial question using raster-based GIS techniques, simulating a real workplace environment. Students will communicate the results of this work to the class and will, in part, be evaluated by peer-review.

3. Information: the students will use the Internet to acquire raster data sets and GIS software to analyze those data. Students will communicate the results of their analyses in written abstracts and in verbal and poster presentations.

4. Systems: the students will understand their roles as Geographic Information Systems technicians by setting up and executing data analysis workflows, troubleshooting and modifying these workflows when problems arise.

5. Technology: the students will apply GIS software every day in class and on all out-of-class assignments.

The course also addresses the SCANS skills and personal qualities:

1. Basic Skills: the students will use reading, writing and mathematics to access and process raster-type geospatial data, analyze those data, and present their results to the class in a professional conference-style poster presentation. Emphasis is placed upon the technical writing and speaking style demanded by the industry.

2. Thinking Skills: the students will apply creative and critical thinking to answer geospatial questions using the tools of a GIS technician, solving problems when they arise.

3. Personal Qualities: the students will conduct themselves in a responsible, professional manner when completing an industry-level capstone project applying remote sensing tools. Projects will be completed in a timely fashion, so students must set realistic goals and manage time appropriately to meet them. During the peer-review process, students will behave in a critical, yet polite fashion, when giving and receiving feedback.

XV. DISTANCE LEARNING COURSE OUTLINE ADDENDUM

GIS M22: Not Applicable

XVI. GENERAL EDUCATION COURSE OUTLINE ADDENDUM

GIS M22: Not Applicable

XVII. STUDENT MATERIALS FEE ADDENDUM

GIS M22: Not Applicable

XVIII. REPEATABILITY JUSTIFICATION TITLE 5, SECTION 55041

GIS M22: Not Applicable

XIX. CURRICULUM APPROVAL

Course Information:

Discipline: GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Discipline Code and Number: GIS M22

Course Revision Category: New Course

Course Proposed By:

Originating Faculty Roger Putnam 09/25/2018

Faculty Peer: _____

Curriculum Rep: _____

Department Chair: Robert Keil 10/24/2018

Division Dean: Mary Rees 10/14/2018

Approved By:

Curriculum Chair: Jerry Mansfield 12/07/2018

Executive Vice President: _____

Articulation Officer: Letrisha Mai 11/01/2018

Librarian: Mary LaBarge 10/31/2018

Implementation Term and Year: Fall 2019

Approval Dates:

Approved by Moorpark College Curriculum Committee: 11/06/2018

Approved by Board of Trustees (if applicable): 12/11/2018

Approved by State (if applicable): 12/14/2018