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 BigBlueButton virtual classroom software (Web based)

Classes begin on Wed, Jan 7; last class: April 22

FLREC OFFICE (DR. HOCHMAIR):

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Gulf Coast Research and Education Center

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REQUIRED COURSE MATERIALS:

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

- Mitchell A (2005). The ESRI Guide to GIS Analysis, Volume 2: Spatial Measurements and Statistics. Redlands, California, ESRI Press.

- Additional reading materials will be made available in advance through the eLearning Web site. (http://lss.at.ufl.edu/)

FURTHER RECOMMENDED READING MATERIALS:

de Smith, M. J., Goodchild, M. F., and Longley, P. A. (2013). *Geospatial Analysis (4th ed.).* Leicester: Matador. Available online at http://www.spatialanalysisonline.com/

SOFTWARE REQUIREMENTS:

ArcGIS 10.2 and Microsoft Excel. Free 1-year student copies for ArcGIS 10.2 will be provided, if needed, for registered students.
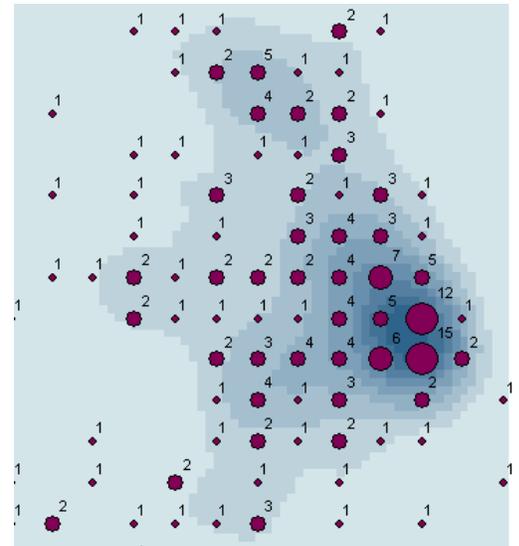
INTRODUCTION - COURSE CONTENT and OBJECTIVES:

GIS analysis involves the process of analysing 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 PREREQUSITES: SUR 3393/SUR3393L. If these courses have not been taken, some experience with ArcGIS software from elsewhere 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 personal computers and application software (MS excel).

GRADING POLICY:

Grade	Percentage	Grade	Percentage
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

Grading item	Percentage
Timeliness and completeness of weekly assignments	97%
Home assignment in-class demo	3%
	100%

COURSE OUTLINE:

Week	Topic	Readings
Week 1, Jan 8 (H)	Course introduction, review concepts of statistics and distributions, matrix notation	O'Sullivan Appendix A Mitchell p. 63-70 (*Longley ch 15.4)*
Week 2, Jan 15 (H)	statistics review (cont.)	
Week 3, Jan 22 (H)	Spatial processes, Density based point pattern measures, KDE	O'Sullivan ch 4.1-4.2, 5.1-5.2 Mitchell p 22-50,
Week 4, Jan 29 (H)	Distance based point pattern measures, G,F,K,L, function; case-control data	O'Sullivan ch 5.2+5.3 Mitchell p 80-103
Week 5, Feb 5 (H)	Cluster detection of point features; clustering with control variables	Mitchell p 148-162, CrimeStat manual ch. 6
Week 6, Feb 12 (H)	Analysis of area objects, spatial autocorrelation, Local and Global Statistics	O'Sullivan ch 7, ch.8.1-8.4 Mitchell p 104-133 (ch3)+163-181 (ch4); *(Longley ch 4.1-4.4, 4.5)*
Week 7, Feb 19 (H)	Geographically Weighted Regression (GWR)	O'Sullivan ch 8.5
Week 8, Feb 26 (A)	Analyzing geographic relationships, multivariate statistical analysis	Mitchell ch 5 O'Sullivan ch 11.1 and 11.2
Mar 3-7	Spring Break	
Week 9, Mar 12 (A)	Clustering and Principal Components Analysis(PCA)	Mitchell ch 5 O'Sullivan ch 11.4-11.6
Week 10, Mar 19 (A)	Analysis of field data, Surface modeling, slope gradient, TIN and raster	O'Sullivan ch 8 *(deSmith, ch. 6.1+6.2)*
Week 11, Mar 26 (A)	Spatial interpolation: deterministic and stochastic models, IDW, kriging, and linear regression	O'Sullivan ch 9, 2.4 *(deSmith, ch. 6.5-6.7)* Mitchell ch 5 *(deSmith, ch. 5.6)*
Week 12, Apr 2 (A)	Map overlays (raster, vector) - Raster data analysis	O'Sullivan ch 11 *Online book (Map Analysis): Topic 22*
Week 13, Apr 9 (A)	Raster data analysis (cont.), local	*Online book (Map Analysis): Topic*
Week 14, Apr 16 (A)	Raster Analysis Applications	
Week 15, Apr 23 (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 6-8 weekly home assignments and two cumulative assignments.

CLASS FORMAT AND POLICIES

1. This course is a distance education course taught synchronously through virtual classroom software. Although the lectures are recorded and available online for review, attendance is strongly encouraged. Partial course credit will be given for presenting one of the home assignments to the other students on the due date, which is usually one week after the hand-out.

2. The E-Learning system should be used as the platform for written communication between students and the instructor, where the built-in e-mail or discussion function should be used. Any short-term changes concerning lectures or classes are announced through E-Learning. Feel free to call the instructors with any questions.

3. For each assignment a <u>due date and time</u> is given, which is usually the beginning of the next class.

4. Lecture material can be downloaded from the E-Learning website (http://lss.at.ufl.edu/) at least half an hour before class starts.

MISSING AND LATE ASSIGNMENT POLICIES

1. 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 E-Learning), and it will be decided by the instructor whether an exception can be made on a case-by-case basis.

2. Students who cannot attend the class regularly need to arrange with the instructor to satisfy the in-class presentation(s) requirements.

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 BIGBLUEBUTTON:

GIS lecture sessions and office hour meetings (per request) will be conducted using BigBlueButton web conferencing system, which can be accessed throug the E-Learning teaching platform and a Web browser. BigBlueButton allows to share documents, webcams, chat, audio and your desktop. It can also record sessions for later playback. Some tutorials can be found here: http://demo.bigbluebutton.org/

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.

ONLINE COURSE 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. These evaluations are conducted online at https://evaluations.ufl.edu. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results. Should you have any complaints with your experience in this course please visit http://www.distance.ufl.edu/student-complaint to submit a complaint.

ACADEMIC HONESTY POLICY:

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*" You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit 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.*"

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). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. 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:
http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code

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.

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 & Wellness Center, 3190 Radio Road, 352-392-1575,* **www.counseling.ufl.edu/cwc/**
  - Counseling Services
  - Groups and Workshops
  - Outreach and Consultation
  - Self-Help Library
  - Wellness Coaching
- *Career Resource Center,* First Floor JWRU, 392-1601, **www.crc.ufl.edu/**

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/