On Tuesday, January 21, the ASC Natural and Mathematical Sciences Panel reviewed our resubmission to add GE Data Analysis to Geography 2200.

On March 27, we were then asked to update our proposal again, following newly developed guidelines. These guidelines provide minimum numbers of instructional hours spent on specific topics. The table indicates the number of hours for each of these topics, and total hours for each topic are summarized at the end. The revised text is highlighted in track-changes for ease of reading.

The Panel asked us to address the following two points:

1. *Probability is part of the GE Data Analysis expected learning outcomes. Please show how probability is covered in the course. Is it in an exercise, in a textbook, or elsewhere? (The week schedule does not mention the word probability.)*

Response:

In week 8 we introduce students to Remote Sensing and Image Maps (Chapter 9 in the text) and the closely related issue of map accuracy and uncertainty (Chapter 10). The lectures and text introduces *basic concepts of probability*, such as measurement error and bias in the context of attribute and location accuracy

In week 9, we then look at spatial autocorrelation through the lens of relative frequencies and empirical distributions as expressions of probability.

During week 8 and 9, students work on a Practical Exercise (PE5, submitted in our previous response) that develop and assess their understanding of how an empirical distribution can be derived and used to interpret a map pattern in terms of how probable it is compared to a random pattern. These two weeks introduces these concepts using data about income disparities in the Columbus area, which allows students to make real world connections.

In weeks 11 and 12 we continue to explore probability in PE6 (also submitted previously) through the lens of point patterns and the use of *p*-values to do test a hypothesis.

Below we specify how the course schedule includes the minimum instructional hours for the core requirements (Denoted C1= Notions of probability, C2= Basics of statistical inference) and the additional requirements (Denoted A1-A4) as outlined in the guidelines.

## Schedule

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| --- | --- | --- | --- |
| Week # | Topic | Practical Exercise (PE) | Required coursework hours |
| 1 | Why is spatial special? Introduction to geographic information | 1. Spatial observations | C1=0.5 hour  A1=1 hours |
| 2 | Spatial observations |  | C1=0.5 hour  A1=2 hours |
| 3 | Visual Variables | 2. Drawing a map | A2=2 hours |
| 4 | Map coordinates and projections |  | A2=1 hours |
| 5 | Hot and cold: weather patterns and what makes a climate | 3. Isoline climate maps | C1=0.5 hour  C2=0.5 hour  A2=0.5 hour |
| 6 | Isoline maps and analysis |  | C2=0.5 hour  A4=1.5 hours |
| 7 | Crossing the line: the nature and significance of political boundaries | 4. Map accuracy and uncertainty | C1=1 hour  C2=0.5 hour  A2=0.5 |
| 8 | Remote sensing and image maps |  | C2=1 hour  A2=1 hour |
| 9 | Where’s Wall Street? The wealth of nations and their connections | 5. Spatial data exploration and autocorrelation | C1= 1 hour  A2=2 hours |
| 10 | Multi-variate data and visualization |  | C2=1.5 hour  A2=1 hours  A3=0.5 hours |
| 11 | Spatial pattern analysis | 6. Spatial pattern analysis | C1=0.5 hour  C2=0.5 hour  A3=0.5 hour |
| 12 | Spatial association analysis |  | A2=0.5 hours  A3=1 hour |
| 13 | Volunteered geographic information and the new Wiki cartography | Term Paper | C1=0.5 hours  A1=0.5 hours |
| 14 | What can maps do for us? Personally selected topic related to the course material |  |  |
| 15 | What can maps do for us? Cont. |  |  |

In summary, the time spent across the Core and additional requirements comes out approximately as follows:

C1 Notions of probability - 4.5 hours

C2 Basics of statistical inference – 4.5 hours

A1 Understanding where data come from – 3.5 hours

A2 Summarizing data graphically and numerically – 8.5 hours

A3 Methods of statistical inference – 2 hours

A4 Statistical modeling – 1.5 hours

1. *Make sure that the GE assessment plan strictly covers assessment of GE expected learning outcomes. The first and third mechanisms listed in the plan do not address GE expected learning outcomes: (1) quantitative student SEI evaluations do not have questions that specifically address the GE Data Analysis expected learning outcomes and (2) the “use of a rubric to assess the course goals” assess the “course goals” (as indicated) not the GE expected learning outcomes. (It is fine to discuss assessment of course goals if Dept wishes, but that information would need to be separated from GE assessment.)*

Response:

We apologize for some confusion due to a typo in our previously submitted material, it should say “use of a rubric to assess the course objectives”. In item 4 of our proposal we have identified three specific GE ELOs: (1) Students understand basic concepts of statistics and probability, (2) comprehend methods needed to analyze and critically evaluate statistical arguments, and (3) recognize the importance of statistical ideas. The table shows how our course objectives map onto these GE ELOs. All three of the GE ELOs are assessed in the term paper through course objectives 1, 2, 4 and 5, using the tentative rubric below.

Using this rubric, we will be able to score each student on the GE ELO’s and provide a short report on how students are meeting the Data Analysis ELOs

|  |  |  |  |
| --- | --- | --- | --- |
| Course Objective  (GE ELO #) | **Excellent (5-4 points)** | **Sufficient (2-3 points)** | **Insufficient (1-0 points)** |
| 1. employ basic methods of spatial data-gathering, presentation, and interpretation  (GE ELO #2) | Clear understanding of  methods, their limitations and  usage | Moderate understanding  of methods usage | Poor understanding/ description of  methods |
| 2. interpret map symbology in order to analyze and critically evaluate the spatial structure of and relationships among spatial phenomena  (GE ELO #2) | Clear and critical evaluation of findings | Moderate but sufficient attempt to critically evaluate findings | Significant gaps in understanding the  critical findings and/or no attempt to  critically evaluate findings |
| 4. apply statistical ideas to seek explanations for unusual or interesting patterns on maps  (GE ELO #1) | Uses statistical ideas appropriately and effectively, providing sufficient evidence and explanation to convince. | Begins to interpret the evidence and explain connections between evidence and statistical ideas. | Depends on overgeneralizations for support, or offers little evidence of any kind. More personal narrative than essay, or summary rather than analysis. |
| 5. evaluate the impact of spatial data sampling and uncertainty on map use  (GE ELO #3) | Demonstrates a clear understanding of how sampling and uncertainty affect integrity of the information | Demonstrates a basic but limited understanding of how data integrity is affected by sampling and uncertainty | Paper is lacking in description of sampling and uncertainty, or the description is unclear |

*Geography 2200 Term Paper – tentative grading rubric*