

# ATM 693

**Course:** ATM693, Introduction to Computational Meteorology

**Class hours:** 3:40pm to 5:10pm, Tuesdays and Thursdays; 407 IARC

**Instructors:** Nicole Mölders, David Atkinson, Uma S. Bhatt, Richard L. Collins, and Chris Swingley

**Contact info:** for office hours and location, email addresses and telephone numbers see web pages of the respective instructors

**Syllabus URL:** [http://www.gi.alaska.edu/~molders/syllabus\\_com.html](http://www.gi.alaska.edu/~molders/syllabus_com.html)

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**Goal:** Students completing this course should have an increased understanding and ability to complement their critical thinking with computational tools in addressing research problems in meteorology.

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**Course Description:** This course will provide students with a basic knowledge on how to apply software related to atmospheric sciences problems. This includes knowledge of UNIX and shell scripts (Instructor: C. Swingley), program logic (algorithm development) and FORTRAN90 (Instructor: N. Mölders), GrADS (Instructor: U.S. Bhatt), IDL (Instructor: R.L. Collins), and NCL (Instructor: D. Atkinson). The students will learn how to run given software products on UNIX and other platforms and the basic skills for modifying these programs for their purposes.

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**Suggested readings/textbooks:**

- Glass, G., and K. Ables, UNIX for programmer and users, Prentice Hall, New Jersey, 1999.
- Chapman, S.J., Fortran 90/95 for scientists and engineers, WCB/McGraw-Hill, 1998.
- GrADS home page with links to software download and documentation: <http://grads.iges.org/grads/grads.html>
- IDL User's guide, Research Systems, Inc, 1995.
- NCAR Command Language (NCL) Mini Reference Manual, NCAR, 2003.

The individual instructors will give a short evaluation of relevant books/manuals at the beginning of their lecture. You do not need to buy any of the books. You should also read other printed material as assigned.

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**Other course resources:** We will provide additional material in class as we think is necessary. We expect you to read assigned material and do additional reading as required to solve the assigned homework problems or deepen your understanding.

It is your responsibility to apply for an ARSC account in time so that you can do the homework assignment.

**Course objective:** At the end of the semester you should be able to read, modify and write programs and be able to program typical tasks in of computational meteorology, solve fundamental meteorological problems on a computer, and visualize data and results graphically. Fundamental goals are that you develop skills to process and handle data, combine data from different sources and of different format, and visualize them and that you learn higher order thinking. This includes application of learned material to totally different problems or combining learned material together to solve a problem. You should be able to handle the computational part of future homework problems (as given in modern textbooks) after the course.

**Attendance:** You should attend class regularly and use the reference manuals and a book of your choice related to this class. Class attendance and submission of the homework assignments are required and will be a part of your grade. Unexcused absences lead to deduction of the attendance points. Excused absences are approved in advance or absences due to a documented emergency. Such documentation must be made immediately upon the student's return to class. Please understand that this is a college course - you are expected to be on time for class and have all the required material unpacked.

**Homework:** Submission deadline for homework assignments is Monday (November 26) after Thanksgiving at noon. You will have to submit the source codes as well as the related plots/data as assigned by the respective instructor. Each instructor will let you know whether they prefer hardcopies and/or email submission. It is your responsibility to keep track of the way of submission required. The contributions should be thorough and complete, reflecting the thought that you have put into your tasks. The homework assignments will be graded for completeness, correctness, understanding and the way of presentation by the instructor that assigned the homework. Your final grade will be the sum of the grades that you get from the five instructors multiplied by 0.2. Each of these grades is based to 90% on your homework assignment and 10% on attendance and class participation.

The homework assignments will ask for applying the material learned in class to a typical meteorological problem. They serve as a preparation for your future education and

research towards your thesis at UAF and your professional life. All core classes rely on that you know how to solve and visualize meteorological problems using a computer.

No late homework will be accepted (except in excused absences). Homework should be submitted in readable style. "Readable style" means typed, double-spaced, using at least a 12-point font, one-inch margins, and in hard copy format. It is simply too tricky to edit and make comments in single-spaced type. If you have not met these stipulations, we will return it to you not graded. Late homework will not be accepted via e-mail or fax unless you make prior arrangements with the respective instructor.

It is the student's responsibility to prepare homework on time. We strongly suggest that you plan and schedule your work. We recommend having backup systems in place so you can have all work completed on schedule. Getting work done on time is a key to early success in your business or scientific career. A major complaint of employers is that faculty do not instill a sense of responsibility in students.

It is part of your homework - even when not said explicitly - to read parts of books on the subject of the class, the readings and the notes provided. This means that at the beginning of the class we may ask questions and you can offer to answer them, but we also reserve the right to randomly ask students who do not volunteer. The answers are also part of your homework grade.

**In-class presentations:** It is the student's responsibility to be aware of and to be prepared for each assigned reading task when it is due. Give the person who is speaking your undivided attention. It is not only common courtesy, but whispering or talking can distract, annoy, and even intimidate students around you as well as the instructors. Essentially, you should treat classmates as you would like, and expect, to be treated yourself.

**Examinations:** There will be no final examination.

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**Additional policies:**

1. No weapons allowed in class.
2. Due dates are firm, with the exceptions mentioned above as well as documented emergencies.
3. If you have a disability and require any auxiliary aids, services or accommodations under the Americans with Disabilities Act, please contact Nicole Mölders during the first week of the semester so that the instructors are able to define specific accommodation needs and have enough time for any necessary preparation. If you have any kind of a physical or learning disability, you must tell us about it. All disabilities are documented by UAF's Center for Health &

Counseling and instructors receive a formal letter requesting that accommodations are made for any student with disabilities.

4. Any student who is an UAF sponsored athletic or who has other personal or situational difficulty that might affect class performance is invited to contact us in the first week of the semester (or as soon as such matters emerge) so that ways of accommodating the difficulty may be anticipated.
5. Please also let us know if you have condition that could require direct medical attention (e.g. allergies, diabetes, pregnancy, depression).

**Other important information:** It is essential that you (1) keep up with the assigned readings, (2) budget your time wisely to complete all of your assignments, and (3) seek clarification on any material, which you do not understand, during office or class hours. If we are not covering subjects adequately, or the in-class exercises are confusing or difficult, or if you do not understand the questions in your homework assignments, please let the respective instructor know. We want you to understand the material.

**Grading Policy:** This is a success-oriented course. Our aim is for all students to meet their individual learning and grade goals. Of course, this does not mean that you can avoid working hard. Instead it means that (1) all students who do well in class and homework assignments will be rewarded accordingly and (2) the grade distribution will not be adjusted to make sure it fits a bell-shaped curve. We expect that (1) you aim to give your personal best in the course, and (2) use in-class exercises, homework, and examinations as an opportunity to demonstrate your understanding of the material. Each of you enters the course as an average student, i.e. with a "C" grade and proceeds to work from there. To obtain an "A" grade you will need to produce work that far exceeds our normal expectations. Our normal expectations are regularly attending the classes, hard work evidence of time spent with the material and an ability to demonstrate understanding of all concepts.

Grading for ATM693 will follow the UAF guidelines included in the following table:

GRADE	UAF GUIDELINES
A	An honor grade indicates originality and independent work, a thorough mastery of the subject, and the satisfactory completion of more work than is regularly required.
B	Indicates outstanding ability above the average level of performance.
C	Indicates a satisfactory or average level of performance.
D	The lowest passing grade indicates work of below average quality and performance.
F	Indicates failure to meet lowest standards.

The grade given by each instructor will be 10% attendance, 90% homework. The final grade is the sum of the five grades multiplied by 0.2. Note that this semester UAF permits us to give plus and minus grades. We will do that if your performance falls between the above grades. A plus is given when performance is closer to the lower grade, a minus if it is closer to the better grade. To get a "C" grade, 50% of the points in each category have to be earned. This means, for instance, that you must pass the homework assignments with at least 50% of the points and attend at least 50% of the classes. The grade distribution for attendance and homework assignments is as follows:

A percentage of 90% or better will guarantee the student an A grade; a percentage of 70% or better will guarantee the student a B grade; a percentage of 50% or better will guarantee the student a C grade; a percentage of 30% will guarantee the student a D grade; any percentage less than 30% will lead to an F grade. Grades of "incomplete" will be given only in cases where an extraordinary, exceptional reason, submitted in writing by the student and judged valid by me. See UAF policies for details. Note that +/- are possible on the final grade starting FY08.

Learning is an interactive process and each class is individual. Although we have put a lot of thought into the sequence of topics, this schedule is tentative by purpose and subject to change as necessary due to availability of support materials, adaptation to specific needs of the class, etc. The schedule for this class will remain an on-going construction in light of what is accomplished in each class meeting. Since this course will be attended by students with different levels and/or background, it will be unavoidable to insert additional subjects or to explain subjects in more detail. Departures from the schedule, such as additional readings, assignments, deadline changes, and activities, may be announced in class. These changes will take priority over the printed schedule. It is your responsibility to be in class and to keep up-to-date on whatever changes we make, or the class negotiates.

### **Tentative Fall 2007 Schedule:**

**Sept 6 & 10:** Reading and discussion of class syllabus; discussion of plagiarism (N. Mölders); introduction to UNIX, shell scripts (instructor: C. Swingley)

**Sept 13 & 18:** Basics of program logic and FORTRAN90/95 (instructor: N. Mölders)

**Sept 25 & 27:** Basics of GrADS (instructor: U.S. Bhatt)

**Oct 2 & Oct 4:** Basics of IDL (instructor: R.L. Collins)

**Oct 30 & Nov 1:** Basics of NCL (instructor: D. Atkinson)

**Nov 26 (Monday after Thanksgiving) at noon:** Submission of homework assignments to the respective instructors.

**Hint:** Plan your time wisely. Start working on your homework assignments as soon as you get them and not the day before they are due.