

GEO 5920/6920 – High Performance Computing in the Physical Sciences (1 credit)

Fall 2010

Lecture: FASB 206, 11:50 a.m – 1:10 p.m., Friday

Instructors:

Michael S. Thorne (Assistant Professor, Dept. of Geology & Geophysics)

Office: FASB 267

Phone: 585-9792

Email: michael.thorne@utah.edu

Office Hours: by appointment

Kris Pankow (Research Associate Professor, Dept. of Geology & Geophysics)

Office: FASB 223

Phone: 585-6484

Email: pankow@seis.utah.edu

Office Hours: by appointment

Course Description: Advanced scientific programming in a Unix based environment, with special emphasis on applications in the physical sciences. Basic Unix commands, Unix shell scripting, scripted plotting, digital mapping, compiled languages, supercomputing, and 3D visualization. One lecture/lab weekly.

1. Policies

Grades: Final grades are based on following weights:

- Homework (**95 %**) – Approximately 16 HW assignments (1 per week).
- In class participation (**5 %**)

Late Policy: Homework must be turned **by 5 pm** of the day they are due. Turning in late homework is a gamble. You may turn in homework late with no penalty if I have not yet graded them. However, you never know when after the time homework is due that I will grade them. If I have already graded the homework, then late assignments will not be graded or count towards your final grade.

2. Class Goals

The primary focus of this class is to learn advanced computer skills in a Unix environment. In this course we will learn through hands on approach how to write software aimed at solving problems in the physical sciences. At the end of the course, the student will be able to:

- Write software in the Unix environment, with specific emphasis on solving numerical problems.
- Be able to generate stunning graphics and be able to prepare those graphics for publication.
- Have a basic understanding of how to run and develop software for the modern distributed computing environment (supercomputing).

3. Expectations

Computing: In this course everyone is expected to understand basic computer usage. However, no prior knowledge of a Unix computing environment is expected. Students are not expected to be knowledgeable in any computing language prior to this course.

Homework Problems: The homework problems in this course are designed to give the student practice in writing software. The only way to learn how to write software is to actually write it. Hence, the emphasis in this class is on the final software products written.

4. Textbook and sources of information:

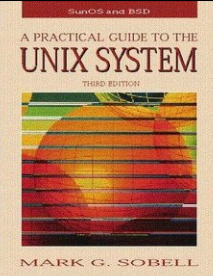
Required Text: There is no required text for this course.

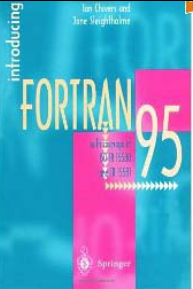

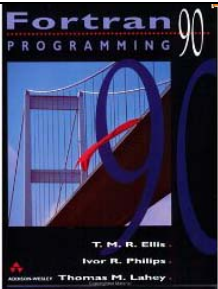
Lecture notes: All lecture notes for this class are available on-line at:

<http://web.utah.edu/thorne/computing.html>

It is your responsibility to print the lecture notes out and bring them to class each week.

Textbooks: There are many good text books that are available for the topics we will be covering in this class. A few of my favorites are shown in the table below.

	<p>A Practical Guide to the UNIX System (Mark G. Sobell). This is an excellent resource on basic Unix commands and shell scripting.</p>

	Introducing Fortran 95 (Ian Chivers and Jane Sleightholme). A very easy introduction to Fortran 95 programming and an excellent reference.
	Fortran 95/2003 Explained (Michael Metcalf). The author is a legendary programmer and this book is well worth the price if you are serious about Fortran programming.
	Fortran 90 Programming (Ellis, Phillips, and Lahey). This is a more advanced book on F90 programming. If I can't find reference on how to do something anywhere else, this book usually has it.

5. Tentative Lecture Schedule

Topic	Description
1	UNIX (Part I): Introduction to the Unix Environment
2	UNIX (Part II): Key Unix Commands: Awk, Cut, Paste, and Join
3	C Shell Scripting (Part I): Basics of a Shell Script
4	C Shell Scripting (Part II): Control structures
5	GMT (Part I): Scripted Plotting, 2D plots
6	GMT (Part II): Global scale mapping
7	GMT (Part III): Local scale mapping, Topo maps, Geologic Maps
8	GMT (Part IV): 3D Map views, Animations
9	Fortran 90 (Part I): Intro to compiled languages, Variables, Numeric types
10	Fortran 90 (Part II): Control structures
11	Fortran 90 (Part III): Arrays, whole array operations, Data I/O
12	Fortran 90 (Part IV): Subroutines, Functions and Modules
13	Supercomputing (Part I): Supercomputing Basics, the Batch system
14	Supercomputing (Part II): The Message Passing Interface
15	3D Visualization (Part I): Rendering with POV-Ray Part 1
16	3D Visualization (Part II): Rendering with POV-Ray Part 2

6. Additional Notes

Statement Concerning Disabilities: “The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.” (www.hr.utah.edu/oeo/ada/guide/faculty).

Faculty and Student Responsibilities: “All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, beginning with verbal warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee.”

“Faculty... must strive in the classroom to maintain a climate conducive to thinking and learning.” PPM 8-12.3, B.

“Students have a right to support and assistance from the University in maintaining a climate conducive to thinking and learning.” PPM 8-10, II. A.