

**GIS 4121 (Geospatial Analysis)/GIS 6116 (GIS Analysis)****INSTRUCTORS:**

Dr. Hartwig Henry Hochmair (FLREC Fort Lauderdale)

Dr. Amr Abd-Elrahman (GCREC Plant City)

**LECTURES:** Wednesdays, 1:55 pm - 4:55 pm (period 7-9)

Taught via Adobe Connect virtual classroom software (Web based)

Classes begin on Wed, Jan 4; last class: April 19

**FLREC OFFICE (DR. HOCHMAIR):**

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**REQUIRED COURSE MATERIALS:**

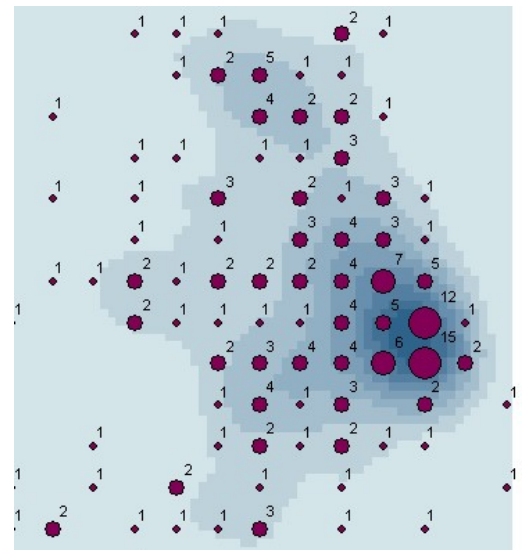
- O'Sullivan D, Unwin DJ (2010). *Geographic Information Analysis* (2<sup>nd</sup> ed.). Hoboken, New Jersey, Wiley & Sons.
- Additional reading materials will be made available through the Canvas course Web site (<http://elearning.ufl.edu/>).

**FURTHER OPTIONAL READING MATERIALS:**

- de Smith, M. J., Goodchild, M. F., and Longley, P. A. (2015). *Geospatial Analysis* (5<sup>th</sup> ed.). Leicester: Matador.  
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.
- Mitchell A (2005). *The ESRI Guide to GIS Analysis, Volume 2: Spatial Measurements and Statistics*. Redlands, California, ESRI Press.

**SOFTWARE REQUIREMENTS:**

ArcGIS 10.4 (or higher) and Microsoft Excel. Free 1-year copies will be provided for registered students, if needed. ArcGIS runs under Windows, but not on Apple operating systems.



**INTRODUCTION - COURSE CONTENT and OBJECTIVES:**

GIS analysis involves the process of analyzing and identifying patterns in geographic data, and describing relationships between spatial features. This course introduces a number of techniques aimed at the analysis of spatial data and will be comprised of lectures and computer labs. Lecture topics include characterization of spatial data, geographic distributions, pattern identification within point and area objects, analysis of field data, spatial modeling and interpolation, regression methods, and cluster analysis. On the practical side, students will conduct spatial analysis with ArcGIS software using ArcGIS extensions, Python scripting and model builder, and Microsoft Excel spreadsheet functions.

**STUDENT LEARNING OUTCOMES:**

At the completion of the course, the student should be able to:

- i. understand how spatial statistics can be used to identify and describe geographic patterns
- ii. select an appropriate analysis method to solve a given spatial research question
- iii. work with vector and raster data and conduct spatial analysis functions using GIS
- iv. perform Geostatistical analysis functions on spatial data using GIS
- v. automate and customize geoprocessing ArcGIS functionality through Python scripting and ModelBuilder

**RECOMMENDED COURSE PREREQUISITES:** GIS3072C or any other introductory GIS course. In general, some working experience with ArcGIS is recommended. The “Getting to Know ArcGIS” workbook provides useful introductory exercises to be better prepared for the course. Basics in statistics are essential, so is competence with MS Excel software.

**GRADING POLICY:**

<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	F	0-59.9

<i>Grading item</i>	<i>Percentage</i>
Timeliness and completeness of weekly assignments	90%
Online quizzes and discussions	10%
	<b>100%</b>

**COURSE OUTLINE:**

<b>Week</b>	<b>Topic</b>	<b>Readings</b>
Week 1, Jan 4 (H)	Course introduction, review concepts of statistics and distributions, matrix notation	O'Sullivan Appendix A
Week 2, Jan 11 (H)	statistics review (cont.)	
Week 3, Jan 18 (H)	Spatial processes, Quadrat count methods	O'Sullivan ch 4.1-4.4, p. 121-130
Week 4, Jan 25 (H)	Distance based point pattern measures (NN, F, G, L functions)	O'Sullivan p. 130-155
Week 5, Feb 1 (H)	Distance-based cluster detection based (KDE, hierarchical, Partitioning: K-means)	de Smith ch. 4.3.4 CrimeStat IV manual ch. 7-16, 8-20
Week 6, Feb 8 (H)	Cluster detection based on attribute values; spatial autocorrelation, Hot-spot analysis	O'Sullivan ch 7, ch.8.1-8.4
Week 7, Feb 15 (H)	Control for background inhomogeneity (Risk adj. NN, scan statistics); Geographically Weighted Regression (GWR)	O'Sullivan ch. 6.5-6.7 CrimeStat IV manual ch. 7-36  O'Sullivan ch 8.5
Week 8, Feb 22 (A)	Analyzing geographic relationships, multivariate statistical analysis	O'Sullivan ch 11.1 and 11.2
Week 9, Mar 1 (A)	Clustering and Principal Components Analysis (PCA)	O'Sullivan ch 11.4-11.6
<i>Mar 8</i>	<i>Spring break</i>	
Week 10, Mar 15 (A)	Analysis of field data, Surface modeling, slope gradient, TIN and raster	O'Sullivan ch 8
Week 11, Mar 22 (A)	Spatial interpolation: deterministic and stochastic models, IDW, kriging, and linear regression	O'Sullivan ch 9, 2.4
Week 12, Mar 29 (A)	Map overlays (raster, vector) - Raster data analysis	O'Sullivan ch 11 <i>Online book (Map Analysis): Topic 22</i>
Week 13, Apr 5 (A)	Raster data analysis (cont.)  neighborhood, zonal, global functions	<i>Online book (Map Analysis): Topic 23</i>
Week 14, Apr 12 (A)	Raster Analysis Applications	
Week 15, Apr 19 (A)	Automating geoprocessing through Python script	Handouts: ESRI white papers and documentations

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**GRADES AND GRADE POINTS:**

For information on current UF policies for assigning grade points, see

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**GRADING ITEMS AND DELIVERABLES**

Through the semester, the students will be given around eight weekly home assignments.

**CLASS FORMAT AND POLICIES**

1. This course is a distance education course taught synchronously the virtual classroom software Adobe Connect. Although the lectures are recorded and available online for review, attendance is strongly encouraged.
2. The Canvas system should be used as the platform for written communication between students and the instructor. The canvas conversation function is like an internal e-mail system. Questions and suggestions to the whole class can also be posted under the Discussions tab.
3. Any short-term changes concerning lectures or classes are announced through Canvas. Feel free to call the instructors with any questions.
4. For each assignment a due date and time is given, which is usually the beginning of the next class.
5. Lecture material can be downloaded from the Canvas website (<http://elearning.ufl.edu/>) at least half an hour before class starts.

**MISSING AND LATE ASSIGNMENT POLICIES**

A 10% penalty per day will be applied to late assignments up to one week after they are due date/time. This means that assignments handed in late on the due date or the next calendar day get a 10% point deduction, for 2 days late this gives a 20% penalty, and so on. Assignments will not be accepted if handed in more than one week (7x24 hours) after the due date/time. If you know in advance that you will be late for an assignment, let the instructor know in advance (via Canvas), and it will be decided by the instructor whether an exception can be made on a case-by-case basis.

**ABSENCES AND MAKE-UP WORK:**

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/ugrad/current/regulations/info/attendance.aspx>.

**USING ADOBE CONNECT SOFTWARE:**

Live lectures (as announced) and office hour meetings (per individual student requests) will be conducted with the Adobe Connect web conferencing software. Sessions can be joined by clicking a link posted by the instructor on Canvas.

The following [link](#) explains how to participate in Adobe Connect meetings/sessions. Adobe Connect only requires an internet connection, a web browser, and Adobe Flash Player version 10.1 or higher. Adobe Connect supports nearly any operating system including Windows, Macintosh, Linux and Solaris, as well as the most widely used browsers including Internet Explorer, Firefox, Safari, and Chrome. A microphone is also needed to communicate with the instructors and the students attending the session.

NOTE - This syllabus is tentative and subject to change. As with all classes, you are responsible to know the course schedule, readings & labs, and check for short term changes in the topics, dates, etc.

**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.

**UF HONOR CODE:**

As a result of completing the registration form at the University of Florida, every student has signed the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."

The instructors of this course fully support the intent of the above statement and will not tolerate academic dishonesty. We, the members of the University of Florida Community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity. Read more: <http://www.dso.ufl.edu/students.php>

**CAMPUS HELPING RESOURCES:**

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- University Counseling Center, 301 Peabody Hall, 392-1575, [www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)
- Career Resource Center, CR-100 JWRU, 392-1602, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)
- Student Mental Health Services, Rm. 245 SHCC, 392-1171, [www.shcc.ufl.edu/smhs/](http://www.shcc.ufl.edu/smhs/)

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- Alcohol and Substance Abuse Program (ASAP)
  - Center for Sexual Assault / Abuse Recovery & Education (CARE)
  - Eating Disorders Program
  - Employee Assistance Program
  - Suicide Prevention Program

**SERVICES FOR STUDENTS WITH DISABILITIES:**

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)