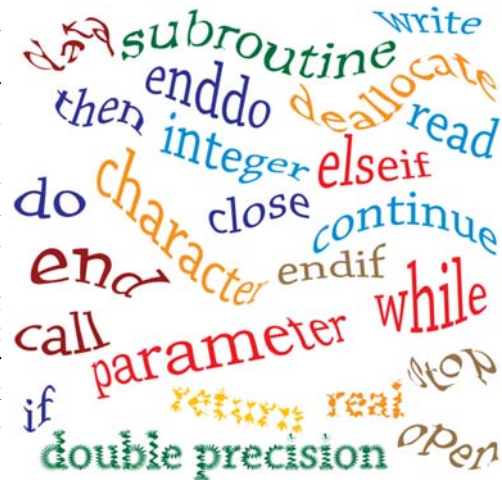


FORTRAN FOR METEOROLOGISTS

ATMS 230

SPRING 2018

While interest in Fortran has waned among engineers and computer scientists in favor of other programming languages, its pervasive use in meteorology makes it an essential tool for obtaining employment or performing research in the field. All major numerical weather prediction models are written in Fortran. Thus, modifying numerical weather prediction models and interpreting the results requires a basic understanding of Fortran syntax. Many researchers prefer the ease and simplicity of Fortran when working with meteorological data and most employers in the government and private sectors require Fortran programming skills. This course will introduce you to the Fortran programming language with examples and assignments tailored for meteorological applications. You will benefit the most if you ask lots of questions both in and out of class and remember that the computer only does what you tell it to do!



PROFESSOR

Dr. Christopher Godfrey

Office: Robinson Hall, room 231

Phone: 828-232-5160

E-mail: cgodfrey at unca dot edu

Office hours: 1:30 p.m. to 2:30 p.m. on Tuesdays and Thursdays, or by appointment. If my door is open at any other time, please drop in.

CLASS INFORMATION

Meeting times: TR 9:55–11:10 a.m.

Location: Robinson Hall, room 209

Required text: None. The Internet provides plenty of useful information and examples of Fortran. If you need help with your programming, consult Google or ask your professor.

Website: <http://www.atms.unca.edu/cgodfrey/courses/atms230/>

GETTING QUESTIONS ANSWERED

I will be in my office during scheduled office hours, but if at any other time you have a question and my office door is open, you are more than welcome to visit. Otherwise, e-mail is by far the best way to reach me. You may also schedule an appointment with me. Since you may not consult classmates with programming problems, I fully expect to answer lots of questions, so please do not hesitate to ask. Really!

IMPORTANT DATES

Thursday, 8 March 2018

Mid-term Exam

Due in class

Tuesday, 8 May 2018

Final Exam

8:00 a.m. – 10:30 a.m.

COMPUTER ACCESS

You will use your account on the atmospheric sciences department's Linux machine, Blizzard, to write and execute your Fortran code. This will require you to gain a working knowledge of the Linux command line and a text editor called Vim. Since most users of Fortran use Linux in some capacity, this knowledge will serve you well in the future. Detailed instructions for accessing Blizzard and getting started with the Linux command line are available at <http://www.atms.unca.edu/cgodfrey/courses/advcomp/preps.shtml>.

COURSE OUTLINE

We will cover the following broad topics during the course of the semester. This outline is approximate and subject to modifications. Note that many concepts relate to one another and we may revisit more complicated examples as we progress through the course.

1. Fortran history and overview of current uses
2. Hardware and software components
3. Algorithm development
4. Creating and testing a program
5. Basic concepts of Fortran
 - a. Constants and variables
 - b. Arithmetic expressions
6. Programming style and documentation
7. Input and output
 - a. File access
 - b. Reading and writing to files
 - c. Formatted input and output
8. Control structures
 - a. Branching structures
 - b. Loops
 - c. Logical data
9. Character manipulation
10. Debugging
11. Multidimensional arrays
 - a. Declaration and manipulation
 - b. Allocatable arrays
12. Functions
13. Subroutines
14. Binary files
15. Numerical methods

COMPUTERS IN THE CLASSROOM

We will make extensive use of the computers in the classroom. Classes will alternate between lecture material and computer exercises. I ask that you please refrain from using the computers for anything other than academic purposes related to the class. This means that Facebook, email, sports scores, and even weather updates must wait until after class. Inappropriate and distracting mouse clicks will earn you an invitation to leave the room.

EVALUATION

There will be four short quizzes, a mid-term exam, and a final exam to assess your progress through the semester. I will announce the quiz dates at least one class in advance (you will surely want to attend every class). The best way to learn how to program is actually to write a program, so you will complete several homework assignments that will strengthen your programming skills. Since life happens, I will drop the lowest quiz grade.

There will be no opportunities for make-up quizzes or exams. Quizzes must be taken on the scheduled date. If you miss the class, you miss the grade. The *only* exceptions to this rule are: (1) serious medical condition (illness or injury) of you or an immediate family member; (2) University excused absence; (3) jury duty; or (4) military orders. Only in such instances will a quiz be dropped or rescheduled depending on your best interests, but *only if I am notified at least 24 hours in advance*. Except under the circumstances described above, **homework is due 50 minutes after the end of class**. I will accept homework up to 24 hours late (12:00 p.m. the following day) for a 50% late penalty. *Homework more than 24 hours late will not be graded*. In the event of an unforeseen circumstance that causes you to miss a quiz or homework due date, *you must notify me by phone or e-mail within 24 hours of the event*. Appropriate documentation must accompany any excused absence from a quiz and should be attached to a late homework assignment.

GRADING

Homework Assignments	50%	
Quizzes	20%	Lowest grade dropped
Mid-term Exam	15%	
Final Exam	15%	

I reserve the option to curve the final grades upward at my discretion. However, you are guaranteed *at least* the following based on your final score before applying any curve:

A	≥92.0%	C	72.0–77.9%
A-	90.0–91.9%	C-	70.0–71.9%
B+	88.0–89.9%	D+	68.0–69.9%
B	82.0–87.9%	D	60.0–67.9%
B-	80.0–81.9%	F	<60.0
C+	78.0–79.9%		

Final grades are not negotiable. If you see a problem with a quiz, exam, or homework grade, you may plead your case no later than 14 days from the date I return the assignment to the class. I do make mistakes. Under no circumstances will your grade be *lower* if you see me with a question.

ACADEMIC INTEGRITY

All assignments must be completed individually. Any collaboration, no matter how small, will result in failure for the assignment. Note that this is somewhat different from my philosophy for other courses. The best way to learn how to program is to solve the problems and debug the code on your own. Copying someone else's code will not help you learn to do it for yourself (and it will be quite obvious to me that the code has been copied). If you do make the unfortunate mistake of repeatedly copying code from anyone who has ever taken this class, now or in the past, you will fail the course immediately.

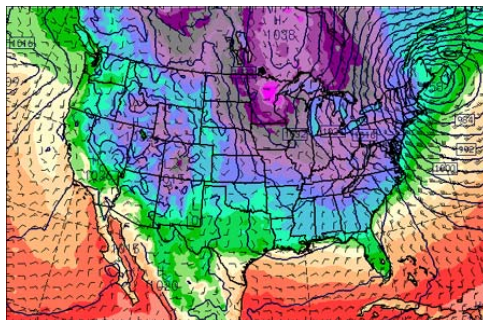
The Internet is a vast resource for programming information. You may use it to help guide your own programming, but you may not copy code and pass it off as your own. When you have questions (and you will), please ask me! Take your time and think the problems through. Because programming often takes much longer than you expect, *start the problems early*. Please don't bombard me with questions an hour before class on an assignment due date.

NOTES

Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students requiring reasonable accommodations must register with the Office of Academic Accessibility by providing supporting documentation. The Office of Academic Accessibility is located in the OneStop Student Services Center, 011 Ramsey Library, phone (828) 232-5050.

SCHEDULING

I am participating in field studies associated with the VORTEX-Southeast research project this semester and may need to cancel class on short notice. I will communicate with you via email regarding cancellations. I will try to stay on schedule, but it is possible that we may fall behind. If so, I may reschedule classes for a Friday or other mutually-agreeable time. I respectfully request your flexibility with scheduling.



20-km ARW WRF forecast valid at 06 UTC 3 January 2010. The WRF model is written primarily in Fortran.