### Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
Submit original form and attachments

1. This request is submitted by the Department of ____________________________
   Ecosystem Science and Management

2. Course prefix, number and complete title of course: FRSC 653, Computer Programming for Natural Resource App

   Attach a brief supporting statement for changes made to items 3a thru 3d. and 5 below.

3. Change requested
   a. Prerequisite(s): From: ____________________________ To: ____________________________
   b. Withdrawal (reason): ____________________________
   c. Cross-list with: ____________________________

   Cross-listed courses require the signature of both department heads.

   d. Change in course title and description. Enter complete current course title and current course description in item 4; enter proposed course title and proposed course description in item 5.

   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 6. Attach a course syllabus.

4. Complete current course title and current course description:

5. Complete proposed course title and proposed course description (not to exceed 50 words):

6. a. As currently in course inventory:

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<td>COMP PRG FOR NAT RES AP</td>
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   b. Change to:

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   Approval recommended by: ____________________________
   Date: 8/7/08

   Head of Department

   Chair, College Review Committee
   Date: 9/10/08

   Head of Department (if cross-listed course)
   Date: 10/10/08

   Dean of College

   Submitted to Coordinating Board by: ____________________________
   Date: ____________________________

   Effective Date: ____________________________

   Questions regarding this form should be directed to Sandra Williams at 845-8201.
Curricular Services – 11/07
ESSM 665: Computer Programming for Natural Resources Applications
TENTATIVE SYLLABUS and SCHEDULE

Instructors:        Dr. Marian Eriksson  
Department of Ecosystem Science and Management  
Office: 320 HFSB or 232 Centeq  
Office Hours: By appointment  

Lecture/Lab:     Centeq; B214  
Meeting Time:  TuTh 4:50:6:35  
Prerequisites:    Approval of the instructors.  

Course Description  
An introduction to programming concepts and applications; elements of Visual Basic programming including data types, control and program structure; introduction to objects and object-oriented programming; macro and applications development; automation of GIS programming through the use of macros. Prerequisites: Approval of instructors.  

Justification and Objectives  
This course is intended for graduate students with little or no previous experience with formal programming languages.  

Students entering graduate-level remote sensing and GIS programs come from a wide array of undergraduate programs, many of which require only the completion of a computer literacy course for graduation. To make maximum use of any type of analytical software often requires that the user "think outside of the box" - that they coax programs into doing things that the designers of the program had not thought of or had chosen not to include. Also, even when the desired functionality is included with the software, it is often necessary to perform the same task on many different objects. The ability to automate such repetitious and tediQus tasks often results in substantial increases in efficiency (and coincident decrease in tedium and boredom).  

A macro is a program, often a very small program, that is written to run from within a larger program package. At this time Visual Basic for Applications (VBA) is the macro programming language of choice in a large number of program packages. This includes most Microsoft products, ArcGIS, and ERDAS. In time, this may change and other languages may come to dominate. That won't matter once you have learned one programming language it is easy to pick up another because the concepts are the same in all languages.  

The course is organized in two distinct portions. In the first portion, lasting 9 weeks, you will learn the fundamentals of VB programming. This portion will be taught by Dr. Eriksson. In the second portion, lasting 5 weeks, you will apply and extend the VB programming skills learned in the first to writing macros for ArcGIS. The second portion of the course will be taught by Dr. Srinivasan.
First Portion: Since Excel is unquestionably the most widely used analytical tool, since most undergrads are introduced Excel, and since it lends itself well to the development of an understanding of Visual Basic programming concepts and techniques, much of the first portion of the course will use Visual Basic for Excel Applications. We will also introduce the fundamentals of creating standalone programs and objects. You will leave this portion of the course with an understanding of the VBA environment, top-down programming, data types, arrays, subroutines and functions, conditional branching, looping, branching to other subroutines and functions, a general understanding of forms and the use of objects. You will also be introduced to objects, the use of flow charts and debugging tools.

Second Portion: Visual Basic macro programming in ESRI ArcOIS: ArcOIS is a powerful and an 'expandable' software, meaning that its capacity/purpose can be extended and/or customized based on user's interests. Just as you have seen in the MS-Excel, the macro environment is available in the ArcOIS to help users extend and/or customize some of the applications in the ArcOIS. VBA offers the same tools as Visual Basic (VB) but provides them in an existing application-in this case the core ArcOIS applications, ArcMap and ArcCatalog, and the ArcOIS extension, ArcScene. VBA is built into each of these applications. In this second portion of the course, you will be acquainted with how VBA programming language is used to perform user-specific operations within the ArcOIS. Also, you will complete other user-specific customization of the ArcOIS Control tools and write VBA codes to extend its applications. At the end of the course, you will be well informed about programming in the macro environment in general and the applications of VBA both in the MS-Excel and the ESRI's ArcOIS in particular.

Homework: 1) Short assignments generally to be done in-class. 2) Weekly or bi-weekly homework assignments will be made. These will be a combination of short tasks intended to learn programming concepts and somewhat longer tasks intended to develop programming competency. Each assignment will count equally toward the final grade unless noted otherwise. 3) AO Exercises.

Exams: There will be no exams.


Supplemental reading materials will be posted on the course web sites.
Web sites
http://www.ssl.tamu.edu/university/courses

Grading:
Assignments .............................................................. 100%
Weighted proportionately to the complexity of assignments.

A = 100-90
B = 89-80
C = 79-70
D = 69–60
F = < 60

ROUGH LECTURE SCHEDULE

Lecture Topic(s)
1a Housekeeping / Hello World.
1b Review Excel: data types; classes of functions esp. string, logical, lookup; record macro
2a/b Basics: Top-down; memory & variables; naming conventions & rules; reserved words; operators; assignment statements; data types; strong vs weak typing / Option Explicit; functions (MsgBox); VBEesp. Immediate Window; Step-Into/Run/Break points; objects (general) / Debug.Print, Application/Range/Cells (Cells will be the primary form of I/O for the next 4½ - 5 Weeks).
3a/b Strings & string functions; order of precedence; record macro - Cell properties; using With; vb/mso/xl constants (Object Browser); If and Select blocks; conditions & logical functions; flow charting basics;
4a/b Events; Error-trapping & debugging; For / Do while / Do until; initializing; accumulators; flow-charting; nested Ifs; nested loops; Exit. May take 2 lectures, if so then at the expense of scripting or stand-alone topics. Assign to read about DMD before next lecture.
5a Larger example (DMD for polygon area). On-line exam assigned, due within 48 hours.
5b User-defined functions; calling other subs; modify DMD; named & optional arguments; recursive functions; scope/lifetime of variables; idea of garbage collection. Modify DMD to (1) call function, subs and (2) use optional parameter to start with (x,y).
6a Arrays & the Array function; Option Base; ReDim (since they will have been working with Cells, this should be straight-forward). Modify DMD to use arrays; Other kinds of statements
6b Using objects; forms & controls; finding objects; the Object Browser; Active-X & Addins - info only, very general; Word, Access, Arc basic objects
7a Working with objects: charts, drawing, etc.
7b General I/O; working with files; Database functions / link to Access;
8a Review HTML & intro client-side scripting
8b Intro server-side scripting; database connections; Excel as client; Excel as server
9a Intro stand-alone programming. Take home practical assigned.
9b Creating a stand-alone program: simple but complete (through the creation of a setup.exe file). Assign on-line exam to be taken after HW 9 is complete.
10a Review ArcGIS: applications and components (arcMap, arcCata10g, arcInfo)
10b Review VBA in ArcGIS: familiarization with data types and classes of functions (application, document, map, layer and feature layer); types of built-in controls
11a Intro to customizing ArcGIS: addition of custom controls such as Commands, Tools, Editbox, Combobox and Menu to the ArcMap interface; customize ArcCatalog
11b Create new UIToolControl: customize with new Control Tools (create new toolbars and menus); define variables; add VBA codes to command the
functionality of the Control Tools

12a/b Using ArcObjects with VBA; reading ArcObjects OMD's class: define interfaces, properties and methods for an object; reading ArcObjects OMD's interfaces: methods of communication with an object, defining logical groups of methods and properties; reading ArcObjects OMD's properties and methods: set/read properties and perform actions ArcObjects OMD's class relationships: inheritance, instantiation, composition and association; Navigating OMD: MxDocument class, Map class and Query Layer class

13a Testing an object reference (type of variable, typeOf object, nothing); programming tips

13b Intro to stand-alone VB programming; creating a stand-alone simple VB programs to run using ArcGIS resources. Working with ArcCatalog: registering dll and Add-Ins

For any other questions or concerns, please refer to http://student-rules.tamu.edu

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Cain Hall or call 845-1637.

An Aggie does not lie, cheat, or steal, or tolerate those who do.

Work hard! Have a good semester!