

GIS 6103 - GIS Programming and Customization

INSTRUCTOR:

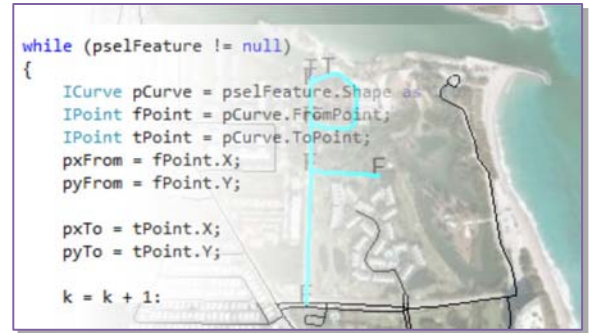
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COURSE MEETINGS:

Fridays, 11:45am-2:45pm (per. 5-7), taught live online via BigBlueButton (a Web based interactive learning tool).

Classes begin on Fri, Aug 29; last class: Wed, Dec 5

OFFICE HOURS:

I can be called any time. if necessary, students can arrange a video conference meeting.

REQUIRED READINGS:

- Amirian, P. (2013). *Beginning ArcGIS for Desktop Development using .NET*. New York, NY: John Wiley & Sons.

FURTHER RELATED READINGS (NOT REQUIRED):

- Stellman, A. and Greene, J. (2010). *Head First C#, 2E: A Learner's Guide to Real-World Programming with Visual C# and .NET*. Sebastopol, CA: O'Reilly Media.

- Albahari, J. and Albahari, B. (2012). *C# 5.0 in a Nutshell: The Definitive Reference (5th ed.)*. Sebastopol, CA: O'Reilly Media.

ADDITIONAL MATERIALS:

- ArcObjects Help for .NET developers: Available at

<http://resources.arcgis.com/en/help/arcobjects-net/conceptualHelp/>

- Links to Websites covering different programming topics

COURSE PREREQUISITES: While there are no formal course prerequisites, this class assumes that students have a basic knowledge of ESRI's ArcGIS software and that they have also been exposed to some basic programming in any programming language (e.g. Python, Basic, R, C, Java-Script). Admission to the course is based on instructor consent.

COURSE DESCRIPTION: This hands-on graduate course gives an introduction on how to expand the functional capabilities of a Geographic Information System (GIS) through programming.

COURSE OBJECTIVE AND STUDENT LEARNING OUTCOMES:

From a programming perspective the course objective is to provide students with a basic understanding of (1) object oriented programming, (2) the syntax of the .NET C# language, (3) ESRI's ArcObjects structure, (4) the Visual Studio programming environment. From the application side an objective is to expose students to showcases of GIS scripting applied to natural resources research so that students understand the benefits of GIS analysis and programming for this type of research problems.

At the completion of the course, the students are expected to be able to:

- I. read ArcObjects diagrams and understand object interfaces, properties, and methods
- II. build programs in C# that utilize ArcObjects
- III. apply raster and vector data analysis functions using C# and ArcObjects
- IV. automate workflow and analysis processes through scripting
- V. apply basic concepts of objects oriented programming for problem solving
- VI. decide when to use GIS Programming and what type of GIS Programming is appropriate for different natural resource research problems

COURSE SOFTWARE:

A student copy of ArcGIS software will be provided, as well as a download link for Microsoft Visual Studio.

GRADING:

| Grading Item | Grade Percentage | Description |
|-------------------------|-------------------------|--|
| Programming Assignments | 85% | - Students complete one programming assignment every 1-2 weeks. - Assignments are based on timeliness and correctness. |
| Literature review paper | 5% | Students perform a literature search for research papers that apply discussed programming concepts to natural resource problems and prepare a written summary. |
| Paper presentation | 5% | Each student presents one selected paper in class and leads the paper discussion. |
| Assignment presentation | 5% | Each student is expected to present his/her home assignment in class at least once during the semester. |

GRADING SCHEME:

| <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 |

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>

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 due date and time 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 through 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.

LECTURE SCHEDULE:

| <i>Week</i> | <i>Date</i> | <i>Lecture Content</i> | <i>Literature review</i> |
|-------------|-------------|--|-----------------------------------|
| 1 | Aug 29 | Introduction, course and software overview; Introduction to C#, Visual Studio and .NET framework | |
| 2 | Sep 5 | C# variable types, basic structures in C# (loops, conditional statements) | |
| 3 | Sep 12 | Collections and dictionaries in C# | |
| 4 | Sep 19 | Concepts of object oriented programming: classes, properties, methods, inheritance | |
| 5 | Sep 26 | ArcObjects model diagrams, ArcObjects online resources | |
| 6 | Oct 3 | ArcGIS layer management using C# and ArcObjects | |
| 7 | Oct 17 | Feature selection and display | |
| 8 | Oct 24 | Feature geometries | |
| 9 | Oct 31 | Creating feature classes and tables | |
| 10 | Nov 7 | Working with feature cursors | Literature review paper due |
| 11 | Nov 14 | Managing and reading raster datasets | Paper presentation and discussion |
| 12 | Nov 21 | Geoprocessing tools | Paper presentation and discussion |
| 13 | Dec 5 | Geoprocessing tools (cont.) | Paper presentation and discussion |

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>.

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/honorcodes/honorcode.php>.

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/