Course Identifier: GEO 221-V (section 730)

Course Name: Introduction to Geographic Information (Virtual)

Department: Geography        College: Social Science

Primary contact name, phone number, and email
(normally this will be the lead instructor)

Adrienne Domas, 517.432.3769, domas@msu.edu

Faculty and Staff Involved in Developing and Offering the Course
(please list full name, position at MSU, email address, and project role for each person)

<table>
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<th>MSU Affiliation</th>
<th>EMAIL (PROJECT ROLE)</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

Semester(s) offered in 2009-2010 and number of students enrolled:

<table>
<thead>
<tr>
<th>SEMESTER</th>
<th># STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer 2009 (US-09)</td>
<td>49 (in a section of 50)</td>
</tr>
<tr>
<td>Spring 2010 (SS-10)</td>
<td>106 (in a section of 100)</td>
</tr>
</tbody>
</table>
I. Course Description (400 word limit)

Introduction to Geographic Information (GEO 221-V) introduces students to the importance of geospatial information and the tools to access, analyze, and visually display it. Geospatial information influences many things in today’s world. Location-based technologies and satellite imagery create a worldwide knowledge base of geographic information that is essential for studying many social and environmental issues, including climate change, migration patterns, emergency management, and sustainable city planning.

This 15-lesson, fully online course meets the important educational goal of helping students understand the application of geographic technologies and the ethical issues they raise. It is open to a diverse group of students: both geography majors and students majoring in other disciplines. The course begins with an introduction to geography’s unique perspective on understanding human and natural patterns and processes. After the introductory material, students learn the fundamental principles and techniques of remote sensing, Geographic Information Systems (GIS), and cartography.

- **Remote Sensing** (Three lessons and one lab assignment): Remote Sensing is the use of satellite images and aerial photographs to gather information about the earth’s surface. Students learn how to interpret these images, as well as the applications of remote sensing.
- **GIS** (Two lessons and two lab assignments): GIS is a system of hardware and software for storing, mapping, and analyzing geographic data. Students learn the structure of a GIS, fundamental tools for GIS analysis, and applications of GIS in environmental and social sciences.
- **Cartography** (Three cartography lessons and one lab assignment): Students learn the principles for creating readable, informative, and creative maps. They also learn about people’s understanding of map components (e.g., their perception of colors and symbol shapes/sizes).

The course concludes with a discussion of ethical issues associated with the use and display of geographical information, such as locational privacy, as well as an entire lesson devoted to the many practical applications for the geographic tools discussed in the course (e.g., the use of satellite images to assess damage from the recent Haiti earthquake).

II. Learning and Interaction Goals of the Fully Online Course

GEO 221-V is **award-worthy** because it teaches Geographic Information (GI) in fresh and innovative ways that are also compatible with the course topics. GI and related technologies have become almost entirely computer and web-based; therefore, online delivery of course content is logical as it can be used to encourage students to explore and use web-based examples to supplement course content. Additionally, GI is spatial in nature and is best represented graphically – through maps, imagery, illustrations, etc. that are all very appropriate for display and discussion in an online environment. This is an award-winning online course for several more reasons:

- **Builds on our experience**: Course design and development was based on years of experience developing and managing online courses in Geography (GEO 206-V, launched in 1999; ISS 310-V, launched in 2002; GEO 204-V, launched in 2003; GEO 330-V, launched in 2005; GEO 324-V, launched in 2008; and GEO 802-V, launched in 2009) and listening to our students’ (over 8,800 to date) and Instructors’ (51 to date) feedback. We have had the opportunity to incorporate many features into our courses and use only those that are truly useful to students. Furthermore, we have published our experiences in the *Journal of Geography*: WinklerPrins, A.M.G.A., B.N. Weisenborn,
• **Unique content:** Few other geography, social science, or environmental science courses offer a combined introduction to geospatial tools. These tools are nearly always used in conjunction with one another (e.g., it is common to import remote-sensing imagery into a GIS program, use GIS to analyze the image, and then use cartographic tools to make a map that presents the analysis). Therefore, it is logical that one course teaches the topics together. Our course also addresses other unique topics that are not covered in other classes, but are particularly relevant to students, most of whom are familiar with easily available geographic tools, such as GoogleEarth. These topics include ethical issues regarding the use of geographic information and the rise of ‘volunteered’ geographic information (e.g., tools such as WikiMapia, Open StreetMap, and so on).

• **Unique lab component:** Lab exercises are the most interactive feature of GEO 221-V. By using a variety of applications (e.g., GoogleEarth, ArcIMS, TatukGIS, ColorBrewer, etc.), they offer students the opportunity to apply lesson concepts and tools to solve real-world problems, such as studying water loss in northern Africa’s Lake Chad, or selecting the most suitable map projection and color schemes for a map presented in a particular viewing environment (e.g., online, in newspapers, etc.).

• **Application of interactive tools:** We use a wide variety of media (see Sections III and IV) to create a student-focused course that specifically aims to enhance each student’s learning experience and encourage active learning. The course is not merely uploaded presentations or videotaped lectures that focus only on the course material. Rather, the course integrates many forms of media to deliver course content and provides numerous avenues of individual learning for students. We aim to satisfy the needs of multiple learning levels, abilities, and styles. Thus, GEO 221-V encourages students to be active participants in their learning process.

**Goals**

In creating the online version of GEO 221-V, we set a variety of pedagogic, entrepreneurial, and administrative goals.

Our **pedagogic objectives** included:

1. To use technology to create an innovative environment for exploring and understanding geographic information;
2. To create a course that encourages students to gain a better understanding of the world through geographical knowledge and to apply that knowledge to current world events, issues, and datasets;
3. To use our online course delivery to help raise the standard of the lecture version of the class.

Our **entrepreneurial and administrative objectives** included:

1. To increase the Geography Department’s visibility within MSU and beyond;
2. To provide additional sections of a required/elective course for students wanting to take a course from their off-campus locations;
3. To increase student interest in additional online Geography courses and encourage students to consider the benefits of becoming a Geography major.

Overall, the course design creates an interactive learning environment that helps students apply a geographic perspective to both their academic studies and their lives as citizens, and to understand the important role of geographic tools in problem solving.
III. Points of Interest and Innovation

The following are brief descriptions of GEO 221-V’s main points of interest and innovation.

Content features

- **Lesson Dashboard:** Students see the Dashboard when they enter a lesson (see Figure 1). The yellow box provides basic information about the lesson (e.g., objectives, topics, introductory video clip, associated readings, etc.). The Dashboard also contains the lesson pages (i.e., Content outline, Key terms & concepts, Studying tips, Intro page, and Topic pages), self-assessment, and checklist.

- **Introductory Video Clips:** Dr. Goldsberry and Ms. Domas recorded 3-5 minute video clips to introduce each lesson (see Figure 1). Here, they describe the lesson content and its relationship to previous and upcoming lessons. The clips also add a more personal feel to the online experience.

- **Lesson Outline & Key Terms and Concepts:** Students can use the outline and list to help them take notes and study for exams (see Figure 1).

- **Summary & Lesson References:** Each lesson concludes with a material summary and a look forward to the upcoming lessons (see Figure 1). We also provide full citations for the references used in the lesson, which is especially useful for students who would like to do additional reading on a topic.

- **Self-assessments:** Assessments were created in response to evaluations in our earlier online courses (see Figure 1). Students indicated that they would like to practice taking tests online so that they felt more comfortable during the actual exams. They also help students test their understanding of the material.

- **Custom Maps and Graphics:** Most maps and figures appearing in the lessons were custom-designed for GEO 221-V. We spent a great deal of effort designing our own graphics so that they were tailored specifically for our lesson text and created specifically for online viewing (see Figure 2).

- **Feature Boxes:** Special boxes have been added throughout the lessons to call attention to content and visually break-up the page (see Figure 2). These boxes include “At This Time” activities, “Key Point” re-iterations, “Side Note” comments, “Follow-up” discussions, and “Tips.”

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**Figure 1.** Screenshot of a Lesson Dashboard page, providing all of the components students will need in order to complete a lesson. Notice the underlined abbreviations, which denote the use of abbr tags to state what each abbreviation stands for. Also notice the links to the video file and transcripts beneath the video clip box. (Example is from the Lesson 8 Dashboard.)

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**Lesson 8: Introduction to Geographic Information Systems**

**Objective:** To introduce basic GIS concepts, including data attributes, accuracy and reliability of geographic information, and an introduction to applications of GIS.

**Topics:**
- Part 1: Definition of GIS
- Part 2: Geographic data - structure and format
- Part 3: Data layers

**Self-assessment:** Test your understanding of the lesson material. (Located in this lesson’s folder.)

**Associated text chapter:** This lesson is supplemented by readings from Chapter 13, pages 256 and 262-267 (about accuracy and reliability).

**Lab:** GIS I, Data Exploration. (Located in the Lab Assignment folder.)
• **Above And Beyond Activities**: Included on nearly every page of the lessons is a list of internet resources for students to explore if they would like additional information about the topics covered on that page (see Figure 2). These resources include relevant online news articles about concepts, interactive graphics and/or maps, and links to related websites.

![Figure 2](image2.png)

**Figure 2.** Example of a lesson page (Lesson 2, page 5), which includes a block of text, a custom illustration with captioning and reference, a feature box, and *Above And Beyond* activities.

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• **Online Lab Exercises**: All lab exercises include an instruction page, write-up, and assessment (for submitting answers to completed labs) (see Figure 3). As mentioned previously, labs employ a variety of geographic tools, such as GoogleEarth, TatukGIS (a GIS freeware), and ColorBrewer (an online program designed to assist mapmakers with choosing appropriate colors and typefaces for map design), among others. Labs give students the opportunity to apply course concepts to real-world issues, such as interpreting aerial imagery to track urban growth in Beijing (China), and using GIS to trace the source of pollution to a lake in southeast Michigan. The lab exercises introduce students to the wide variety of free geographic tools and datasets on the web (which they could use in their future classes). They also provide a good foundation for using GIS desktop software in more advanced courses.
• **Camtasia:** We use Camtasia to illustrate steps or important skills needed to complete each lab. This way we can effectively simulate a walkthrough of the lab as it would be done in a lecture section.

**Management features**

- **Learning Object Repository (LOR):** A LOR was created to house GEO 221-V’s original content, assessments, and supplemental features. This is essential in the administration and management of multiple sections of the course. The LOR allows multiple course administrators to edit all content and assessments in one location, yet have the freedom to run large sections independently.

- **RSS Feeds, News Articles, & Polls:** We employ RSS feeds (see Figure 4) to keep the course as current as possible. Additional links to sites and more static features are also News Article postings. We also use ANGEL’s Poll feature to obtain students’ opinions on current events and/or the course material.

**Additional features**

- **labIDAT:** Although we have the ability to create graphics with static labels of image features, we find it extremely useful to provide dynamic labels for geographic features in satellite/aerial imagery (see Figure 5). Using vuDAT’s labeling widget, we have created interactive images that students can roll over to read notes about different features. Students can also hide labels – allowing them to view the entire unobstructed image to practice the skill of image interpretation.

- **digitizeDAT:** One of our lessons introduces students to the interpretation of geographic features in aerial imagery. Traditionally this is done by showing an image and discussing examples of typical features, which we do in our lesson. We realize, however, that feature recognition seems far easier using this approach than in real-world applications. As a result, we worked with vuDAT to develop a digitizing application that displays an unlabeled aerial image and gives students the opportunity to not only identify features, but also attempt to delineate, digitize, and label them (see Figure 6). These digitizing practice activities aim to simulate real-world imagery interpretation.
pollDAT: We have placed in-lesson polls (using vuDAT’s polling widget) throughout lessons, in places where an Instructor would normally ask students a question in a lecture format (see Figure 7). This encourages student interaction.

Figure 5. Example of a labelDAT image that is embedded in Lesson 5, on page 4.

Figure 6. Example of a digitizeDAT activity included in the lesson on Aerial Image Interpretation (Lesson 6 folder).
V. Evidence of Effectiveness with Students

We began collecting student data during the first offering of GEO 221-V (US09) to gauge course effectiveness. We are interested in whether the online course is comparable to and is more or less effective than the GEO 221 lecture version. The following questionnaires were used to gather information from anonymous, willing students at the beginning and end of the session.

- **Entrance Questionnaire**: This is delivered the first week of class and used to gather information about the students and their reasons for taking the course.
- **Course Evaluation**: This is given the last week of class. It contains 77 questions aimed to evaluate the course in general, instructor, online-learning experience, interactions (as compared to traditional lectures), as well as provide students with the opportunity to suggest improvements.
- **Student Learning Outcome (SLO) Assessment Questionnaire**: Dr. Judy Olson and Jessica Winans (both associated with the Geography Department, but not with GEO 221 instruction) designed an assessment to gauge students’ learning of the material taught in GEO 221 (lecture and online). The assessment was granted IRB exemption and ran in SS09, US09, and FS09. The intake questionnaire, given the first week of class, contains 30 multiple choice questions that students should be able to answer upon successfully completing GEO 221. Follow-up questions were embedded within the required exams and their data compiled to make the exit questionnaire. Final grade data were also compiled. We were interested in testing whether assessment performances could predict final-grades. Preliminary results were presented at a recent conference (Olson, J., A.M.G.A. WinklerPrins, J. Winans, and B. Weisenborn. “Assessment in Selected Courses at Michigan State University.” Conference of the National Council for Geographic Information meeting, San Juan, Puerto Rico, September 2009). The assessment was re-designed accordingly so that it could be given during SS10.

How are students performing in GEO 221-V?

**Grade Comparisons**
A comparison of final scores from the lecture and online versions of GEO 221 show that students appear to be performing better in the online section.

<table>
<thead>
<tr>
<th></th>
<th>Exam 1</th>
<th>Exam 2</th>
<th>Exam 3</th>
<th>Lab 1</th>
<th>Lab 2</th>
<th>Lab 3</th>
<th>Lab 4</th>
<th>Lab 5</th>
<th>Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS09 (lecture)</td>
<td>78.5%</td>
<td>80.2%</td>
<td>83.2%</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>US09 (online)</td>
<td>74.8%*</td>
<td>79.3%</td>
<td>81.2%</td>
<td>80.8%*</td>
<td>86.4%</td>
<td>80.4%</td>
<td>64.8%</td>
<td>81.5%</td>
<td>81.7%</td>
</tr>
<tr>
<td>FS09 (lecture)</td>
<td>78.2%</td>
<td>79.5%</td>
<td>80.7%</td>
<td>86.8%</td>
<td>80.0%</td>
<td>74.4%</td>
<td>70.8%</td>
<td>70.8%</td>
<td>79.0%</td>
</tr>
</tbody>
</table>

*We suspect the lower average for Exam 1 & Lab 1 has to do with students’ inexperience with the online format.

** Labs for the class were updated with the first summer session offering. Lab scores offered in the SS09 section cannot be compared, as the labs had a different content and format.

How are we doing in administering GEO 221-V?

**Course-Student-Instructor Interactions**
We are successfully connecting with the students, as evidenced by student responses. Questions on the SIRS and SOCT student evaluations were scored using a Likert scale, asking students if they Strongly Agree (1 pt), Agree (2pts), are Neutral (3 pts), Disagree (4 pts), or Strongly Disagree (5 pts) with the question or statement. Below are average scores for several questions that assess students’ learning in the course, their interest in the material, and how the course was presented.
• **checkDAT**: At the end of each lesson we provide students with a check list of all tasks associated with that lesson (see Figure 8). A student can check off the tasks that they have completed and then, in preparation for the exam, view the master list of all tasks associated with that exam. The tasks that were completed earlier are shown, as well as the tasks that the student has yet to complete.

![Checklist for Exam 1](#)

**Lesson 1**

These are the lesson components that you need to complete in order to be prepared for Exam 1.

- [ ] Read Lesson 1.
- [ ] Re-read the Lesson 1 and take notes.
- [ ] Learn the key terms and concepts for Lesson 1.
- [ ] Take the self-assessment for Lesson 1.
- [ ] Discuss any questions you have about Lesson content with your instructor or fellow students.

**Course Message Boards and Discussions**: Course Message Boards allow students to interact with each other throughout the semester. The message boards provide a discussion forum for anything from clarifying concepts covered in lecture to sharing experiences that relate to geographic topics (e.g., sharing travel photos).

IV. **Accessibility**

Because we began development and production of this course shortly after MSU’s Web Accessibility standards were introduced, we were able to incorporate many accessibility features into our course. Some of the accessibility features include:

- Use of *alt, title, abbr, acronym* tags and **XHTML code** for screen-readers (see Figure 1);
- Use of *captioning* beneath all images and figures (see Figure 2);
- **Transcripts** of introductory video clips for all lessons (see Figure 1); and
- Use of **Teams** to setup custom assessment settings (e.g., extended time-limits) for students with RCPD VISAs.

So far we have received positive feedback from the RCPD students currently enrolled in GEO 221-V (there were no RCPD students in the US09 section).
Most questions in the course evaluation (averages are reported below) written specifically for online Geography courses ask students to rank characteristics of the course as Superior (1 pt), Above Average (2 pts), Average (3 pts), Below Average (4 pts), or Inferior (5 pts).

<table>
<thead>
<tr>
<th>Online Geography Course Evaluation Questions</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course website organization.</td>
<td>1.9 – Above Average</td>
</tr>
<tr>
<td>Utilization of links to external websites.</td>
<td>1.7 – Above Average</td>
</tr>
<tr>
<td>Use of case studies</td>
<td>2.1 – Above Average</td>
</tr>
<tr>
<td>Your evaluation of the technical quality of the online course materials.</td>
<td>2.0 – Above Average</td>
</tr>
<tr>
<td>Your evaluation of the aesthetic quality of the online course materials.</td>
<td>2.0 – Above Average</td>
</tr>
<tr>
<td>The ease of navigating through the course web site.</td>
<td>2.0 – Above Average</td>
</tr>
<tr>
<td>The instructor's enthusiasm in talking about course material.</td>
<td>2.0 – Above Average</td>
</tr>
<tr>
<td>The course as an intellectual challenge.</td>
<td>2.2 – Above Average</td>
</tr>
<tr>
<td>Improvement in your competence in this area due to this course.</td>
<td>2.2 – Above Average</td>
</tr>
<tr>
<td>The web was used effectively in this class.</td>
<td>2.2 – Above Average</td>
</tr>
</tbody>
</table>

What are students saying about the course? (Submitted anonymously.)

What surprised you about the course?
- “The amount of material covered was more than I anticipated.”
- “What surprised me most about the course were the labs. I didn’t understand how a lab was going to be distributed through an online course.”
- “It gave a great deal of information but still was not just reading a bunch. There was interaction and I actually enjoyed the labs.”

What did you like about the course?
- “How advanced the technology was when using the different geographic programs.”
- “I liked learning about the satellite images and how to read the different images.”
- “I enjoyed working on the labs especially when they were real world problems.”

VI. Plans for Sustainability

The initial success of GEO 221-V means that the course will continue to be offered in multiple sections (both in the summer and full-semester formats) throughout the academic year. The key to sustainability lies in the Department’s creation of three Online Course Coordinator positions. The Online Course Coordinators are solely dedicated to the development, maintenance, coordination, and management of the Department’s online courses, including GEO 221-V (see Figure 9).

Beyond the Online Course Coordinator positions, future plans for GEO 221-V include content update and improvement, development of new labs, incorporation of new geographic and pedagogic technologies, growth/recruitment of students, and on-going collaboration with vu-DAT.
Content update
Yearly content and pedagogical updates and bi-yearly site maintenance are essential to the sustainability of our Department’s fully online courses. Due to the highly dynamic nature of both online teaching and geographic information, GEO 221-V requires frequent attention, updating, and improvement to keep it current and, in turn, interesting to students. Faculty, instructors, and the Online Course Coordinators create new lesson content and exam questions each time the course is offered. These continual contributions help us achieve our maintenance goals.

Course improvement
We aim to improve the course on a yearly basis by reading our student and Instructor reviews. Based on these reviews, we enhance aspects of the course that receive praise and improve on aspects of the course that receive constructive criticism. We also integrate new components at the request of students and Instructors. Often these requests can be met even while the course is running.

One of the newest additions to the course was suggested by our past Instructors. The GeoBlog (see Figure 10) is a new project that is intended to provide a ‘space’ for all instructors of online Geography courses to post information (e.g., news articles, photos from travels, and links to interesting websites) relevant to Geography. Students reading the blog will experience the many topics discussed in other Geography courses and can consider how these topics relate to the material in their class. GeoBlog will facilitate interaction and collaboration between members of the human, physical, and technical branches of the diverse discipline of Geography as it is studied at MSU.

Also suggested by Instructors and students is the use of breeze.msu.edu for online help and screen-sharing for lab and exam-review discussions. We are scheduled to begin using this feature in the SS2010 offering.
Growth of students
To sustain enrollment in GEO 221-V we developed a Virtual Geography website to inform prospective students about our course (see Figure 11). This site provides a course description and preview, sample schedule and syllabus, computer setup, staff description, registration instructions, and answers to frequently asked questions. In addition, we are incorporating a feature called the “9-to-5 Geographer” into our course to expose students to what professional Geographers do as part of their jobs.

On-going collaboration with vuDAT
An integral part of GEO 221-V has been our interaction with Ryan Yang, an eProducer in vuDAT. Mr. Yang was a valuable resource during the initial development and construction of the course and continues to be a key player in our yearly course reassessment. Contact with vuDAT keeps us informed on new aspects of ANGEL and other innovative technological components that may be integrated into our course.