Geography 611: Seminar in Geographic Information Science

- **Course number:** GEOG 611 (3 credit hours, CRN 54366)
- **Class location:** Burchfiel Geography Building (BGB), Room 406
- **Class time**: 2:30 - 3:45 pm (Tuesdays & Thursdays)
- **Instructor:** Shih-Lung Shaw, Professor
- **Office**: Burchfiel Geography Building (BGB), Room 317
- **Office hours:** Tuesdays and Thursdays, 12:40 – 1:10 pm or by appointment
- **Contact information:** Email: sshaw@utk.edu, Phone: 865-974-6036 (office)

Class Website

- Class webpage is available at Canvas. You can access Canvas at https://oit.utk.edu/instructional/tools/online/canvas/default.html

Textbooks

- O'Sullivan, D. and Unwin, D. 2003. *Geographic Information Analysis*, first edition. Hoboken, NJ: John Wiley & Sons. (Note: The contents in the first edition are not significantly different from the contents in the second edition. However, you can get a copy of the first edition far cheaper than the second edition. We will use the first edition in this class, but you are welcome to get a second edition if you like.)
- This class also will include other selected publications and materials that are relevant to the topics covered in this course.

Course Description

The main objective of this course is to learn important concepts and methods in geographic information science (GIScience). This GIScience Seminar class covers the following two main themes:

1. GIScience Research – Past, Present, and Future: This class will read relevant publications to gain knowledge of the key research approaches and challenges as the field evolved from Geographic Information Systems (GIS) to Geographic Information Science (GIScience) and beyond. In addition to the publications selected by the instructor, students in this class will identify additional publications that are relevant to this class and share them in this class. Each student will choose one article to share with the class and give an in-class presentation and lead class discussion. The objective of this theme is to help students build a general understanding of GIScience research along with knowledge of specific GIScience research topics that are relevant to their own research.
2. Geographic Information Analysis: Discussions of this theme will be mainly based on the textbook of *Geographic Information Analysis* by David O'Sullivan and David Unwin. The objective is to gain knowledge of important concepts underlying geographic information analysis as well as different types of geographic analysis methods. Furthermore, students in this class will explore functions in current GIS software products (ArcGIS software family and open source GIS software) that can support various geographic information analysis needs.

Central Learning Objectives

Students who successfully complete this class are expected to gain the following knowledge/experience:

- Learn key research topics and challenges as the field evolved from geographic information systems to geographic information science and beyond;
- Understand the concepts and methods behind different types of geographic information analysis; and
- Develop in-depth knowledge and innovative approaches to tackling key research challenges in geographic information science.

Degree Learning Objectives

- Students will gain in-depth knowledge of geographic information science as well as ability in critical thinking and communication.
- Students will be able to use knowledge in geographic information science to ask sound research questions, to select suitable analysis methods, and to explain analysis results properly.
- Students will be able to apply knowledge and skills in geographic information science to address specific theoretical and/or practical geographic problems.

Prerequisites and Other Important Notes

- Basic knowledge of geographic information science and hands-on experience of ArcGIS Pro equivalent to GEOG 311/GEOG 411 class are assumed.
- Students should feel comfortable with computer skills such as communication via email, information search via Web browsers and generative AI tools, use of the Microsoft Word and Powerpoint, working with UT's Canvas system, and ArcGIS Pro or equivalent software.
- Most course materials will be posted on UT's Canvas website. Students are expected to access the Canvas course website on a regular basis.
- Students are expected to attend classes and actively participate in class discussion.
- All reading/discussion materials must be posted on the Canvas class website on time. A 10% penalty per calendar day will be assessed toward late postings.
- No make-up course work or incomplete grade will be allowed except for extenuating circumstances with appropriate documents approved by the instructor.
- No individual student is allowed to perform extra credit work in order to increase their grade. Any extra credit options will be made available to the entire class.
- Some class meetings may be held online via Zoom. These online class meetings will be announced in class and posted on the Canvas course website ahead of each online class meeting.
- Students who feel they may need an accommodation based on the impact of a disability should contact the Office of Student Disability Services (SDS) at 865-974-6087 or sds@utk.edu in Blount Hall l, 1534 White Avenue to document their eligibility for services. SDS will work with students and faculty to coordinate reasonable accommodations for students with documented disabilities.
- Cheating, plagiarism, and other forms of academic dishonesty will not be tolerated.
- It is important to recognize that the classroom is an environment that requires respect for all participants. Therefore, students are expected to conduct themselves in a considerate manner. All participants in the class must respect the classroom environment by being on time, muting cell phones, and refraining from reading non-class materials.
- In this course, students are encouraged to use Generative AI Tools such as ChatGPT, Microsoft Copilot, Google Gemini, etc. to support their work, especially in open discussion sessions. To maintain academic integrity, students must disclose any AI-generated material

they use and properly attribute it, including in-text citations, quotations, and references. A student should include the following statement in assignments to indicate their use of a Generative AI Tool: "The author(s) would like to acknowledge the use of [Generative AI Tool Name], a language model developed by [Generative AI Tool Provider], in the preparation of this assignment. The [Generative AI Tool Name] was used in the following way(s) in this assignment [e.g., brainstorming, grammatical correction, citation, which portion of the assignment]."

- When using AI tools, it is important to be aware that the user data supplied might be utilized for training AI models or other purposes. Consequently, there is no guarantee that the information you provide will remain confidential. Students should exercise caution and avoid sharing any sensitive or private information when using these tools. Examples of such information include personally identifiable information (PII), protected health information (PHI), financial data, intellectual property (IP), and any other data that might be legally protected.

Grading System

1. Class participation/presentation/discussion: 40%
   - Students are expected to attend classes and actively participate in class discussion. For each assigned reading by the instructor, one student will be designated to give a **15-minute Powerpoint presentation** to summarize the key points in the reading assignment **and then lead class discussion (20 minutes)** with a list of pre-prepared questions. All other students are expected to read the reading assignments before each class and actively participate in class discussion and share their thoughts and comments.
   - For each selected chapter in the *Geographic Information Analysis* book, one student will be designated to give a **20-minute Powerpoint presentation** to highlight the important concepts/methods in the assigned chapter **and then lead class discussion (25 minutes)** with a list of pre-prepared questions. The same student also will demonstrate at least 3-5 ArcGIS Pro software functions (or in open-source GIS software) that can support the analysis methods relevant to the assigned chapter by giving **20-25 minutes of live demos**.
   - All students MUST **post their Powerpoint file and discussion questions along with other relevant materials on the Canvas class website by 12 noon ONE DAY before they will give a presentation and lead class discussion.**

2. Contributions to collaborative learning: Paper selected and presented by each student: 15%
   - To encourage collaborative learning, each student will select one GIScience publication to share with the entire class. Each student will give a **20-minute Powerpoint presentation** to summarize the key points of the selected publication and then **lead class discussion (30 minutes)** with a list of pre-prepared discussion questions. Students must **post their chosen article under the "Discussion - Publications Selected by Class Members" link on the Canvas course website by 12 noon ONE WEEK before their in-class presentation**. Students also must **post their Powerpoint file and discussion questions on the Canvas class website by 12 noon ONE DAY before their in-class presentation**. All other students are expected to read the selected publications and actively participate in class discussion to share their thoughts and comments.

3. Contributions to collaborative learning: ArcGIS/Open source GIS software functions: 15%
   - Each student who is responsible for software demos of a selected chapter in the *Geographic Information Analysis* book will give **live demonstrations of at least 3-5 useful**

functions in ArcGIS Pro software (or open source GIS software) that are relevant to the specific chapter in the *Geographic Information Analysis* book. All students should share their ArcGIS Pro or open source GIS software functions by **posting relevant information under the "Discussion – GIS Software Functions" link on the Canvas course website by 12 noon ONE DAY before their in-class software demos**.

4. A full research proposal OR an innovative GIS project: 30%
   - Each student is required to either write a full research proposal or implement an innovative GIS project using ArcGIS Pro or open-source GIS software.
   - If you choose to write a research proposal, you must write it as a Full Research Proposal by following the *NSF Proposal and Award Policies and Procedures Guide* (available at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg), Part I (Proposal Preparation and Submission Guidelines), Chapter II (Proposal Preparation Instructions), Section C (Format of the Proposal) and Section D.2 (Sections of the Proposal). Specifically, your final full research proposal must include the following sections:
     - b. Project Summary ("Each proposal must contain a summary of the proposed project not more than one page in length. The Project Summary consists of an overview, a statement on the intellectual merit of the proposed activity, and a statement on the broader impacts of the proposed activity." – p. II-11) The project summary is limited to one page.
     - d. Project Description (This section may not exceed 15 pages. See p. II-11 to p. II-13 for information regarding what should be included in this section. You can skip all NSF-specific information such as prior NSF support.)
     - e. References Cited ("Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. (See also Chapter II.D.2.d(iii)(d)) If the proposer has a website address readily available, that information should be included in the citation." – p. II-14. This section does not have a page limitation.)

     Students can choose their own research topic that is relevant to this class. You can search for active and expired NSF awards at https://www.nsf.gov/awardsearch/. You must **email a digital copy of your final full research proposal, in MS Word format as an email attachment, to Dr. Shaw at sshaw@utk.edu by 12:00 Noon on Monday, December 9, 2024**. In addition, you will **give a 15-minute presentation of your research proposal at 1:00 – 3:15 pm on Monday, December 9, 2024.**
   - If you choose to conduct an innovative GIS project, your GIS project must include data that are needed to solve a meaningful real-world problem with advanced GIS analysis functions/procedures using ArcGIS Pro or open-source GIS software. You also must prepare a project report that describes the project objectives, data, analysis methods, and findings (single-spaced, max. 5 pages). The deadline of completing this innovative GIS project and project report is **12:00 Noon on Monday, December 9, 2024.** You must email to Dr. Shaw at sshaw@utk.edu before the deadline the project report and all relevant data files in one zip file or a Google drive link (including computer programs, data files, a user's guide and other relevant information) as an attachment to the email. In addition, you will **give a 15-minute presentation with live demos of your innovative GIS project at 1:00 – 3:15 pm on Monday, December 9, 2024.**

Final course letter grades will be determined as follows:

- A: >= 93%, A-: 90-92%, B+: 87-89%, B: 83-86%, B-: 80-82%, C+: 77-79%, C: 73-76%, C-:

70-72%, D: 60-69%, F: < 60%

Course Schedule

Week/ Dates	Topics	Readings/Discussions
1 (8/20, T)	▪ Course syllabus ▪ Course organization	
2 (8/22, R)	▪ GIS & GIScience Research: Past, Present and Future	* Goodchild (1992): Lead: * Egenhofer & Mark (1995): Lead:
3 (8/27, T)	▪ GIS & GIScience Research: Past, Present and Future	* Sui (2004) & Goodchild (2004): Lead: * O'Sullivan (2006): Lead:
4 (8/29, R)	▪ GIS & GIScience Research: Past, Present and Future	* Thatcher et al. (2016): Lead: * Harvey (2018): Lead:
5 (9/3, T)	▪ Open discussion	* All class members with Lead:
6 (9/5, R)	▪ GIS & GIScience Research: Past, Present and Future	* Sui & Goodchild (2011): Lead: * Kitchin (2014): Lead:
7 (9/10, T)	▪ GIS & GIScience Research: Past, Present and Future	* Kwan (2016): Lead: * Shaw & Sui (2020): Lead:
8 (9/12, R)	▪ GIS & GIScience Research: Past, Present and Future	* Bergmann & Lally (2021): Lead: * Janowicz et al. (2020): Lead:
9 (9/17, T)	▪ Open Discussion	* All class members with Lead:
10 (9/19, R)	▪ GIA – Chap. 1: Geographic information analysis and spatial data	* GIA-Chap. 1: Lead & Software Demo:
11 (9/24, T)	▪ GIA – Chap. 2: The pitfalls and potential of spatial data	* GIA-Chap. 2: Lead & Software Demo:
12 (9/26, R)	▪ GIA – Chap. 3: Fundamentals: Maps as outcomes of processes	* GIA-Chap. 3 (Chap. 4 in 2nd ed): Lead & Software Demo:
13 (10/1, T)	▪ GIA – Chap. 4: Point pattern analysis	* GIA-Chap. 4 (Chap. 5 in 2nd ed): Lead & Software Demo:
14 (10/3, R)	▪ GIA – Chap. 5: Practical point pattern analysis	* GIA-Chap. 5 (Chap. 6 in 2nd ed): Lead & Software Demo:
15 (10/8, T)	▪ **No Class (Fall Break)**	
16 (10/10, R)	▪ GIA – Chap. 7: Area objects and spatial autocorrelation	* GIA-Chap. 7: Lead & Software Demo:
17 (10/15, T)	▪ GIA – Chap. 8: Describing and analyzing fields	* GIA-Chap. 8 (Chap. 9 in 2nd ed) : Lead & Software Demo:
18 (10/17, R)	▪ Space-Time GIS in Hybrid Physical-Virtual Space	* Shaw and Yu (2009): Lead: Andrea * Software Demo: Lead:
19 (10/22, T)	▪ Open Discussion	* All class members with Lead:
20 (10/24, R)	▪ **Work on Final Report/Project (No Class Meeting)**	
21 (10/29, T)	▪ **Work on Final Report/Project (No Class Meeting)**	
22 (10/31, R)	▪ Readings Selected by Class Members	* Reading #1: Lead:
23 (11/5, T)	▪ **No Class (Election Day)**	

24 (11/7, R)	▪ Readings Selected by Class Members	* Reading #2: Lead:
25 (11/12, T)	▪ Readings Selected by Class Members	* Reading #3: Lead:
26 (11/14, R)	▪ Readings Selected by Class Members	* Reading #4: Lead:
27 (11/19, T)	▪ Readings Selected by Class Members	* Reading #5: Lead:
28 (11/21, R)	▪ Readings Selected by Class Members	* Reading #6: Lead:
29 (11/26, T)	▪ Readings Selected by Class Members	* Reading #7: Lead:
30 (11/28, R)	▪ **No Class (Thanksgiving Recess)**	
31 (12/3, T)	▪ Readings Selected by Class Members	* Reading #8: Lead:
32 **(12/9, Monday, 1:00 – 3:15 PM)**	▪ **Live presentation/demo of your research proposal or an innovative GIS project**	*** Each studnt must email all relevant materials of their final full research proposal or innovative GIS project, as an email atatchment as a single zip file or a Google drive link, to Dr. Shaw at sshaw@utk.edu by 12:00 Noon on Monday, December 9, 2024.**

*** Note: This schedule is subject to change. Updated syllabus (if any) will be posted on the Canvas website of this class. Please contact the instructor if you have questions regarding the course materials or course requirements.**