FORTRAN Programming for Physics and Astronomy

Computer programming is an important skill for experimental, observational and theoretical scientific work, and FORTRAN is (still) one of the most important computer languages used for such work. Similarly, the Unix operating system is now in use on most scientific computer systems, ranging from Cray and Connection Machine supercomputers to desktop workstations (and now even PC's). The purpose of this course is to introduce students to programming in FORTRAN, while at the same time familiarizing them with the Unix operating system and many of the programming tools available in the Unix environment, such as the emacs editor, the Revision Control System, and the 'make' program.

Instructor: Eric Myers

Credit: 0 at Vassar, but much more in the "real" world. (Can be taken for $\frac{1}{2}$ credit.)

Structure of the Course: The only real way to learn to program is by writing programs, so the course is structured around a set of exercises. Each exercise requires that you learn one or more new programming concepts in order to complete that exercise. I will provide you with handouts which contain the exercises, which you should perform on the computer. You will turn in a copy of your programs for me to review and critique. Once you have finished one exercise you come to me and get the next set of handouts.

As in any writing course, I will put great emphasis on learning to use good style, not just proper grammar.

Textbook: Any introductory textbook on the FORTRAN-77 language will do. If you don't have one you want to use, I can suggest:

> *FORTRAN 77 with Numerical Methods for Engineers and Scientists*,
> by D. M. Etter, (Benjamin/Cummings, Redwood City, Calif, 1992).

There are several other versions of this book by Etter, and those are also acceptable. Computer reference manuals such as Programmers' Manuals or User's Guides are not acceptable, nor are books or manuals for the FORTRAN-90 language (or FORTRAN IV or FORTRAN II). If you have a book you'd like to use but have questions about whether it is appropriate bring it by for me to see.

For those unfamiliar with Unix I can recommend:

> *Learning the UNIX Operating System*, by Grace Todino, John Strang, and Jerry Peek, (O'Reilly and Associates, Sebastopol, Calif., 1990). 108 pages, ISBN 1-56592-060-0, $9.95 (Available in Vassar's Co-op bookstore.)

Almost all of O'Reilly's computer manuals have a picture of an animal on them, and this is the "owl" book.

Enrollment: To join the class come see me and see about getting an account on the computer and the first set of handouts.

FORTRAN via the Web: All of the materials for this course are now available on the World Wide Web (WWW) using Mosaic. To view the course materials the URL is: `http://noether.vassar.edu/~myers/Fortran.html`

COURSE OUTLINE: [file names shown in brackets]

1. Getting Started:
   - How to Login to the Computer [`Login.ps`]
   - How to choose a "bad" password [`Password`]
2. Compiling a FORTRAN program:
   - Compiling the "Hello World" program. [`Hello.ps`]
   - How to get help in Unix. [`Help`]
3. How to send E-Mail [`Email.ps`]
4. Entering and Editing programs:
   - Editing with the Emacs Editor (exercise). [`Editing.ps`]
   - An Introduction to the Emacs Editor. [`Emacs.ps`]
   - A sample Fortran program - avgvar.f [`avgvar.f`]
   - A summary of the most useful emacs keys. [`emacs.keys`]
   - A reference card for emacs. [`refcard.ps`]
   - A sample .emacs file. [`sample.emacs`]
5. The "assignment" statement – Aircraft Weight and Balance [`Balance.ps`]
6. Conditional Execution – the IF Statement [`IFthen.ps`]
7. Iteration – the DO Loop [`Iteration.ps`]
8. Iteration II – the REAL DO Loop [`RealDO.ps`]
9. Nested DO Loops [`Nested.ps`]
10. Building A Better Bomb Code - the Flour Bomb program [`Flour.ps`]
11. The Bubble Sort [`Bubble.ps`]
12. The Selection Sort [`Sort.ps`]
13. Sorting with Heapsort [`Heapsort.ps`]
    - The heapsort subroutine - heapsort.f [`heapsort.f`]
    - A Quick Introduction to RCS (the Revision Control System) [`RCS.ps`]
14. Functions [`Functions.ps`]
15. System Libraries and Computer Graphics [`Graphics.ps`]
    - Simple curve plotting using VOGL [`curve.f`]
    - Sample .xinitrc file. [`sample.xinitrc`]
    - Sample .twmrc file. [`sample.twmrc`]
    - How to initialize X on the NeXTStation [`Xnext.ps`]
    - How to Initialize and Use X on the Mac [`MacX.ps`]
    - Sample .MacXrc file. [`sample.MacXrc`]
    - Sample .MacXdefaults file. [`sample.MacXdefaults`]