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FORMAT 1

Submit original with signatures + 1 copy + electronic copy to UAF Governance.
See http://www.uaf.edu/uafgov/faculty/cd for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:

Department	**Atmospheric Sciences**	**College/School**	**CNSM**
Prepared by	**Barbara Day**	**Phone**	**7368**
Email Contact	**bdday@alaska.edu**	**Faculty Contact**	**Igor Polyakov, x2686 (igor@iac.uaf.edu)**

1. ACTION DESIRED (CHECK ONE): Trial Course [ ] New Course [X]

2. COURSE IDENTIFICATION: Dept **ATM** Course # **F610** No. of Credits **3**

Justify upper/lower division status & number of credits: **Course requires graduate level mathematics and computer skills. Course load, readings, and homework are in keeping with three-credit hour student activities.**

3. PROPOSED COURSE TITLE: **Analysis Methods in Meteorology and Climate**

4. CROSS LISTED? *YES/NO* **No** If yes, Dept: [ ] Course # [ ]

(Requires approval of both departments and deans involved. Add lines at end of form for such signatures.)

5. STACKED? *YES/NO* **No** If yes, Dept. [ ] Course # [ ]

6. FREQUENCY OF OFFERING: **Offered spring odd-numbered years**

(Every or Alternate) Fall, Spring, Summer — or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (if approved) **Spring 2015**

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SEP 2 0 2012
Dean's Office
College of Natural Science & Mathematics

8. COURSE FORMAT:

NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.

COURSE FORMAT: (check one) [ ] *1* [ ] *2* [ ] *3* [ ] *4* [ ] *5* [x] *6 weeks to full semester*

OTHER FORMAT (specify) _____

Mode of delivery (specify lecture, field trips, labs, etc) **lecture**

9. CONTACT HOURS PER WEEK: **3** LECTURE hours/weeks **0** LAB hours /week **0** PRACTICUM hours /week

Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See http://www.uaf.edu/uafgov/faculty/cd/credits.html for more information on number of credits.

OTHER HOURS (specify _____

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type)

10. COMPLETE CATALOG DESCRIPTION including dept., number, title and credits (50 words or less, if possible):

ATM, Analysis Methods in Meteorology and Climate, 3 credits
Introduction to standard analysis topics in atmospheric sciences, including basic aggregate stats, time series work, eigenmode analysis, mixed models, and extreme value analysis. Focus on manipulation of very large data sets, especially weather/climate model output. Hands-on instruction in supporting computer topics. Student presentations will be emphasized.

11. COURSE CLASSIFICATIONS: (undergraduate courses only. Use approved criteria found on Page 10 & 17 of the manual. If justification is needed, attach on separate sheet.)

H = Humanities [ ] N = Natural Science [ ] S = Social Sciences [ ]

Will this course be used to fulfill a requirement for the baccalaureate core? [ ] **YES** [ ] **NO**

IF YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, Format 6 [ ] W = Writing Intensive, Format 7 [ ] Natural Science, Format 8 [ ]

12. COURSE REPEATABILITY:

Is this course repeatable for credit? [ ] **YES** [x] **NO**

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).

How many times may the course be repeated for credit? [ ] **TIMES**

If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course? [ ] **CREDITS**

13. GRADING SYSTEM:

LETTER: [x] **PASS/FAIL:** [ ]

RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES **ATM 601; graduate standing; or permission of instructor.**

These will be *required* before the student is allowed to enroll in the course.

RECOMMENDED

Classes, etc. that student is strongly encouraged to complete prior to this course.

15. SPECIAL RESTRICTIONS, CONDITIONS **No**

16. PROPOSED COURSE FEES **$-0-**

Has a memo been submitted through your dean to the Provost & VCAS for fee approval? Yes/No

17. PREVIOUS HISTORY

Has the course been offered as special topics or trial course previously? **Yes/No** | **Yes**

If yes, give semester, year, course #, etc.: | Spring 2013; Spring 2011; Spring 2009

18. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

No impact since Atmospheric Sciences' students have taken this course as a special topic in the past.

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (ffklj@uaf.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No ☐ Yes ☐

Professor has talked to the librarian and all the requested materials will be available at the Keith Mather Library.

20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

There will be no impact on the department since a professor was hired effectively Fall 2012 to teach this course during the spring odd-numbered years.

21. POSITIVE AND NEGATIVE IMPACTS

*Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.*

The positive impact is that the Atmospheric Sciences students will be able to take this course to help them in understanding different methods in analyzing meteorology and climate. No negative impact since a professor was hired to teach this particular course.

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

The DAS program has identified a need for this specialized course to serve their graduate student especially since many of the atmospheric sciences students have thesis projects that require knowledge of different methods used in analyzing meteorology and climate.

APPROVALS:

Nicole Mölders Nicole Mölders	Date	9-20-12	
Signature, Chair, Program/Department of:	**Atmospheric Sciences**		
	Date	9/26/2012	
Signature, Chair, College/School Curriculum Council for:CNSM	**CNSM**		
Paul W. Layer Paul W Layer	Date	9/26/12	
Signature, Dean, College/School of:	**CNSM**		
	Date		

Signature of Provost (if applicable)

Offerings above the level of approved programs must be approved in advance by the Provost.

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

	Date	

Signature, Chair, UAF Faculty Senate Curriculum Review Committee

ADDITIONAL SIGNATURES: (If required)

	Date		
Signature, Chair, Program/Department of:			
	Date		
Signature, Chair, College/School Curriculum Council for:			
	Date		
Signature, Dean, College/School of:			

ATTACH COMPLETE SYLLABUS (as part of this application).
Note: syllabus must follow the guidelines discussed in the Faculty Senate Guide
http://www.uaf.edu/uafgov/faculty/cd/syllabus.html.
The department and campus wide curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course change will be denied.

SYLLABUS CHECKLIST FOR ALL UAF COURSES
During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

1. **Course information:**
   Title, number, credits, prerequisites, location, meeting time
   (make sure that contact hours are in line with credits).
2. **Instructor (and if applicable, Teaching Assistant) information:**
   Name, office location, office hours, telephone, email address.
3. **Course readings/materials:**
   Course textbook title, author, edition/publisher.
   Supplementary readings (indicate whether required or recommended) and
   any supplies required.
4. **Course description:**
   Content of the course and how it fits into the broader curriculum;
   Expected proficiencies required to undertake the course, if applicable.
   Inclusion of catalog description is *strongly* recommended, and
   Description in syllabus must be consistent with catalog course description.
5. **Course Goals (general) and Student Learning Outcomes (more specific)**
6. **Instructional methods:**
   Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).
7. **Course calendar:**
   A schedule of class topics and assignments must be included. Be specific so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.
8. **Course policies:**
   Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.
9. **Evaluation:**
   Specify how students will be evaluated, what factors will be included, their relative value, and
   how they will be tabulated into grades (on a curve, absolute scores, etc.)
10. **Support Services:**
    Describe the student support services such as tutoring (local and/or regional) appropriate for the course.
11. **Disabilities Services:**
    The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials.
    State that you will work with the Office of Disabilities Services (208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities."

ATM F610: Analysis Methods in Meteorology and Climate

Spring 2013

Professor: Igor Polyakov
Office: IARC 408g
Tel: (474) 2686
email: igor@iarc.uaf.edu

Class room: IARC 407 and ARSC computer lab
Class times: MWF: 10am to 11am
Office hours: TBD

Prerequisites: Basic understanding of statistics. Programming of some form will be helpful.

Introduction: It is your first day of work and your supervisor comes to you and says, "It's great to finally have on board someone who knows something about environmental data. What I'd like from you is a map showing maximum hourly 10-year return temperatures for the 1950-2005 period for all weather stations reporting in North America."

At the very least we can note the following about this task:

- There are almost half a million hourly observations for this period
- There are thousands of weather stations
- What data set(s) are there to handle this? – Where to get them?
- How to read them in?
- How is a return frequency analysis performed?
- How do we ramp it up to run for so many weather stations?
- How do we present the results?

But where/how do you start? This is what we will explore.

This course is an introduction to the access and analysis of the large data sets that are often encountered in atmospheric sciences, and many other allied disciplines, such as oceanography. We will cover these broad areas:

- where to find data
- how to get it into a form that can be analyzed (programming)
- various standard analysis methods, including extreme event work

We do have a recommended text. Readings from the text will be regularly assigned. The course will follow these readings because the textbook was designed for an atmospheric analysis type of course, and you should keep up with them. Of course in class we will emphasize certain topics. Material will be conveyed by standard lecture, in-class discussions, in-class presentations by students, and lab work.

Course Objectives:

1. Learn about weather and climate data storage formats. This includes various regular and non-regular ascii formats for observational data and a range of self-describing gridded binary formats, including HDF, GRIB, netCDF. Understand how their dimensionality works. Develop creative ways to read in all kinds of data. Data I/O is the biggest stumbling block to analyzing data!

2. Learn to manipulate programming software to tackle large data sets. These software packages are fundamental tasks of analysis work; familiarity with their operation is essential.
3. Learn about statistical methods to reduce and analyze data sets. Analysis methods frequently utilized in weather and climate research will be explored. This includes standard aggregate reduction statistics, time series analysis, and eigen methods.
4. Learn about extreme event analysis. A frequently requested output is some idea of return intervals of extreme events. We will explore this topic.
5. Learn about model output analysis. Weather and climate models are heavily utilized. Assessment of their output is a critical first step before their results can be folded into research.
6. Results presentation. An important component to this business is presentation of your results, both in oral format as well as in journal format. We will work on issues of presentation via submitted work and class presentations.

Student learning objectives
By the end of this course students should be able to:
- Describe what a self-describing gridded binary format is and identify major formats currently in use.
- Know how to gain information about such a dataset when presented with one.
- Delve into a dataset to reduce and prepare it for further analysis.
- Perform a variety of standard types of data analysis (e.g. correlations/regressions/EOFs).
- Present project results in a clear and concise manner. This includes readying results for print publication.

General Course Subjects:

1. Data storage methods
2. Aggregate statistics
3. Time-series statistics
4. Eigenmode analysis methods
5. Error analysis
6. Parametric vs non-parametric concepts
7. Model output analysis
8. Extreme value analysis

Textbook/readings:
The course will draw primarily from the following books but will also draw from journal articles and other texts:
- Statistical Methods in the Atmospheric Sciences 2nd ed., by Daniel Wilks (2005), Academic Press, ISBN 978-0127519661.
- Hans *von Storch* and Francis W. *Zwiers*; Cambridge. University Press, Cambridge, 1999, x+484pp., ISBN 0-521-45071-3.
- Handbook of Statistical Methods in Meteorology by C. E. P. and N. Carruthers Brooks (Hardcover - 1953)

Evaluation: The course grade will consist of the following components. Final letter grades will be based on a standard scale: A=90 to 100%, B=80% to 89%, C=70% to 79%, D=50% to 69%, and F≤50%. As of Fall 2006, UAF has instituted a +/- scale to the grades, so the bottom and top 3 percentage points will fall within the '-' and '+' ranges, respectively. For example: 90-92% will be an A-, 93-96% will be an A, and above 97% will be an A+. Note that tests will be graded on a curve, so the above scale may be modified.

	ATM693
Class Project	40%
Homework	30%
Quiz 1	15%
Quiz 2	15%

Disabilities Services:
The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. We will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.

Tentative topics schedule. Labs and subjects might be rearranged as needs dictate
0. Intro – analysis examples, needs, analysis dimensions
1. Data structures, Ascii regular, irregular
2. Aggregate statistics, Basic descriptor stats
3. Time series, Regression, Correlation, autocorrelation, Computer lab
3. Time series (cont.), Computer lab
4. Eigenmode analysis, PCA, EO, Computer lab
4. Eigenmode analysis (cont), Computer lab
5. Mixed models, Computer lab
6. Parametric vs. non-parametric, Bootstrapping, Computer lab
7. Model output analysis, Computer lab
8. Extreme value analysis, Computer lab, Overflow