

# Syllabus Environmental Applications of GIS

## Advanced Academic Programs

Zanvyl Krieger School of Arts and Sciences  
Johns Hopkins University

AS.420.603.81 – Environmental Applications of GIScience  
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## Course Description

Geographic information systems technology (GIS) is a powerful data visualization and analysis tool. This course is designed to introduce students to advanced concepts of geographic information science related to the fields of reserve planning, environmental science, natural resources, and ecology for the purpose of spatial analysis and geo-visualization of environmental issues. Topics may include conservation needs using remote sensing, digital image processing, data structures, database design, landscape ecology and metrics, wildlife home range and habitat analysis, suitability modelling, terrain and watershed analysis, and spatial data analysis. This course will only be offered online yearly.

## Course Overview

Students will learn to understand and apply GIS and remote sensing technologies and methodologies to important topics in environmental studies. Students will learn the fundamentals of mapping, photogrammetry, geographic information science, and remote sensing. Students will learn to acquire and prepare data for analysis related to environmental research, model, edit, and analyze data, and interpret and map environmental data they might encounter in their careers. Students will also read, assess, and discuss peer-reviewed literature to become exposed to the latest methodologies and techniques to examining environmental issues.

## Course Goals & Learning Objectives

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

- Identify GIScience concepts and how this is used to gather, manage, quality check, process, analyze, model, and interpret environmental spatial data

- Critically evaluate environmental GIS data and information produced by government agencies, industry, academia, and popular media
- Identify environmental spatial data needed for particular tasks used in their careers
- Locate environmental spatial data is available and has been quality assessed
- Use commonly available GIS and remote sensing software (e.g. ArcGIS, Google Earth) to view, assess, and present spatial datasets (e.g. shapefiles, satellite imagery).
- Develop, analyze, and produce research to examine a real-world environmental issue of interest for a final project
- Present products of their environmental analyses in written and oral/visual form as maps, interactive graphics, videos, etc.

## Course Materials

### Textbook/s

The textbook **required** for purchase for this course is: Zhu, Xuan *GIS for environmental applications: a practical approach*. Routledge, 2016. ISBN-13: 978-0415829076 (*this uses an older version of the software but the concepts and tools are still applicable*)

There will be also be article readings (e.g. journal articles, technical reports, etc.) throughout the semester.

### Other equipment/software/websites/online resources

This course requires the use of the following software:

- ArcGIS Pro (free for Johns Hopkins Students)
- Google Earth Pro (free to download from <https://www.google.com/earth/download/gep/agree.html>)
- 7-Zip (free to download from <https://www.7-zip.org/>)

Optional software requirements:

- R (free open source software)
- QGIS (free open source software)

### Specific Technology Requirements & Skills for this Course

This course requires the use of a computer that complies with the following hardware specifications:

ArcGIS Pro is available on lab computers on campus and through [JHU Information Technology Services](#).

Should you choose to install ArcGIS on your personal computers, **please review the Windows system requirements** (<http://pro.arcgis.com/en/pro-app/get-started/arcgis-pro-system-requirements.htm>).

**It is mandatory that you check the system requirements of your computer to make sure you can run the software prior to taking this course.** If you have an older PC, a newer PC that does not meet the minimum requirements, or a Mac, you will struggle using the software in this course. Please make arrangements prior to the start of this course to either purchase a new computer, borrow a computer, or use a computer on campus.

If you would like to purchase a new computer, consider this a long-term investment in yourself. If you need help choosing a new computer to purchase, please contact me and I will provide some recommendations.

Learning online requires some basic knowledge of computer technology. At a minimum, you need to be able to:

- Navigate in and use Blackboard; the Blackboard Student Orientation course on your “My Institution” page
- Create and save MS Word documents; review [MS Word training and tutorials](#) for PC users (all versions); [Word Help](#) for Mac users
- Find basic resources on the Internet
- Create and organize files & folders on your computer
- Send, receive, and manage email
- Unzip and extract data from zipped files (we will use 7-Zip)

## Assignments and Grading Policy

### Assessment Summary:

*I may edit/subtract assignments as we go based on class feedback.*

Assignments	Due Dates	Assignment Value
Weekly Activities	Due midnight Tuesday	20 pts x 10 = 200
Discussion Posts	Post throughout the week beginning no later than Saturday; Final post midnight Tuesdays	15 pts x 14 = 210
Final Topic Proposal	Due midnight 3/5	25 pts
Proposal Critiques	Due midnight 3/12	10 pts
Final Project Draft	Due midnight 4/16	5
Final Project Draft Critiques	Due midnight 4/23	10 pts
Final Project Presentations	Due midnight 4/30	40 pts
Final Project Fact Sheet	Due midnight 5/7	60 pts
<b>Total</b>		<b>560 pts</b>

### Grading Policy

#### Extra Credit

You can earn extra credit points during the course (details will be provided during the semester). You can **ONLY** receive these points if you have participated in **ALL** assignments, forums, and activities throughout the semester. Your participation will be noted each week.

#### Letter Grade Percentage

A+	98% to 100%
A	94% and less than 98%
A-	90% and less than 94%
B+	88% and less than 90%
B	84% and less than 88%
B-	80% and less than 84%
C	70% and less than 80%
F	0% and less than 70%

This course will follow the [Advanced Academic Programs Grading Policies](#).

### **Assignment Submission**

Students are required to adhere to the following guidelines when submitting written work:

- Use a formatting and style guide of your choice **useful** to your intended career path (e.g. APA, MLA, Chicago, etc.)
- Adhere to word and page limits for each **assignment**
- [Cite sources properly](#)

### **Assignment Feedback**

The instructor will aim to return assignments to you within 5-7 days following the due date, depending on the length of the assignment. You will receive feedback in the My Grades area of the course which can be accessed via the navigation menu.

### **Late Policy**

All assignments are due by the stated due date midnight EST to receive full credit.

You are expected to contact your instructor in advance if you think you cannot meet an assignment **deadline**. Extensions without penalties will be given on a case-by-case basis. However, if an assignment is late and prior arrangements have not been made with the instructor, 10% of the points will be deducted from the assignment per day up to five days. After five days, the assignment will receive a 0 grade.

### **Synchronous Sessions**

The instructor may hold live, synchronous sessions in [Adobe Connect](#). Attendance for synchronous sessions, while not required, is highly recommended. If you cannot attend a synchronous session, you will be responsible for watching the recording at a later time.

### **Time Management Expectations**

It is expected that you look ahead to schedule your time. Plan to complete coursework across several days of the week rather than all in one day. Be sure to consider how group activities impact your schedule as well. You should expect to spend at least 10-15 hours per week on this course.

Some assignments require that you work on them for multiple weeks. Be sure to review the assignment directions at the beginning of the course so that you can plan your time accordingly.

**Please seek help before becoming frustrated and spending a significant amount of time to resolve an issue.**

### **Directions for Students**

**Next Steps:** Carefully review the remaining sections of the syllabus before beginning the first week's activities, which are located in the **Lessons** area of the navigation menu in your online course.

Once you feel that you are ready to dive into the first week's activities, select **Lessons** on the navigation menu. Then, select **Week 1** to begin.

## About Your Course

### What to Expect in this Course

This course is 14 weeks in length and includes individual and group activities in a weekly cycle of instruction. Each week begins on a Wednesday and ends on the following Tuesday. Please review the course syllabus thoroughly to learn about specific course outcomes and requirements. Be sure to refer to the Checklist each week, which provides a week-at-a-glance and shows targeted dates for the completion of activities.

## Course Policies

### Course Participation

#### Participation Requirements

You are expected to log into Blackboard regularly throughout the week - a daily check-in is recommended. It is your responsibility to read all announcements and discussion postings within your assigned forums. You should revisit the discussion multiple times over the week to contribute to the dialogue.

#### Group Work

Group work may be assigned as part of this course. If group work is required, you are expected to work equitably within your group to complete collaborative group activities. If group work is assigned, you will have an opportunity to privately rate your own participation and that of your group-mates.

#### Online Etiquette

In this course, online discussion will primarily take place in our online discussion board. In all textual online communication, it is important to follow proper rules of online etiquette... communicating with others in a proper and respectful way. For helpful tips, please see these [Ground Rules for Online Discussions](#).

### Course Protocols and Getting Help

#### Amendments to the Course

Changes to the course will be posted in the Announcements section of your course. Please check announcements every time that you log into your online course.

#### Course Communication

You should communicate often with your classmates and the instructor. The majority of communication will take place within the Discussion forums. When you have a question about an assignment or a question about the course, please contact your instructor, or post your question in the course's "Syllabus & Assignment Question" forum.

#### Email Communication

For questions regarding course activities and assignments that would be general interest to other students, please post those in the Discussion forum. If you have a question regarding course activities and assignments of a personal nature, please send an email message to the instructor and observe the following guidelines:

- Include the title of the course in the subject field (e.g., JHU Insert Name of Course).
- Keep messages concise, and check spelling and grammar.
- Sign your full name (the sender's email is not always obvious).

Feel free to contact your instructor with comments, questions, and concerns. All email messages will be sent to you via your JHU email account, so you should be in the habit of checking that account every day or you should ensure that your JHU email account forwards messages to another account of your choice.

Email messages will be responded to within 24-48 hours.

## Library Services & Copyright Policy

- For assistance with determining which resources and readings can be made available to students through the eReserves (ARES) system, please consult with the [Johns Hopkins University Librarians](#). By submitting the weekly reading list to the eReserve staff, they will help secure any copyright permissions.
- Please be aware of [JHU's copyright compliance policy](#) for protecting intellectual property.

## University Policies

### General

This course adheres to all University policies described in the academic catalog. Please pay close attention to the following policies:

### Students with Disabilities

Johns Hopkins University is committed to providing reasonable and appropriate accommodations to students with disabilities. Students with documented disabilities should contact the coordinator listed on the [Disability Accommodations](#) page. Further information and a link to the Student Request for Accommodation form can also be found on the [Disability Accommodations](#) page.

### Ethics & Plagiarism

**JHU Ethics Statement:** The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Report any violations you witness to the instructor. Read and adhere to JHU's [Notice on Plagiarism](#).

### Dropping the Course

You are responsible for understanding the university's policies and procedures regarding withdrawing from courses found in the current catalog. You should be aware of the current deadlines according to the [Academic Calendar](#).

## Getting Help

You have a variety of methods to get help on Blackboard. Please consult the help resources listed in the online classroom for additional information. **Important Note: If you encounter technical difficulty in completing or submitting any online assessment, immediately contact the 24-hour Help Desk listed under the "Blackboard Help" tab.** Also, contact your instructor at the email address listed atop this syllabus.

## Copyright Policy

All course material are the property of JHU and are to be used for the student's individual academic purpose only. Any dissemination, copying, reproducing, modification, displaying, or transmitting of any course material content for any other purpose is prohibited, will be considered misconduct under the [JHU Copyright Compliance Policy](#), and may be cause for disciplinary action. In addition, encouraging academic dishonesty or cheating by distributing information about course materials or assignments which would give an unfair advantage to others may violate AAP's [Code of Conduct](#) and the University's [Student Conduct Code](#). Specifically, recordings, course materials, and lecture notes may not be exchanged or distributed for commercial purposes, for compensation, or for any purpose other than use by students enrolled in the class. Other distributions of such materials by students may be deemed to violate the above University policies and be subject to disciplinary action.

## Code of Conduct

To better support all students, the Johns Hopkins University non-academic [Student Conduct Code](#) has been integrated and updated to include all divisions of the University. In addition, it is important to note that all AAP students are still accountable for the [Code of Conduct for Advanced Academic Programs](#).

## Title IX

### Confidentiality and Mandatory Reporting

As an instructor, one of my responsibilities is to help create a safe and inclusive learning environment on our campus. I also have mandatory reporting responsibilities related to my role as a Responsible Employee under the Sexual Misconduct Policy & Procedures (which prohibits sexual harassment, sexual assault, relationship violence and stalking), as well as the General Anti-Harassment Policy (which prohibits all types of protected status based discrimination and harassment). It is my goal that you feel able to share information related to your life experiences in classroom discussions, in your written work, and in our one-on-one meetings. I will seek to keep information you share private to the greatest extent possible. However, I am required to share information that I learn of regarding sexual misconduct, as well as protected status based harassment and discrimination, with the Office of Institutional Equity (OIE). For a list of individuals/offices who can speak with you confidentially, please see Appendix B of the [JHU Sexual Misconduct Policies and Laws](#).

For more information on both policies mentioned above, please see: [JHU Relevant Policies, Codes, Statements and Principles](#). Please also note that certain faculty and other University community members also have a duty as a designated Campus Safety Authority under the Clery Act to notify campus security of certain crimes, as well as a duty under State law and University



policy to report suspected child abuse and/or neglect.

### Course Schedule

Activity and assignment details will be explained in detail within each week's corresponding learning module (Lessons in Blackboard). If you have any questions, please contact your instructor.

*This schedule is subject to change with fair notice. Any changes will be posted via Announcements in Blackboard.*

Week	Dates	Topics	Activities & Assessments	Due Dates
1	1/23	<ul style="list-style-type: none"> <li>• Introduction and Course Navigation</li> <li>• Introduction to spatial data and software</li> <li>• Roles of GIS and Remote Sensing in environmental research, management, and planning</li> </ul>	<ol style="list-style-type: none"> <li>1. Read course syllabus</li> <li>2. Introduce yourself to the class - Discussion 1</li> <li>3. Install and make sure you can access mandatory software</li> <li>4. Read Ch. 1, sections 1.1-1.3</li> </ol>	1/29
2	1/30	<ul style="list-style-type: none"> <li>• Begin to explore final project topic ideas</li> <li>• Where to obtain publicly available spatial datasets</li> <li>• Download and view some datasets</li> <li>• Create and post maps and graphics</li> </ul>	<ol style="list-style-type: none"> <li>1. Activity 1</li> <li>2. Discussion Post 2</li> <li>3. Read Ch. 2, section 2.3 (pgs. 59-64; 67-73)</li> <li>4. Skim Ch. 10 for final project ideas</li> </ol>	2/5
3	2/6	<ul style="list-style-type: none"> <li>• Locate publicly available GIS datasets pertinent to your topic</li> <li>• Begin downloading pertinent data</li> <li>• Create and post maps and graphics</li> </ul>	<ol style="list-style-type: none"> <li>1. Activity 2</li> <li>2. Discussion Post 3</li> <li>3. Read Ch. 1, section 1.4; Ch. 2, sections 2.1-2.2, Ch. 8, "Layout design"</li> <li>4. Skim Ch. 10 for final project ideas</li> </ol>	2/12

Week	Dates	Topics	Activities & Assessments	Due Dates
4	2/13	<ul style="list-style-type: none"> <li>● Introduction to environmental modelling</li> <li>● Explore USGS DEMS and elevation data</li> <li>● Calculate terrain metrics (e.g. slope, aspect)</li> <li>● Perform terrain analysis</li> <li>● Create and post maps</li> </ul>	<ol style="list-style-type: none"> <li>1. Activity 3</li> <li>2. Discussion Post 4</li> <li>3. Read Ch. 7</li> </ol>	2/19
5	2/20	<ul style="list-style-type: none"> <li>● Explore site selection</li> <li>● Tailor your research location</li> <li>● Create and share maps and figures of your data</li> </ul>	<ol style="list-style-type: none"> <li>1. Activity 4</li> <li>2. Discussion Post 5</li> <li>3. Read Ch. 4, pgs. 152-158, 163-164; Ch. 9, sections 9.1 and 9.4</li> </ol>	2/26
6	2/27	<ul style="list-style-type: none"> <li>● Download remotely sensed data</li> <li>● Pre-process remotely sensed data</li> <li>● Create and share maps and figures of your data</li> </ul>	<ol style="list-style-type: none"> <li>1. Activity 5</li> <li>2. Discussion Post 6</li> <li>3. <b>Final project proposal</b></li> <li>4. Read Ch. 6, sections 6.1-6.3</li> </ol>	3/5
7	3/6	<ul style="list-style-type: none"> <li>● Download remotely sensed data</li> <li>● Georeferencing remotely sensed data</li> <li>● Create and share maps and figures of your data</li> </ul>	<ol style="list-style-type: none"> <li>1. Activity 6</li> <li>2. Discussion Post 7</li> <li>3. Critique final project proposals (peer review)</li> <li>4. Read Ch. 3 pgs. 89-93</li> </ol>	3/12
8	3/13	<ul style="list-style-type: none"> <li>● Land cover and image classification</li> <li>● Change detection and time series analysis</li> <li>● Unsupervised classification</li> <li>● Create and share maps and figures of your data</li> </ul>	<ol style="list-style-type: none"> <li>1. Activity 7</li> <li>2. Discussion Post 8</li> <li>3. Read Ch. 6, section 6.5; and Ch. 4. Pgs. 144-147 (reclassification)</li> </ol> <p><b>SPRING BREAK</b> <b>March 18 – March 24</b></p>	3/26

Week	Dates	Topics	Activities & Assessments	Due Dates
9	3/27	<ul style="list-style-type: none"> <li>Land cover and image classification</li> <li>Change detection and time series analysis</li> <li>Supervised classification</li> <li>Create and share maps and figures of your data</li> </ul>	<ol style="list-style-type: none"> <li>Activity 8</li> <li>Discussion Post 9</li> </ol>	4/2
10	4/3	<ul style="list-style-type: none"> <li>Vegetation indices</li> <li>Disturbance mapping</li> </ul>	<ol style="list-style-type: none"> <li>Activity 9</li> <li>Discussion Post 10</li> <li>Read Ch. 6 pgs. 261-263 (Band ratioing)</li> </ol>	4/9
11	4/10	<b>Final Project First Drafts</b>	<ol style="list-style-type: none"> <li><b>Final project drafts</b></li> <li>Discussion Post 11</li> </ol>	4/16
12	4/17	<ul style="list-style-type: none"> <li>Create and share animations and videos about your work</li> </ul>	<ol style="list-style-type: none"> <li>Activity 10</li> <li>Discussion Post 12</li> <li>Critique final project drafts</li> <li>Prepare final project presentations</li> <li>Read Ch. 8, section 8.5</li> </ol>	4/23
13	4/24	<b>Final Project Presentation</b>	<ol style="list-style-type: none"> <li><b>Final Project Presentation</b></li> <li>Discussion Post 13</li> </ol>	4/30
14	5/1	<b>Final Project - Fact Sheet</b>	<ol style="list-style-type: none"> <li><b>Final Project</b></li> <li>Discussion Post 14</li> </ol>	5/7