10-day
reposted

11- GNC (sigs)

RECEIVED SEP 19

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	SFOS	**College/ School**	SFOS

Prepared by	Harper Simmons	**Phone**	474-5729

Email Contact	hlsimmons@alaska.edu, clneumann@alaska.edu	**Faculty Contact**	Harper Simmons

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

2. COURSE IDENTIFICATION:	Dept	MSL	Course #	632	No. of Credits	3

Justify upper/lower division status & number of credits:	

3. PROPOSED COURSE TITLE:	Oceanographic Data Analysis and Visualization

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

7. *SEMESTER & YEAR OF FIRST OFFERING* (if approved)	**Spring ~~2013~~ 2014**

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:*	3.0	LECTURE hours/weeks		LAB hours /week		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 type)	

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

MSL 632: Oceanographic Data Analysis and Visualization (3+0 credits)
This course introduces students to data analysis and visualization techniques commonly applied to oceanographic datasets. Students will gain a theoretical and practical understanding of propagation of errors, linear least squares regression, and time series analyses such as correlation, coherence and spectral estimation. The course will also cover Empirical Orthogonal Function (EOF) analysis. A significant portion of the class will be a project that will give students an opportunity to learn a data analysis technique suited to their research. Matlab will be used throughout. **Prerequisites: Graduate Standing; MATH 202; MATH 314 or permission of instructor.**

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	X	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	**Graduate standing; MATH 202; MATH 314 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	**NONE**

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.:	Fall 2009, Fall 2011

18. ESTIMATED IMPACT

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

This course is not expected to have significant impact on budget and faculty. It will be taught by existing faculty in the School of Fisheries and Ocean Sciences as part of their regular workload. Impacts on space are limited to the need for a standard lecture room; smart classroom capability is not necessarily required. Course uses matlab, which is installed in a number of computing labs around campus. A student version of matlab is available for $99.

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	X	Contacted Fall 2010, class has been taught twice. Emory & Thompson (required) and Tufte (optional) available via online booksellers or at the Biosciences Lib..

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)

Other programs are unlikely to be significantly impacted, other than through the broadening of course offerings made available to graduate students.

21. POSITIVE AND NEGATIVE IMPACTS

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

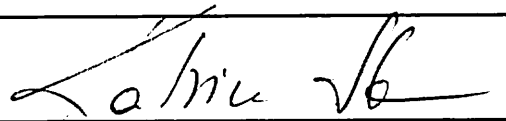
This course is not expected to negative significant impact on budget and faculty. It will be taught by existing faculty in the School of Fisheries and Ocean Sciences as part of their regular workload. Impacts on space are limited to the need for a standard lecture room; smart classroom capability is not necessarily required. Positive impacts are broadening the GPMSL curriculum with essential tools of oceanographic data analysis such as interpolation, filtering, aliasing, curve fitting, spectral and tidal harmonic analysis.

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.

This course should greatly benefit students in oceanography. Although classes on statistics are offered, many of the topics to be covered are not covered in the present GPMSL curriculum. Examples of such material are interpolation, filtering, aliasing, curve fitting, tidal harmonic analysis. Furthermore matlab, which this course will be based on, is a standard tool for oceanographic data analysis and visualization.

APPROVALS:

	Date	9/18/12

Signature, Chair, Program/Department of:	GPMSL

	Date		

Signature, Chair, College/School Curriculum Council for:	

	Date	6/ 18, 2012	

Signature, Dean, College/School of: Arctic	SFOS

	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:**
   θTitle, θ number, θcredits, θprerequisites, θ location, θ meeting time
   (make sure that contact hours are in line with credits).
2. **Instructor (and if applicable, Teaching Assistant) information:**
   θ Name, θ office location, θ office hours, θ telephone, θ email address.
3. **Course readings/materials:**
   θ Course textbook title, θ author, θ edition/publisher.
   θ Supplementary readings (indicate whether θ required or θ recommended) and
   θ any supplies required.
4. **Course description:**
   θ Content of the course and how it fits into the broader curriculum;
   θ Expected proficiencies required to undertake the course, if applicable.
   θ Inclusion of catalog description is *strongly* recommended, and
   θ Description in syllabus must be consistent with catalog course description.
5. **θ Course Goals (general) and θ Student Learning Outcomes (more specific)**
6. **Instructional methods:**
   θ 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:**
   θ 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:**
   θ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.
9. **Evaluation:**
   θ Specify how students will be evaluated, θ what factors will be included, θ their relative value, and
   θ how they will be tabulated into grades (on a curve, absolute scores, etc.)
10. **Support Services:**
    θ 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.
    θ State that you will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities."

Last edit: 9/5/12

MSL 632 New Course: Oceanographic Data Analysis and Visualization (3 credits)

Instructor:
Dr. Harper Simmons
Rm. 127 O'Neill building
Phone: 474-5729
Email: hlsimmons@alaska.edu

Class meeting times: TBA
Location: TBA
Office Hours: MWF 11-noon

Course Description

This course introduces students to data analysis and visualization techniques commonly applied to oceanographic datasets. Students will gain a theoretical and practical understanding of propagation of errors, linear least squares regression, and time series analyses such as correlation, coherence and spectral estimation. The course will also cover Empirical Orthogonal Function (EOF) analysis. A significant portion of the class will be a project that will give students an opportunity to learn a data analysis technique suited to their research. Matlab will be used throughout. **Prerequisites: Graduate standing; MATH 202; MATH 314 or permission of instructor.**

Course Objectives

This course introduces graduate students in oceanography to basic approaches and tools for the analysis and visualization of marine data sets. The course will be divided between visualization/presentation and quantitative data analysis.

This is a practical course designed to give students basic abilities to manipulate, explore and visualize marine data. This course introduces students to data analysis and visualization techniques commonly applied to oceanographic datasets. Students will gain a theoretical understanding and learn practical application of the techniques covered. After taking this course, you should be able to process data from a variety of sources, explore it through data visualization, identify and remove data errors, use techniques such as linear regression to fit data to models, interpolate over gaps or handle irregular sampling in space or time, and be able to quantify propagation of errors.

Class schedule: 3 lecture hours per week.

Required software: Matlab. If you wish to use another tool, we can discuss this.

Pre-requisites: Graduate standing; MATH 202; MATH 314 or permission of instructor.

Office hours: MWF 11-noon.

Course Text: Emory and Thompson, Data Analysis Methods in Physical Oceanography, 2nd Edition, 2001 Pergamon.

Additional material

The following books will be available on reserve at the Biosciences library, or available as PDF handouts or for purchase via online booksellers

1) The Visual Display of Quantitative Information, 2nd Edition, Edward Tufte

2) The Cognitive Style of PowerPoint, Edward Tufte.

3) Numerical Methods With Matlab, Gerald Recktenwald

Grading:

Homework (6 assignments):	600	points
Class Participation:	200	points
Project Presentation:	200	points
Projects Paper:	200	points
Total	1200	points

For the project, each student will prepare a lecture on a data analysis or visualization project relevant to their research, or as agreed upon with the instructor. Along with the lecture, a students will prepare a short report adhering to the format of a published GRL paper. The presentations will be delivered toward the end of the semester to allow time for students to choose a topic of interest and to perform the necessary work.

Grading on the project weighs the student's command of the topic, thoroughness in researching the topic, and clarity of the presentation. I do not expect the student to have a thorough grasp of all the nuances of the subject that they present and, in particular, there might be complex mathematical derivations that are beyond the student's capability. Nevertheless, the student should firmly grasp the key ideas of the topic.

Presentations/papers will be graded according to the following criteria. A range of grades reflects potential ranges of fulfillment of the stated criteria:

- Student has in-depth command of the topic AND the presentation and reports are clear and concise, well-referenced: 90-100%
- Good grasp of the topic, but is unable to present a key component of the subject clearly and/or the presentation lacks clarity in part, references missing or incomplete. 80-89%
- Modest understanding of the subject, or is unable to present two or more key aspects of the subject clearly and/or the presentation lacks substantial clarity, few references provided or substantially incomplete referencing. 70-79%
- Poor understanding of the subject, and cannot present any important aspects of the subject and/or the presentation is unclear throughout, or no references provided. 60-69%
- No presentation or presentation shows no understanding or ability to present the subject 0-59%

Grading scale:
For homework and the final grade letter grades will correspond to the following percentages.

A+	98-100%	A	93-97%	A-	90-92%	
B+	87-89%	B	83-86%	B-	80-82%	
C+	77-79%	C	73-76%	C-	70-72%	
D+	67-69%	D	63-66%	D-	60-62%	F<60%

Assignments

A progression of 6 assignments will be given based on the exploration of 1, 2 and 3-dimensional datasets. Datasets will be processed and visualized with step-by-step guidelines, using class-distributed matlab code or, upon instructor approval, tools that students are comfortable with. A questions set about the data will be distributed. These assignments will naturally lead to class discussions of the concepts of envisioning information "truthfully", fitting data to models, identifying modes of variance, et cetera. Opportunities will exist to adapt homework datasets to student's research data or personal interest. In addition to whatever else may be covered in the assignment, you will be graded on the aesthetics of your plots with increasing rigor throughout the semester.

Course Policies: Students are expected to attend lectures, participate in discussions, ask questions, and prepare professional level work. As graduate students you might have research related obligations (field work, meetings, etc) and these important aspects of your graduate education may require you to miss some classes. It is your responsibility to obtain the notes and perform the work required, although I will grant you the flexibility to do so. You must make every reasonable effort to communicate all conflicts to me well in advance. Plagiarism will result in an F for the assignment.

Late Homework Policy. Homework due dates will be given when the assignments are handed out unless prior arrangements are made. Late assignments will be deducted 5%, per lecture day missed. For instance an assignment due on a Monday will have 5 percentage points deducted if it is turned in on Tues or Weds, 10% if turned in on Thurs or Friday, 15% if turned in on the following Monday, et cetera, with a maximum of 40% deducted if turned in before the end of the semester so that the lowest grade for a complete, satisfactory assignment is 60%. Therefore you must turn in an assignment even if it is very late. Per the course policies above, exceptions to this rule may be granted on a case by case basis if discussed well in advance.

Disabilities Services: I will work with the student and with the Office of Disabilities Services (http://www.uaf.edu/disability, 474-5655) to provide reasonable accommodation for students with disabilities.

Support Services: Students will need to prepare a lecture and associated paper. The students will have access to the student computers in SFOS and can enlist the assistance

of the SFOS IT group if necessary. If needed, the students can also enlist the assistance of the Student Writing Center.

Course Schedule and Lecture Topics (SUBJECT TO CHANGE)

Note that the course content may be adjusted to student needs and interests

Course components:

Week 1: Introduction to ocean data

reading: Emery and Thompson, Ch. 1.1 – 1.4

a) How are seawater properties, velocity, et cetera, measured.
b) Principles of instruments, how do instruments work.
c) What do data look like?

Week 2: Introduction to Matlab
reading: Getting started with Matlab (PDF handout)

a) Data handling
b) Reading and formatting of data
c) Basic data manipulation & visualization

Week 3: Noise and uncertainty in data
reading: Emery and Thompson, Ch 2

a) Physical noise, measurement error, model error
b) Propagation of errors
c) Instrumentation issues

Week 4-5: Least Squares linear regression

Week 6: Harmonic Analysis

Week 7: Tidal analysis

Week 7-9: Spectral estimation: Periodograms

Week 10: Filtering in the time and frequency domain

Week 11: Spatial analyses of data fields
reading: Emery and Thompson, Ch. 4.1-4.3

Gridding: block averaging, objective analysis, empirical orthogonal functions

Week 12: Concepts of visualization
reading: Tufte, Ch. 1 -2

a) Truth and lies with data
b) Perception
c) Visual aesthetics
d) Representing data, exploring data, identification of signals.

Week 13: Data acquisition
Reading: Emery and Thompson, Ch 1.5-1.12

a) Sample design and aliasing
b) Example: Resolving a tidal cycle
c) Designing a sampling scheme in a system dominated by tidal variation

Week 14: Data processing, error handling
reading: Emery and Thompson Ch. 2 * Ch. 3.12, Recktenwald Ch. 9

a) Curve fitting, regression, correlation, et cetera
b) Harmonic analysis and de-tiding of data
c) Interpolation of gappy data
d) Errors, noisy data

Week 15: Visualization, part II
reading: Tufte handout

a) Image quality, vector vs. raster graphics, color, publication considerations
b) Animation, file formats, display software
c) Map projections

Week 16: Student presentations