
GIS 4121 (Geospatial Analysis)/GIS 6116 (GIS Analysis)**1. OVERVIEW**

GIS analysis involves the process of analyzing and identifying patterns in geographic data, and describing relationships between spatial features and phenomena. This course introduces a number of techniques aimed at the analysis of spatial data and will be comprised of lectures and software labs. Lecture topics include characterization of spatial data patterns, cluster analysis, spatial regression, spatial modeling and interpolation, and multidimensional raster analysis. On the practical side, students will conduct spatial analysis with GIS software including ArcGIS Pro, Model Builder, Microsoft Excel spreadsheet functions, and miscellaneous spatial analysis programs.

- Spring semester, 3 credits
- 100% online
- <http://elearning.ufl.edu/>

Course prerequisites: No formal course pre-requisites. GIS3072C or any other introductory GIS course as well as an introductory statistics course are recommended, so is some working experience with ArcGIS Pro and Microsoft Excel software.

Instructors:

- **Dr. Hartwig Henry Hochmair**, Ft. Lauderdale Research & Education Center, phone: (954) 577-6317; e-mail: [hhhochmair@ufl.edu](mailto:hhochmair@ufl.edu)
- **Dr. Amr Abd-Elrahman**, Gulf Coast Research and Education Center, phone: (813) 757-2283; e-mail: aamr@ufl.edu

Communication:

- Please use the Canvas e-mail system for fastest response.
- Office hours: Tuesday 4-6 pm in Zoom (on days before a home assignment is due)

Lectures:

Links to pre-recorded lectures and other lecture materials will be posted in weekly modules on the course Web site

Primary recommended reading materials:

- O'Sullivan D, Unwin DJ (2010). *Geographic Information Analysis* (2nd ed.). Hoboken, New Jersey, Wiley & Sons

Further recommended reading materials:

- de Smith, M. J., Goodchild, M. F., and Longley, P. A. (2024). *Geospatial Analysis (7th ed.)*: Winchelsea Press. Available online at <http://www.spatialanalysisonline.com/>
- Rogerson, P. and Yamada, I. (2009). *Statistical Detection and Surveillance of Geographic Clusters*. Boca Raton, FL: CRC Press.
- Short instructional videos closely related to the lecture content can be found at the [Geomatics @ FLREC YouTube channel](#)

Software requirements:

- The latest ArcGIS Pro version and Microsoft Excel will be used for many topics taught in this course.
- ArcGIS Pro download and installation instructions are provided on the course website in the Week 1 module.
- Additional free software packages used (e.g., GeoDa) will be introduced in corresponding course modules.

2. LEARNING OUTCOMES

The course objective is to provide students with the following competencies at the completion of the course:

1. Investigate spatial analysis methods in spreadsheet applications
2. Use spatial statistics to identify geographic patterns
3. Demonstrate correct handling of vector and raster data with GIS tools to answer spatial research questions

4. Apply multi-dimensional data ordination and clustering techniques to address spatial problems
5. Implement deterministic and geostatistical spatial interpolation methods
6. Automate geoprocessing functionality through Python scripting and ModelBuilder
7. Apply critical thinking skills in GIS analysis

The course Website (see under Modules/Course Overview) contains a course map which visually illustrates how course activities (e.g. assignments, discussion posts, quizzes) are linked to these competencies.

3. COURSE LOGISTICS

- Assignments are graded based on timeliness, correctness of computations and interpretation of numerical results, creativity and technical versatility with written feedback by the instructor; quizzes are auto-graded based on correctness of multiple choice questions with correct answers shown after completion, and discussion items are graded within a week based on creativity, completeness, technical correctness and the number of comments provided to peers.
- There is a 1-week turnaround for assignment grading and a 2-week turnaround for discussion grading. Quizzes are autograded instantaneously in Canvas.
- Undergraduate and graduate students will receive different home assignments reflecting different levels of complexity.
- This is an asynchronous distance education course which uses pre-recorded lectures. Recordings can be downloaded from weekly modules on the Canvas website.
- This course does not offer extra credit tasks

The Canvas system should be used as the primary platform for written communication between students and the instructor. Questions and suggestions to the class can also be posted under the Discussions tab. Any short-term changes concerning lectures or other course components will be announced through Canvas. Feel free to contact the instructors with any questions.

Technology Requirements:

- A computer or mobile device with high-speed internet connection and a headset and/or microphone and speakers to view lectures or join live sessions.
- ArcGIS Pro runs only on Microsoft operating systems. If students use a Mac computer or other operating systems, they are encouraged to use ArcGIS Pro in UF Apps (<https://info.apps.ufl.edu/>).
- For Zoom: A supported web browser on a supported operating system (Windows, Mac OS, Linux); and minimum bandwidth. More details can be found [here](#).

Using Zoom:

Occasional, informal Q&A sessions (after announcement), or office hour meetings (per individual student requests) will be conducted with Zoom web conferencing software. Zoom sessions can be joined by clicking a link provided on the course Web site or through Canvas e-mail.

Grades:

<i>Item</i>	<i>Percentage</i>
Home assignments (8 assignments @ 9% each)	72%
Quizzes (4 quizzes @ 4% each)	16%
Topical discussions (2 discussion @ 3% each)	6%
Home assignment discussions (5)*	6%
Total	100%

* To earn full points for this item, share one post and one response for at least four different home assignment discussions.

Grading scale:

<i>Grade</i>	<i>Percentage</i>	<i>Grade</i>	<i>Percentage</i>
A	92.0-100.0	C+	78.0-79.9
A-	90.0-91.9	C	72.0-77.9
B+	88.0-89.9	C-	70.0-71.9
B	82.0-87.9	D	60.0-69.9
B-	80.0-81.9	E	0-59.9

For information on current UF policies for assigning grade points, see
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

4. COURSE CONTENT

Week	Topic	Assignment (due)	Readings
Week 1, Jan 15 (H)	Course introduction (live), review concepts of statistics and distributions, matrix notation	Q1 (Jan 22)	O'Sullivan Appendix A
Week 2, Jan 22 (H)	Statistics review (cont.)	Q2 (Jan 29)	
Week 3, Jan 29 (H)	Spatial processes, Quadrat count methods [H1]	H1 (Feb 5)	O'Sullivan ch 4.1-4.4, p. 121-130
Week 4, Feb 5 (H)	Distance based point pattern measures	H2 (Feb 12)	O'Sullivan p. 130-155
Week 5, Feb 12 (H)	Attribute-based cluster detection; spatial autocorrelation, hot-spot analysis	H3 (Feb 19)	O'Sullivan ch 7, ch.8.1-8.4
Week 6, Feb 19 (H)	Location based cluster detection (hierarchical, K-means) [Q3]	Q3 (Feb 26)	CrimeStat IV manual ch. 7-16, 7-36, 8-20
Week 7, Feb 26 (H)	Geographically Weighted Regression (GWR); autoregressive models	H4, D1 (Mar 5)	O'Sullivan ch 8.5 de Smith ch. 5.6
Week 8, Mar 5 (A)	Multidimensional space and spatialization: dissimilarity and clustering	H5 (Mar 12)	O'Sullivan ch 11.1 and 11.2
Week 9, Mar 12 (A)	Multidimensional space and spatialization: multi-dimensional scaling- principal component analysis – factor analysis	H6 (Mar 26)	O'Sullivan ch 11.4-11.6
<i>Mar 17 – Mar 21</i>	<i>SPRING BREAK</i>		
Week 10, Mar 26 (A)	Spatial interpolation: deterministic and stochastic models	H7 (Apr 2)	O'Sullivan ch 8, 2.4
Week 11, Apr 2 (A)	Surface modeling, TIN and Raster representation - Raster data analysis - neighborhood, zonal, global functions	D2 (Apr 9)	O'Sullivan ch 9 <i>Online book (Map Analysis): Topic 22 & 23</i>
Week 12, Apr 9 (A)	Raster analysis application example 1 & 2: Fire Risk and Species Mapping using ArcGIS Model Builder	H8 (Apr 9)	<i>Model downloads through canvas</i>
Week 13, Apr 16 (A)	Automating geoprocessing through ArcPy Python scripting	Q4 (Apr 23)	Handouts: ESRI white papers and documentations
Week 14, Apr 23 (A)	Raster analysis application example 3: Dynamic Fire Growth using ArcGIS Model Builder		<i>Model downloads through canvas</i>

D: Discussion, Q: Quiz, H: Home assignment
 H...Hochmair, A...Abd-Elrahman

5. POLICIES AND REQUIREMENTS

This syllabus represents current plans and objectives for this course. As the semester progresses, changes may need to be made to accommodate timing, logistics, or to enhance learning. Such changes, communicated clearly, are not

unusual and should be expected.

Late submissions and make-up requests:

It is the responsibility of the student to access on-line lectures, readings, quizzes, and assignments to maintain satisfactory progress in the course.

- A 10% penalty per day will be applied to late assignments. A late submission on the due date results also in a 10% deduction. Students can submit a late assignment as an attachment in an e-mail to the instructor.
- Assignments will not be accepted if handed in more than seven days after the due date.
- Students may request an extension to submitting a home assignment for a justified reason but need to do so before the submission deadline.
- Quizzes cannot be taken past the deadline.
- Online discussions cannot be completed past the deadline.
- Exceptions to the late policy are only allowed per university policy.

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

Computer or other hardware failures, except failure of the UF e-Learning system, will not excuse students for missing assignments. Any late submissions due to technical issues **MUST** be accompanied by the ticket number received from the Helpdesk when the problem was reported to them. The ticket number will document the time and date of the problem. You **MUST** e-mail your instructor within 24 hours of the technical difficulty if you wish to request consideration. For computer, software compatibility, or access problems call the HELP DESK phone number—352-392-HELP = 352- 392-4357.

Semester Evaluation Process:

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>

Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluer.com/ufl/>. Summaries of course evaluation results are available to students at: <https://gatorevals.aa.ufl.edu/public-results/>

Communication Courtesy and Professionalism:

Just as in any professional environment, meaningful and constructive dialogue is expected in this class and requires a degree of mutual respect, willingness to listen, and tolerance of opposing points of view. Respect for individual differences and alternative viewpoints will be maintained in this class at all times. All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats, as laid out in the [UF Netiquette Guide](#) for Online Courses. Failure to do so may result in loss of participation points and/or referral to the Dean of Students' Office.

Inclusive Learning Environment:

This course embraces the University of Florida's Non-Discrimination Policy, which reads, The University shall actively promote equal opportunity policies and practices conforming to laws against discrimination. The University is committed to non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information and veteran status as protected under the Vietnam Era Veterans' Readjustment Assistance Act.

Academic Honesty Policy:

UF students are bound by The Honor Pledge which states "We, the members of the University of Florida community,

pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Conduct Code specifies a number of behaviors that are in violation of this code and the possible sanctions. See the UF Conduct Code website for more information. If you have any questions or concerns, please consult with the instructor or TAs in this class.

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <https://policy.ufl.edu/regulation/4-040/>

University Policy on Accommodating Students with Disabilities:

Students requesting accommodation for disabilities must first register with the Dean of Students Office (<https://disability.ufl.edu/>). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

Software use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Privacy Statement:

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

In-class recordings:

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal education use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and deliver by an instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentation such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or guest lecturer during a class session.

6. CAMPUS HELPING RESOURCES

Whole Gator App:

The Whole Gator website and app connects UF students with resources dedicated to supporting overall health and well-being. In addition to many of the resources below it also has strategies to practice self-care.

<https://one.uf.edu/whole-gator/topics>

Health and Wellness:

- U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit the [U Matter, We Care website](#) to refer or report a concern and a team member will reach out to the student in distress.
- Counseling and Wellness Center: Visit the [Counseling and Wellness Center website](#) or call 352-392-1575 for information on crisis services as well as non-crisis services.
- Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the [Student Health Care Center website](#).
- University Police Department: Visit the [UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).
- UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the [UF Health Emergency Room and Trauma Center website](#).
- GatorWell Health Promotion Services: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the [GatorWell website](#) or call 352-273- 4450.
- Student Success Initiative, <http://studentsuccess.ufl.edu>

Academic Resources:

- E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu
- [Career Connections Center](#): Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.
- [Library Support](#): Various ways to receive assistance with respect to using the libraries or finding resources. Call 866-281-6309 or email ask@ufl.libanswers.com for more information
- [Teaching Center](#): 1317 Turlington Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.
- [Writing Studio](#): Daytime (9:30am-3:30pm): 2215 Turlington Hall, 352-846-1138 | Evening (5:00pm-7:00pm): 1545 W University Avenue (Library West, Rm. 339). Help brainstorming, formatting, and writing papers.

Student Complaints:

- Academic Complaints: Office of the Ombuds; Visit the Complaint Portal webpage for more information.
- Enrollment Management Complaints (Registrar, Financial Aid, Admissions): View the Student Complaint Procedure webpage for more information.
- Residential Course: <https://www.ombuds.ufl.edu/complaint-portal/>
- Online Course: <https://pfs.tnt.aa.ufl.edu/state-authorization-status/#student-complaint>