# Course Change Proposal

## Form A

<table>
<thead>
<tr>
<th>Academic Group (College):</th>
<th>Academic Organization (Department):</th>
<th>Date:</th>
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<tbody>
<tr>
<td>Natural Sciences and Mathematics</td>
<td>Geology</td>
<td>12/17/2010</td>
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<tr>
<th>Type of Course Proposal:</th>
<th>Department Chair:</th>
<th>Submitted by:</th>
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<tbody>
<tr>
<td>New <em>X</em> Change ___ Deletion ___</td>
<td>Dr. David Evans</td>
<td>Dr. Kevin Cornwell</td>
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- **Does this course fulfill a requirement for single-subject or multiple subject credential students?** Yes ___ No _X_
- **For Catalog Copy:** Yes _X_ No ___
- **CCE (Extension):** Yes ___ No ___
- **Semester Effective:** Fall _X_ Spring ___, 2010

This course replaces experimental course **Subject Area (prefix) and Catalog Nbr (course number):**

## Change from:

<table>
<thead>
<tr>
<th>Subject Area (prefix) &amp; Catalog Nbr (course no.):</th>
<th>Title:</th>
<th>Units:</th>
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<tbody>
<tr>
<td>Geol - 150</td>
<td>Computer Mapping in Geology</td>
<td>3</td>
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## Change to:

<table>
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<th>Subject Area (prefix) &amp; Catalog Nbr (course no.):</th>
<th>Title:</th>
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## JUSTIFICATION:

Computer aided drafting and map making software has become so in demand in the geological professional community that geology students entering the market-place are at a distinct disadvantage if they don't possess some of these skills. Students with these skills take the art of map making (a primary geological skill) to new and more interactive levels.

## NEW COURSE DESCRIPTION: (Not to exceed 80 words, and language should conform to catalog copy. See http://www.csus.edu/aca/univmanual/crspsl.htm - Guidelines for Catalog Course Description)

This course is designed to enhance the mapping skills of geology majors by providing them an opportunity to learn modern computer aided mapping techniques - methods and tools widely used across industry, government and academe. The course is designed to teach students how to effectively use various tools and mapping software by applying their developing skills in solving a variety of geological problems. This course strategy will help develop both student technical map making and innovative problem solving skills.

**Note:**

- **Prerequisite:** Yes _X_ No
- **Corequisite:** Yes ___ No ___
- Geography 109

**CAN (California Articulation Number):**

- **Graded:** Letter _X_ Credit/No Credit
- **Instructor Approval Required:** Yes ___ No _X_

**Course Classification (e.g., lecture, lab, seminar, discussion):**

- **C2 - lecture**
- **Title for CMS (not more than 30 characters):** Computer Mapping in Geology

**Cross Listed?**

- Yes ___ No _X_

**If yes, do they meet together and fulfill the same requirement, and what is the other course.**

**How Many Times Can This Course be Taken for Credit?** _1_

**Can the course be taken for Credit more than once during the same term?** Yes ___ No _X_
FOR NEW COURSE PROPOSALS OR SUBSTANTIVE CHANGES ONLY:

Description of the Expected Learning Outcomes: Describe outcomes using the following format: "Students will be able to: 1), 2), etc."
See the example at http://www.csus.edu/acaf/example.htm

Students will be able to:
1. Understand and become proficient with modern mapping tools.
2. Collect, import and merge field data into mapping software.
3. Build, comprehensive, accurate and visually pleasing digital maps.
4. Effectively extract useful data from completed maps and data sets to generate insights and solve geologic problems.

**Attach a list of the required/recommended course readings and activities [Note: it is understood that these are updated and modified as needed by the instructor(s).] This attachment should be forwarded only to your Dean's office, not Academic Affairs.

Assessment Strategies: A description of the assessment strategies (e.g., portfolios, examinations, performances, pre- and post-tests, conferences with students, student papers) which will be used by the instructor to determine the extent to which students have achieved the learning outcomes noted above:

Students will be assigned weekly assignments designed to develop skills in one or more mapping tools or software. These assignments will be graded for accuracy and proficiency. 50% of course grade.

Two mid-term exams will be given to assess the overall understanding students have gained of mapping tools, software and their application. 30% of course grade.

A cumulative project that highlights an interesting geologic problem, utilizes mapping tools and software to create geologic maps and generates a data set(s) that furthers the understanding of, or solution to the project problem. 20% of course grade.

For whom is this course being developed?
Majors in the Dept X__ Majors of other Depts ___ Minors in the Dept ___ General Education ___ Other ___
Is this course required in a degree program (major, minor, graduate degree, certificate)? Yes ___ No ___X___
If yes, identify program(s):

Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer facilities, faculty, etc.)? Yes ___ No ___X___
If yes, attach a description of resources needed and verify that resources are available.

Indicate which department or programs will be affected by the proposed course (if any). ___none___

The Department Chair's signature below indicates that affected programs have been sent a copy of this proposal form.

Approvals: If proposed change, new course or deletion is approved, sign and date below. If not approved, forward without signing to the next reviewing authority, and attach an explanatory memorandum to the original copy.

Signatures: 

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<tr>
<th>Department Chair:</th>
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<tr>
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<td>12/17/10</td>
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<tr>
<td>College Dean or Associate Dean:</td>
<td>12/20/10</td>
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<tr>
<td>CPSP (for school personnel courses ONLY)</td>
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<tr>
<td>Associate Vice President and Dean for Academic Programs:</td>
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Distribution: Academic Affairs (original), Department Chair and College Dean. Dean's office to send original after approval to Academic Affairs, at mail zip 6016. An electronic copy must also be sent.

8/27/07
GEOLOGY 150  Computer Mapping in Geology  Syllabus

This course is designed for the student with some background in geology who is interested in using GIS technology to produce geologic maps for academic and professional use. During the course of the semester we will learn about the foundation of GIS technology, how to use the ARCCOMPONENTS of ARCGIS to make maps, what data is available for GIS maps and how to access it, how to modify non-GIS formatted data so that it is usable in the GIS environment, and how to use various GIS tools to extract insights and data from constructed maps to solve geological problems. General learning objectives are as follows:

Learning Objectives:
1. to understand the general nature of the GIS mapping environment,
2. to be able to build an accurate three-dimensional map set and display that map set in a variety of different, visually pleasing manners,
3. to be able to access disparate data sets and incorporate them into the GIS environment, and to
4. effectively extract useful data from completed map sets and generate insights to solving geologic problems.

Instructor: Dr. Kevin Cornwell  1010 Placer Hall  278.6667  cornwell@csus.edu

Grades - Your course grade will be determined by your performance on multiple homework assignments generated from class discussions on how to perform certain tasks necessary to build computer maps (50%), your skills at producing a final project that highlights a geologic problem and generates a data set to explore that problem from (20%) and from two mid-term exams that will explore your understanding of the concepts and logic of the software and its application (30%).

Textbooks for the course will consist of online "how to" sheets (generated by the instructor) and Mastering ArcGIS by Maribeth Price (ISBN# 978-0-07-331280-4).

TENTATIVE OUTLINE OF DISCUSSION TOPICS AND ASSIGNMENTS

Week 1 – What is GIS, a GIS framework and the structure and operation of the ARCCOMPONENT software program. Introduce students to ARCCOMPONENT, ARCTOOLS, ARCCATALOG, ARSCENE, conversion tools, and the Raster calculator.
Assignment – introduce students to the interface menu of ArcMAP, ArcTOOLS, ArcSCENE and ArcCATALOG

Week 2 - What are digital raster graphics (DRG) and a digital orthophoto quadrangle (DOQ) files? Where is such data located? How do you bring it into the ARCCOMPONENT venue? How to bring in aerial photographs from online sources. How and why do you georeference images? Discuss
coordinate systems, projections, map datum.

Assignment - get a DRG and DOQ data set from one of the quadrangle maps that cover the Sierra Nevada, import it into ARCMAP and visually display the map in ARCSCENE.

Week 3 – What is a digital elevation model (DEM), why is it important in building 3-D maps, where is such data located and how do you begin using that dataset in ARCMAP? How do you work with DEM’s in the ARCMAP venue? What if the area of interest is larger than the DEM data set? How do you sew different DEM’s together? How do you correct numerical errors within a DEM? How to assign color schemes to DEM’s. How to manipulate the transparency of DEM’s and DRG’s.

Assignment – get a DEM data set from one of the quadrangle maps that cover the Sierra Nevada, import it into ARCMAP, process it, produce a hillshade image of the map and visually display the map in ARCSCENE.

Assignment – get four DEMs that share common boundaries and sew them together using the raster calculator. Correct for numerical errors in the data set. Drape a DRG of this area across the DEM.

Week 4 – What is a shapefile, what are they used for and how do you make one?

Assignment – using a minimum of 4 DEM’s sewn together from the Cosumnes drainage basin add the regional soil coverage and the geologic shapefile layers to your map and evaluate the role that geology plays in the development of soil formations.

Week 5 – More on shapefiles. How do you import data into one? How do you trim the shapefile to the same shape as your foundation map? How do you generate a new polygon – point – line shapefile?

Assignment – take provided GPS coordinates throughout the Cosumnes basin map of week 4 and successfully import to GIS as a shapefile. Modify data sets to account for mapping inaccuracies.

EXAM 1

Week 6 – How to clip DRG and other graphic files to a shapefile, How to trim a DEM to represent a specific area of interest.

Assignment – Utilizing the map from your previous efforts to isolate one small drainage basin from the map and clip your map and all of its associated layers to represent just the drainage basin of interest.

Assignment – Build a DEM of the Auburn, California area (need 4 DEM’s), import the geologic map over the DEM. Trim to shape. What can be said about the role the Rocklin Pluton might have played in diverting the American River flow to the south through this region?

Week 7 – How to get geometric data from DEM’s and DRG’s (area, volume, perimeter), How to generate cross-sections and slope profiles from the DEM. How to manage profile datasets in EXCEL software.
Assignment – Construct a DEM map of the central portion of the Sierra Nevada and using EASY Profiler, measure the slope of the rivers that drain the western slope. Use EASY Profiler to generate a series of cross-sections through the steepest river valleys and, knowing the age of rocks exposed on the surface, calculate the rate of incision.

Week 8 – How to construct a geodatabase and import GPS data into the map database using shapefiles.
  Assignment – Using data generated in class, produce a simple geology map with specific color assignments for different rock units, include line shapefiles that identify faults and strike and dip conditions and add a legend that explains symbols and colors used.

Week 9 – How to add field collected, geo-referenced data to an ARCMAP file.
  How to display that data, how to alter color schemes to enhance visual properties of data, how to alter proportional data sizes to show numerical differences.
  Assignment – work up a peak stream discharge data set for several gage locations in the project area (USGS archives), convert it into an XYZ data set and then apply to your constructed map. Show the location of all gage stations used, arrange data visually in concert with different colors, and as proportionally variable circles. Discuss the distribution of peak discharges you see relative to general elevation trends as shown on the DEMs.

Week 10 – How to build map images for export maps, how to build legends, scales, and titles in the image, how to modify text within the exported image and how to turn completed maps into image files for import into Powerpoint or other software.
  Assignment - Take map products from Week 9 and apply these lessons to produce images that show a map title, legend, scale, and north arrow across the several different map products.

EXAM 2

Week 11 – Begin individual ARCMAP project after consultation with instructor.
  Assignment - Project must highlight a geological problem and generate a dataset (or sets) through which that problem can be explored. Project must incorporate DEM(s) that cover the field area and find all relevant coverages that outline natural conditions.

Week 12 – Continue work on individual project with instructor

Week 13 – Continue work on individual project with instructor

Week 14 – Class presentations of ARCMAP project

Week 15 – Class presentations of ARCMAP project