Sample Syllabus for GEOS 436/636

The remainder of this file based on the actual syllabus for the current trial version of the course, which is being offered as GEOS 692. The trial course was developed collaboratively by Freymueller and graduate student Ronni Grapenthin – in fact, the course was Grapenthin's brainchild. The results of the trial courses have been significant enough that we aim to integrate it into the curriculum as a formal course with a permanent instructor. More information about the course is available online:

http://www.gps.alaska.edu/programming/

The 2010 version of the trial course is also online:

http://www.gps.alaska.edu/programming_2010/

That version includes the lecture presentations in PDF format for the entire semester, as they were delivered in Fall 2010. A 2009 version is also available. Some selected material is included in PDF form. The trial course was not stacked and was offered pass/fail. One undergraduate took it in Fall 2011, which was useful in helping calibrate expectations. The syllabus here has been modified from the originally submitted version to better develop the stacked undergraduate version of the course and to incorporate feedback from the Faculty Senate. The main changes were to be more specific about the expectations for project, and to make a clearer separation between the work assigned and expectations for undergrads taking it as 436. Flexibility in the project is beneficial for the students, so keeping that is important. The students are more excited about the project and learn more when it is directly helping them do something they need to do for their research. That means there are many styles of projects, and these have been listed now in the syllabus so students can see what the expectations are. My hope is that they will do more than the minimum because that advances their research, but that is up to them. The structure of the lab and homework assignments is not conducive to having undergraduates do different or simpler assignments or only do a part of each assignment, and in reality there is no reason they should not be able to do these as well as the grad students. So the main difference is that the undergrads have a much simpler final assignment, which is just to present something they have done in the lab rather than to do independent work lik

GEOS 692: Beyond the Mouse 2011 – Programming and Automation for Geoscientists (2 Cr.)

"Programming is legitimate and necessary academic endeavor."
Donald E. Knuth

Instructors:

Ronni Grapenthin
Geophysical Institute
University of Alaska Fairbanks
903 Koyukuk Drive, P.O. Box 757320
Fairbanks, Alaska 99775-7320
office: Elvey 413H
hours: by appointment
email: ronni@gi.alaska.edu
phone: +1 (907) 474 – 7428

Jeff Freymueller
Geophysical Institute
University of Alaska Fairbanks
903 Koyukuk Drive, P.O. Box 757320
Fairbanks, Alaska 99775-7320
office: Elvey 413B
hours: by appointment
email: jeff.freymueller@gi.alaska.edu
phone: +1 (907) 474 – 7286

Overview:

In the (geo)sciences – as in many other disciplines – we collect data which need to be analyzed in ways that depend on the problem posed. The ability to modify your working environment according to your needs instead of having it dictate how you approach a problem is invaluable. This is especially true in a setting that is supposed to generate fresh knowledge. Also, and this may be even more important, *we are lazy people*. We do not want to waste time by repeating the same steps again and again, and ... again. Such boredom causes errors. And being bored by such routines is totally legitimate. A computer (the machine, and earlier the person) exists to perform such routines rapidly, reliably and repetitively: It takes in data, manipulates the data following *your* commands (YEAH!), and produces a result. The point of writing computer programs is to *automate an intellectual challenge that has been solved* and make it reusable at all times - for yourself and ideally for others. 21st century scientific research frequently involves manipulation or analysis of very large data sets, or the development of numerical models; this work can only be used effectively by scientists who can make software tools themselves. Acco

things with them that are fun for you. The more you do, the more you will learn.

What it is not:

Complete.

Prerequisites:

GEOS 436: Senior standing or permission of instructor.

GEOS 636: Graduate standing.

Textbook:

No textbook exists for this course. Handouts and lecture slides will be provided, and we will guide you to some of the many reference sources available on the web.

Student Learning Outcomes:

By actively participating in this course you will become significantly more proficient at:

- Breaking problems down into a series of steps
- Organizing data and tools to make automated work easier
- Writing and understanding how to read computer programs in MATLAB
- Writing and understanding how to read Unix/Linux shell scripts
- Making publication-quality maps and figures using GMT (Generic Mapping Tools)
- Using HTML and CSS for web pages

Grading:

This 2 credit class is pass/fail. The class assignments are primarily lab exercises, specifically computer programs written in the computer lab. We use software that is available to students at no cost (for use within the UAF network), so all students could also install and use it on their own computer if they wish. The computer lab is also available for students to use at other times, if they need to finish an assignment outside of lab. During the first third of the semester, additional short homework assignments will be given outside of lab (these do not require any particular computer or software).

Grading is based on weekly lab exercises, homework assignments, a final project, and the presentation of that project in the form of a web page or pages. There will be a total of 12 graded lab assignments, equally weighted, and all other assignments except for the final project itself are scored points equivalent to a lab assignment or a fraction of that.

Graduate Students

Labs+Homework+Project Presentation	**70% of total**
Each Lab assignment	1 Lab
Each Homework assignment	1/2 Lab
Final Project Presentation	1 Lab

Final Project	**30% of total**
Passing (graduate)	***>= 65%***

Undergraduate Students

Labs+Homework+Final Presentation	**100% of total**
Each Lab assignment	1 Lab
Each Homework assignment	1/2 Lab
Final Presentation	1 Lab
Passing (undergraduate)	***>= 65%***

The homework and lab exercises consist of basic application of methods and practices presented in class. The labs help you apply things taught in class. The complexity of the labs varies. Usually they consist of a simple introduction problem to get you used to the

presentation

Prior to each lecture you will find handouts, examples, and problem sets here. The problem