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| **Assurance of Student Learning Report**  **2023-2024** | | |
| Ogden College of Science and Engineering | | Department of Earth Environmental and Atmospheric Sciences |
| Undergraduate Certificate in Geographic Information Systems (#174) | | |
| Amy Nemon | | |
| ***Is this an online program***?  Yes  No | Please make sure the Program Learning Outcomes listed match those in CourseLeaf . Indicate verification here  Yes, they match | |

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| ***Use this page to list learning outcomes, measurements, and summarize results for your program. Detailed information must be completed in the subsequent pages. Add more Outcomes as needed.*** | | | |
| **Program Student Learning Outcome 1:**  Students can demonstrate proficiency in the quantitative and qualitative spatial analysis and critical thinking through written and oral communication. | | | |
| **Instrument 1** | Direct: Applied spatial data synthesis and analysis projects utilizing GIS technology, mapping, along with written and oral communication of processes and analysis) is administered in GISC 316 Geographic Information Systems I. A series of three applied projects were completed in the course demonstrating the students abilities to create data, analyze data, display and communicate their findings. All data analysis and projects completed in the course are from real-world data sets. | | |
| **Based on your results, check whether the program met the goal Student Learning Outcome 1.** | | **Met** | **Not Met** |
| **Program Student Learning Outcome 2:**  Students will be able to organize GIS data and communicate effectively through mapping using accepted principles of cartographic design and spatial reference systems. | | | |
| **Instrument 1** | Direct: For the capstone project, students must create a customized research project, in their area of interest. Each project requires data collection, manipulation, analysis, interpretation and display through a traditional map that has a projection for their study area, and develop an attractive map layout that effectively communicates their data set’s theme while adhering to accepted principles of cartographic design, along with an online storymap to further reinforce their process and findings. Each projected was then presented to their classmates. A comprehensive rubric is used to evaluate the capstone project. GISC 317 GIS II is the final 300-level GISC course for all certificate students, so examining the artifacts of this course provides the best overall reflection of students’ basic ability to synthesize and analyze data quantitively and spatially. | | |
| **Based on your results, check whether the program met the goal Student Learning Outcome 2.** | | **Met** | **Not Met** |
| **Program Student Learning Outcome 3:** Students will demonstrate proficiency in GIS project planning, design, and implementation, as well as mastery of advanced geoprocessing and modeling techniques. | | | |
| **Instrument 1** | Direct: Analysis of capstone project in GISC 417 (GIS Analysis and Modeling). A comprehensive rubric is used to evaluate the capstone project. | | |
| **Instrument 2** | Direct: Analysis of six applied projects in GISC 419 (GIS Programming). A comprehensive rubric is used to evaluate all six projects. | | |
| **Based on your results, check whether the program met the goal Student Learning Outcome 3.** | | **Met** | **Not Met** |
| **Assessment Cycle Plan:** | | | |
| Each course, in the certificate program, is taught at least once in an academic year. These courses are continually asessed each academic year. | | | |

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| **Program Student Learning Outcome 1** | | | | | |
| **Program Student Learning Outcome** | Students can demonstrate proficiency in the quantitative and qualitative spatial analysis and critical thinking through written and oral communication. | | | | |
| **Measurement Instrument 1** | Direct: Applied spatial data synthesis and analysis projects utilizing GIS technology, mapping, along with written and oral communication of processes and analysis) is administered in GISC 316 Geographic Information Systems I. A series of three applied projects were completed in the course demonstrating the students abilities to create data, analyze data, display and communicate their findings. All data analysis and projects completed in the course are from real-world data sets. | | | | |
| **Criteria for Student Success** | The overall score on the capstone project will be 70% or higher. | | | | |
| **Program Success Target for this Measurement** | | The goal is for the class average to be 70% or higher on the assessment. | **Percent of Program Achieving Target** | The class average was 84.10%. (n=45) | |
| **Methods** | All sections of GISC 316 during AY24 were included in the data set. A comprehensive rubric was used to evaluate each of the three projects. All project scores were averaged to create the program average. For n=45 students, the program average was 84.10% | | | | |
| **Based on your results, highlight whether the program met the goal Student Learning Outcome 1.** | | | | **Met** | **Not Met** |
| **Results, Conclusion, and Plans for Next Assessment Cycle (Describe what worked, what didn’t, and plan going forward)** | | | | | |
| GISC 316 & GISC 317 (PSLO#2) went through a curriculum change and those changes were implemented this academic year. Ultimately the curriculum was swapped along with the addition of new technologies important for our major and certifate students utilizing this tool. Based on the results of this learning outcome with an average of 84.40% over the three projects things have gone smoothly. We will continue to monitor and upgrade our projects along with the changing technologies. | | | | | |

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| **Program Student Learning Outcome 2** | | | | | |
| **Program Student Learning Outcome** | Students will be able to organize GIS data and communicate effectively through mapping using accepted principles of cartographic design and spatial reference systems. | | | | |
| **Measurement Instrument 1** | Direct: For the capstone project, students must create a customized research project, in their area of interest. Each project requires data collection, manipulation, analysis, interpretation and display through a traditional map that has a projection for their study area, and develop an attractive map layout that effectively communicates their data set’s theme while adhering to accepted principles of cartographic design. In addition students must create an online storymap to further reinforce their process and findings. Each project was then presented to their classmates. A comprehensive rubric is used to evaluate the capstone project. GISC 317 GIS II is the final 300-level GISC course for all certificate students, so examining the artifacts of this course provides the best overall reflection of students’ basic ability to synthesize and analyze data quantitively and spatially. | | | | |
| **Criteria for Student Success** | Students will have earned a grade of 70% or higher on a series of five applied projects to demonstrate proficiency in quantitative and spatial data analysis, critical thinking, and written communication. (see grading criteria at end of document). | | | | |
| **Program Success Target for this Measurement** | | The goal is for the class average to be 70% or higher on the assessment. | **Percent of Program Achieving Target** | The class average was 95.61%. (n=26) | |
| **Methods** | All sections of GISC 317 during AY23 were included in the data set. All project scores were averaged to create the program average. For n=26 students, the program average was 95.61%. A comprehensive rubric (see end of this report) is used to evaluate the capstone project. | | | | |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.** | | | | **Met** | **Not Met** |
| **Results, Conclusion, and Plans for Next Assessment Cycle (Describe what worked, what didn’t, and plan going forward)** | | | | | |
| As mentioned above this was the first section of the newly remodeled GISC 317 course. This was also the first time that a project such as this was implemented in a 300 level GIS course. It is believed that the success rate of an average score of 95.61 occurred as the class spent a number of weeks on the project and students were required to meet and send regular progress reports to the instructor. As the success target for this measurement was met, no follow-up actions are required. Annually, we update all modules in our GISC courses to incorporate any added capabilities of the latest geoscience spatial analysis software and adapt to any changes in GISC technologies and software. Project, assignment, and exam data utilized in our GISC courses are updated to reflect the latest challenges and opportunities present in the geosciences. | | | | | |

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| **Program Student Learning Outcome 3** | | | | | | | |
| **Program Student Learning Outcome** | Students will demonstrate proficiency in GIS project planning, design, and implementation, as well as mastery of advanced geoprocessing and modeling techniques. | | | | | | |
| **Measurement Instrument 1** | Direct measures of student learning (GISC 417): Students in the capstone course, GISC 417 (GIS Analysis & Modeling), were given a final group project for demonstrating skills and knowledge in data visualization and cartography from the core courses, GISC 316 and GISC 317, as well as skills and knowledge from GISC 417. All three courses are required courses in the GIS Certificate program. In addition, students presented their project findings orally. | | | | | | |
| **Criteria for Student Success** | The overall score on the capstone project will be 70% or higher in GISC 417. | | | | | | |
| **Program Success Target for this Measurement** | | | The goal is for the class project average to be 70% or higher on the assessment. | | **Percent of Program Achieving Target** | GISC 417: The class average was 95.6%. (n=23) | |
| **Methods** | In GISC 417, all students’ group papers, project data, and maps from GISC 417 in AY24 (Fall 2022) were evaluated. A comprehensive rubric was used to evaluate students’ planning, design, and project implementation. The total project score of all students was averaged. For n=23 students, the average capstone project score was 95.6%. | | | | | | |
| **Measurement Instrument 2** | Direct measures of student learning (GISC 419): Students in this advanced GIS course, GISC 419 (GIS Programming) completed independently 6 applied projects to implement custom GIS analytical tools with ArcGIS ModelBuilder and Python scripting. | | | | | | |
| **Criteria for Student Success** | The average scores on the six project will be 70% or higher in GISC 419. | | | | | | |
| **Program Success Target for this Measurement** | | The goal is for the class project average to be 70% or higher on the assessment. | | **Percent of Program Achieving Target** | | GISC 419: The class average was 94.1%. (n=17) | |
| **Methods** | In GISC 419, all six applied GIS projects in AY24 (Spring 2024) were evaluated. A comprehensive rubric was used for all six projects. The total project score of all students was averaged. For n=17 students, the average capstone project score was 94.10%. | | | | | | |
| **Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 3.** | | | | | | **Met** | **Not Met** |
| **Results, Conclusion, and Plans for Next Assessment Cycle (Describe what worked, what didn’t, and plan going forward)** | | | | | | | |
| The goals for this SLO were met, so no follow-up action is required for both GISC 417 and 419. We have seen a slight increase in the overall percent of student’s passing the GISC 417 & GISC 419final project with a C or higher compared to the past AY.  As these courses are taught annually, we will continue to assess this outcome in the next academic year. It is vital that we analyze the same statistics, for the next academic year, to better understand if the pandemic contributed to these changes. | | | | | | | |

**GISC 316 Capstone Project Rubric example**

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| Georeferencing – Criteria:   * The image is accurately georeferenced to the orthophotos * The images were given correct spatial metadata (KY State Plane S NAD83 feet) * Include RMS score or table image in write-up | /10pts |
| Feature accuracy - Attribute accuracy – Criteria:   * A polygon feature class was created to hold the soils polygons multiple were created instead of just one as indicated in the directions. -5 * All data sets reside in the geodatabase * the feature class’s spatial reference was correctly defined * all polygons are present * no extra polygons, gaps, slivers of open areas * Domain Created. Students should follow the same set up as learned in the digitizing practice assignment. A suitable attribute domain for soil type was created in the geodatabase. The geodatabase and subsidiary structures have been set up correctly with a domain * Soil type attribute was created and it references the attribute domain * All polygons have been given a soil type attribute value and soil type values are correct * All polygons are labeled with the with a soil type | /35pts |
| Digitizing quality – Criteria:   * lines are smooth * lines accurately placed relative to soil areas on photo at edges * adjacent polygons form a smooth boundary, | /20pts |
| Symbology – Criteria:   * Each lot type has been given a different color and a pleasing color scheme was selected * Labels do not overlap polygon lines and are well place | /15pts |
| Metadata – Criteria:   * Created the required metadata for the soils polygon feature class * The metadata contains good and reasonable information * Did not create | /10pts |
| Project management – Other Criteria:   * all files are present * Jpeg * Write up * no broken links in the map project (broken links=25% deduction) * all names are well chosen and descriptive * All extraneous files (other than the geodatabase & .mxd) have been removed * Named layers in the Table of contents (instead of a legend) * Completion is of professional quality. | /10pts |
| On time? Broken Links  Total: | /100pts |

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| Analysis – Criteria:   * Identified the correct set of parcels * Fully automated the solution * Dealt adequately with the data mismatches (temporal & spatial) and any simplifying assumptions made are reasonable | / 30 points |
| Map - Criteria:   * Symbology – good use of color to convey features * Layout * Balance * Scale – appropriate size & interval length * Legend – identifies features shown * Typography * Font selection & size * Placement of text * Grammar & spelling * Text is accurate & meaningful | / 30 points |
| Procedure – Criteria:   * Clearly describes all steps used in reaching the solution * Identifies the spatial and temporal discrepancies in the data sets. * Grammar, spelling, & style | / 30 points |
| Project management – Criteria:  * all files are present * jpeg included * files are organized in a reasonable manner * no broken links in the map project (additional 25% deduction) * all names are well chosen and descriptive | / 10 points |
| On time? |  |
| **Total:** | **/ 100 points** |

**GISC 317 Capstone Project Rubric example**

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| Topic & Presentation Logistics: Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * Topic pproved by professor * research question is\_\_\_\_\_\_ * Submitted progress report * Attended meetings with professor * Present for both days of presentations April 22 & 24 * Presentation submitted on time for presentation date 8am on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Final Project turned in on time. Due\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * All files turned in: map project, pdf of project, story map link, write up * Other | /10pts |
| Detailed Write up   * Word, 12pt font, double spaced or bulleted points. * Make sure there are headings for each section of the write up * Describe why you chose this topic * Include screenshots of your process as you go * Detailed description of the process to: * A) Data collection or Creation process that you did to get your specific data into the GIS, (see section below for what to include) * B) Analysis: Describe the tools and layers used for each step of the analysis. If you using queries then the equation should be in the write up. (see section below for what to include) * Analysis Interpretation * Findings/Trends * Well interpreted * Other | /10pts |
| Data collection   * Process of data collection explained in detail for clear understanding * Links for any collection should be included in the write up * Details of any manipulation to the datasets to get them to work in the GIS * Details any digitizing, domain creation if used * Created Metadata (see section below) * All data used and layers created should be in the geodatabase and not deleted * Metadata was created for any layers manipulated through data collection, data creation or analysis from its original form * Does the new metadata include your name, data, and all other details of the collection process or analysis that led to the output? * Other | /20pts |
| Analysis:   * Write up clearly explains all tools and layers used for each step of the analysis * If you using queries then the equation should be in the write up * Write up should include why this process was chosen specifically for this research question * Accuracy * Other | /20pts |
| Create a map layout, in Pro, of your final solution   * Do not include any unnecessary details * Layout, balance * Use of inset * Color * Typography * Title * Legend * Source/name * Scale * File management: * Broken links * Names * Data frame names * Projection * Submitted all the layers for the project in one geodatabase * Other: | /20pts |
| Storymap:   * Created a story map * You have much flexibility in your storymap but here are some guidelines I will grade on: * Published your map into the app from pro * Using details from your write up; these sections required: * 1-Abstract/question * 2-Data collection process * 3-Analysis used * 4-Findings and interpretations * Should have a map or image for each section * Published correctly * Other | /20pts |
| Grade: | /100 |
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GISC 417 Capstone Project Rubric Example

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| Project planning & design – Criteria:   * Study area determined * Facility type determined * A project proposal with project objectives and steps | /10pts |
| Project data collection – Criteria:   * Sidewalk centerlines collected in the study area with GPS and Collector for ArcGIS * Other required GIS datasets collected in the study area, e.g. facilities, crosswalks, junctions, steps * Project data made available on ArcGIS Online as basic web maps * All project data sets converted in a project geodatabase | /20pts |
| Project data processing – Criteria:   * Sidewalk centerlines planarized * A network dataset built with sidewalk centerlines and walk time cost attribute | /20pts |
| Network analysis – Criteria:   * A service area analysis conducted to general walk time network polygons with proper walk time breaks | /20pts |
| Project map – Criteria:   * A final ArcGIS Online map created | /10pts |
| Project report – Criteria:   * In APA style: page numbers, title page, font and font size, line spacing, justification, and margins * Figures and tables titled and numbered * Project sections: Introduction, Data and Methods, Results, Conclusions * Maps must follow standard principles of cartographic design: layout, legend, map title, scale, etc. | /20pts |
| Total: | /100pts |

GISC 419 Project Rubric Example

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| Data/file management – Criteria:   * Practice good data/file management: subfolders, file/data names * Submission files in a single zipped folder file | /10pts |
| Tool development – Criteria:   * Target geoprocessing workflow identified and tested manually * Custom tool developed with proper tool parameters and properties. * Custom tool tested and debugged without any errors | /60pts |
| Tool documentation and metadata – Criteria:   * Basic naming conventions followed in ArcGIS models or Python scripts * Proper labels added in ArcGIS models * Proper comments added in Python scripts * Tool metadata created | /20pts |
| Project short report – Criteria:   * In APA style: page numbers, title, font and font size, line spacing, justification, and margins * Figures and tables titled and numbered * Report presented in sections * Main lessons learned reported in the conclusion section | /10pts |
| Total: | /100pts |

**\*\*\* Please include Curriculum Map (below/next page) as part of this document**

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| **Program name:** | Certificate in GIS |
| **Department:** | EEAS |
| **College:** | Ogden |
| **Contact person:** | Amy Nemon |
| **Email:** | [amy.nemon@wku.edi](mailto:amy.nemon@wku.edi) |

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| KEY: |
| I = Introduced |
| R = Reinforced/Developed |
| M = Mastered |
| A = Assessed |

LO1: Students will be able to organize GIS data and communicate effectively through mapping using accepted principles of cartographic design and spatial reference systems.

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| GISC | 316 | Fundamentals of GIS | I, R, M, A |
| GISC | 317 | Geographic Informations Systems | M, A |
| GISC | 417 | GIS Analysis & Modeling | M, |
| GISC | 419 | GIS Programming | M |

LO2: Students can demonstrate proficiency in the quantitative and qualitative spatial analysis and critical thinking through written and oral communication.

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| **Course Subject** | **Number** | **Course Title** |  |
| GISC | 316 | Fundamentals of GIS | I |
| GISC | 317 | Geographic Informations Systems | R, M, A |
| GISC | 417 | GIS Analysis & Modeling | M |
| GISC | 419 | GIS Programming | M |

LO3: Students will demonstrate proficiency in GIS project planning, design, and implementation, as well as mastery of advanced geoprocessing and modeling techniques.

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| **Course Subject** | **Number** | **Course Title** |  |
| GISC | 316 | Fundamentals of GIS | I |
| GISC | 317 | Geographic Informations Systems | R |
| GISC | 417 | GIS Analysis & Modeling | M, A |
| GISC | 419 | GIS Programming | M, A |