A. **TITLE:** Introduction to Geographic Information Systems

B. **COURSE NUMBER:** CONS 350

C. **CREDIT HOURS:** (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)

   # Credit Hours: 3
   # Lecture Hours: 2 per week
   # Lab Hours: 3 per week
   Other: per week

   Course Length: 15 Weeks

D. **WRITING INTENSIVE COURSE:** Yes ☐  No ☒

E. **GER CATEGORY:** None: ☒  Yes: GER
   If course satisfies more than one: GER

F. **SEMESTER(S) OFFERED:** Fall ☐  Spring ☒  Fall & Spring ☐

G. **COURSE DESCRIPTION:**

   The course introduces students to GIS terminology, the concept of relational databases, spatial data models, topology, raster data and vector data. Data entry methods, including quality control and metadata area discussed. The student is introduced to spatial analysis applications including terrain analysis, cartographic modeling and visualization. Students apply knowledge in the laboratory using GIS software.

H. **PRE-REQUISITES:** None ☐  Yes ☒  If yes, list below:

   ENGS 101, CITA 108, CITA 109, or SOET 101, and sophomore status; or permission of the instructor.

   **CO-REQUISITES:** None ☒  Yes ☐  If yes, list below:
### I. STUDENT LEARNING OUTCOMES: (see key below)

By the end of this course, the student will be able to:

<table>
<thead>
<tr>
<th>Course Student Learning Outcome [SLO]</th>
<th>Program Student Learning Outcome [PSLO]</th>
<th>GER [If Applicable]</th>
<th>ISLO &amp; SUBSETS</th>
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<tbody>
<tr>
<td>a. Define terminology applicable to Geographic Information Systems</td>
<td>2488: 1a</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>b. Compile and organize spatial and attribute data to create a map that communicates information.</td>
<td>2488: 1b, 7c</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>c. Comprehend the importance of map projections, datums and coordinate systems and apply corrections to synthesize data from different sources.</td>
<td>2488: 1ab, 6b</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>d. Create a map by synthesizing and georeferencing data from old drawings.</td>
<td>2488: 1ab, 6b, 7c</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>e. Evaluate spatial and attribute data to determine trends and impacts.</td>
<td>2488: 2a, 3c, 6b</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
<td>Subsets Subsets Subsets Subsets</td>
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<td>f. Create a map from GPS, remotely sensed or independently processed data.</td>
<td>2488: 1ab, 7c, 11ad</td>
<td>5-Ind, Prof, Disc, Know Skills ISLO ISLO</td>
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<td>ISLO #</td>
<td>Institutional Student Learning Outcomes [ISLO 1 – 5]</td>
<td>ISLO &amp; Subsets</td>
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<td>1</td>
<td>Communication Skills</td>
<td>Oral [O], Written [W]</td>
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<td>2</td>
<td>Critical Thinking</td>
<td>Critical Analysis [CA], Inquiry &amp; Analysis [IA], Problem Solving [PS]</td>
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<td>3</td>
<td>Foundational Skills</td>
<td>Information Management [IM], Quantitative Lit./Reasoning [QTR]</td>
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<td>4</td>
<td>Social Responsibility</td>
<td>Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]</td>
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<td>5</td>
<td>Industry, Professional, Discipline Specific Knowledge and Skills</td>
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*Include program objectives if applicable. Please consult with Program Coordinator!
J. **APPLIED LEARNING COMPONENT:**  

Yes ☒  No ☐

If YES, select one or more of the following categories:

- Classroom/Lab ☒
- Internship ☐
- Clinical Placement ☐
- Practicum ☐
- Service Learning ☐
- Community Service ☐
- Civic Engagement ☐
- Creative Works/Senior Project ☐
- Research ☐
- Entrepreneurship ☐
- (program, class, project)

K. **TEXTS:**


L. **REFERENCES:**

M. **EQUIPMENT:** None ☐  Needed: Computer labs with ArcGIS software.

N. **GRADING METHOD:**  A-F

O. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

- Exams
- Quizzes
- Laboratory Projects
- Final Project

P. **DETAILED COURSE OUTLINE:**

Introduction to GIS  
A. Components of a GIS  
B. GIS software  
C. GIS applications  
II. Data Models  
A. Data modeling concepts  
B. Vector data models  
C. Raster data models  
III. Geodesy  
A. Shape of the earth  
B. Units of measurement  
C. Map projections  
D. Coordinate systems  
IV. Map creation  
A. Creating a database  
B. Digitizing  
C. Coordinate transformation  
D. Map outputs  
E. Metadata  
V. Global navigation satellite system  
A. GPS basics  
B. Differential correction  
C. GPS applications  
VI. Aerial and satellite imagery  
A. Basic principles  
B. Air photo interpretation  
C. Satellite imagery  
   i. Sources  
   ii. Interpretation  
VII. Digital Data  
A. Attribute data and tables  
B. Relational databases  
C. Normal forms  
IX. Spatial analysis  
A. Boolean algebra  
B. Classification  
C. Dissolving  
D. Proximity functions and buffers  
E. Overlaying  
F. Clipping  
G. Network analysis  
X. Raster analysis  
A. Map algebra  
B. Local functions  
C. Neighborhood functions  
   i. Zonal functions  
   ii. Cost surfaces  
XI. Terrain analysis  
A. Slope and aspect  
B. Hydrologic functions  
C. Viewsheds  
D. Profile and contour plots  
E. Shaded relief maps  
XII. Spatial models and modeling  
A. Cartographic models  
B. Weighting and ranking  
C. Spatio-temporal models  
D. Examples
Q. LABORATORY OUTLINE: None □ Yes □

II. Introduction to ArcGIS II.
Reprojecting map layers III. Map Design and Layouts IV. Using imagery to prepare a map - V. Georeferencing old data VI. Proposal for student project VII. Using attribute tables VIII. Spatial analysis IX. Terrain analysis X. Cartographic Modeling XI. Student Project