GIS 6103 - GIS Programming and Customization

Overview:
This hands-on graduate course gives an introduction on how to expand the functional capabilities of a Geographic Information System (GIS) in the ESRI environment through programming in the .NET framework. Using Visual Studio as the developer environment and various online coding resources students will leverage modern .NET features to write add-ins that can be used in ArcGIS Desktop.

- Fall semester, 3 credits
- 100% online, synchronous and asynchronous component
- http://elearning.ufl.edu/

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 (e.g. in Python, Basic, R, C, Java-Script).

Instructor:
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Teaching assistant:
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Lectures:
Fridays, 11:45am-2:45pm (per. 5-7) via Adobe Connect (recordings available)
First day of class: Fri, Aug 24; last day of class: Fri, Nov 30

Office hours:
The instructor and TA can be best reached via the conversation tool in Canvas. Students are also welcome to call by phone or arrange a video conference meeting in Adobe Connect.

Required readings:
Further related readings (not required):

Additional materials:
- ArcObjects online Help for .NET developers: Available at http://desktop.arcgis.com/en/arcobjects/latest/net/webframe.htm

Course objective and student learning outcomes:
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. The programming skills learned will enable students to use scripting for problem solving related to natural resources, planning, forestry, and data visualization within the ArcGIS Desktop environment.

At the completion of the course, the students will be able to:
I. read ArcObjects diagrams with object interfaces, properties, and methods
II. access ArcObjects capabilities through C#
III. utilize concepts of object oriented programming for spatial programming tasks
II. conduct vector data analysis using C# and ArcObjects
V. automate geoprocessing steps

Course logistics:
Throughout the semester, the students will be given approximately 10 home assignments. For each assignment a due date and time is given, which is usually the beginning of the next class. This course is a distance education course taught as live lectures using the virtual classroom software Adobe Connect. Lecture materials can be downloaded from the course website. The Canvas course management system (http://elearning.ufl.edu/) should be used as the platform for written communication between students and the instructor. Questions and suggestions to the whole 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 call the instructors with any questions.

Technology Requirements:
- A computer or mobile device with high-speed internet connection
- A headset and/or microphone and speakers; a web cam is suggested
- A Web browser with the latest updates for Adobe Connect

Using Adobe Connect:
Adobe Connect web conferencing sessions can be joined by clicking a link posted by the instructor on Canvas. Adobe
Connect requires an internet connection and a web browser. More details can be found here.

Course software:
- ArcGIS 10.6 software with ArcObjects SDK for the Microsoft .NET Framework
- Microsoft Visual Studio 2017
Instructions for software download are provided on the course Web site.

Grading:

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

<table>
<thead>
<tr>
<th>Grading Item</th>
<th>Grade Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Assignments</td>
<td>97%</td>
<td>- Timeliness and quality of programming assignments;</td>
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<tr>
<td>Assignment presentation</td>
<td>3%</td>
<td>- Assignments will be performed as a homework every 1-2 weeks.</td>
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<td></td>
<td></td>
<td>- Present a completed assignment during the lecture (once during the semester).</td>
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</table>
### Lecture schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Related readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 24</td>
<td>Introduction to Visual Studio, .NET, C#; Integrated Development Environment</td>
<td>Book Ch. 2</td>
</tr>
<tr>
<td>2</td>
<td>Aug 31</td>
<td>C# variable types, basic structures (loops, conditional statements)</td>
<td>Book Ch. 3</td>
</tr>
<tr>
<td>3</td>
<td>Sep 7</td>
<td>Classes, objects and arrays</td>
<td>Book Ch. 3, 4</td>
</tr>
<tr>
<td>4</td>
<td>Sep 14</td>
<td>Collections, lists and dictionaries, ArcObjects object model diagrams (OMD)</td>
<td>Book Ch. 4, 5</td>
</tr>
<tr>
<td>5</td>
<td>Sep 21</td>
<td>OMD (cont.), Add-Ins</td>
<td>Book Ch. 5</td>
</tr>
<tr>
<td>6</td>
<td>Sep 28</td>
<td>Accessing maps and layers</td>
<td>Book Ch. 6</td>
</tr>
<tr>
<td>7</td>
<td>Oct 5</td>
<td>Search cursor</td>
<td>Book Ch. 7, 8</td>
</tr>
<tr>
<td>8</td>
<td>Oct 12</td>
<td>Update and insert cursor</td>
<td>Book Ch. 7, 8</td>
</tr>
<tr>
<td>9</td>
<td>Oct 19</td>
<td>Feature geometries</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Oct 26</td>
<td>Graphic elements</td>
<td>Book Ch. 9</td>
</tr>
<tr>
<td>11</td>
<td>Nov 2</td>
<td><em>Homecoming (no class)</em></td>
<td>Book Ch. 11</td>
</tr>
<tr>
<td>12</td>
<td>Nov 9</td>
<td>Custom User Interface elements</td>
<td>Book Ch. 14 (part)</td>
</tr>
<tr>
<td>13</td>
<td>Nov 16</td>
<td>Geoprocessing tools</td>
<td>Book Ch. 12</td>
</tr>
<tr>
<td>14</td>
<td>Nov 23</td>
<td><em>Thanksgiving (no class)</em></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Nov 30</td>
<td>Data management, creating geodatabase objects</td>
<td>Book Ch. 13</td>
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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](https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx)

### Class format and policies
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, and 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.
• Assignments will not be accepted if handed in more than seven days after the due date.
• Exceptions to the late policy are only allowed per university policy.

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 (option 2).

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.

Semester Evaluation Process:
Student assessment of instruction is an important part of efforts to improve teaching and learning.

At approximately the mid-point of the semester, the School of Forest Resources & Conservation will request anonymous feedback on student satisfaction on various aspects of this course. These surveys will be sent out through Canvas and are not required, but encouraged. This is not the UF Faculty Evaluation!

At the end of the semester, students are expected to provide UF with feedback on the quality of instruction in this course using a standard set of university and college criteria (UF Faculty Evaluations). 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.

Netiquette: Communication Courtesy  Semester Evaluation Process:
All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. Failure to do so may result in loss of participation points and/or referral to the Dean of Students’ Office. http://teach.ufl.edu/docs/NetiquetteGuideforOnlineCourses.pdf

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 them 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 or 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

**University Policy on Accommodating Students with Disabilities:**

Students requesting accommodation for disabilities must first register with the Dean of Students Office (http://www.dso.ufl.edu/drc/). 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.

**Getting help:**

For issues with technical difficulties for e-learning in Canvas, please post your question to the Technical Help Discussion in your course, or contact the UF Help Desk at:

- Learning-support@ufl.edu | (352) 392-HELP - select option 2 | http://elearning.ufl.edu
- Library Help Desk support http://cms.uflib.ufl.edu/ask
- SFRC Academic Hub https://ufl.instructure.com/courses/303721

**Student Life, Wellness, and Counseling Help:**

- Counseling and Wellness resources http://www.counseling.ufl.edu/cwc/
- U Matter, We Care http://www.umatter.ufl.edu/
- Career Resource Center http://www.crc.ufl.edu/
- Other resources are available at http://www.distance.ufl.edu/getting-help for online students

**Student Complaint Process:**

The School of Forest Resources & Conservation cares about your experience and we will make every effort to address course concerns. We request that all of our online students complete a course satisfaction survey each semester, which is a time for you to voice your thoughts on how your course is being delivered.

If you have a more urgent concern, your first point of contact should be the SFRC Academic Coordinator or the Graduate/Undergraduate Coordinator for the program offering the course. You may also submit a complaint directly to UF administration:

- Students in online courses: http://www.distance.ufl.edu/student-complaint-process
- Students in face-to-face courses: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf