FORMAT 1

Submit original with signatures + 1 copy + electronic copy to Faculty Senate (Box 7500).
See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/ for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:

Department	Biology & Wildlife	College/School	CNSM
Prepared by	Falk Huettmann	Phone	907 474 7882
Email Contact	fhuettmann@alaska.edu	Faculty Contact	Falk Huettmann

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

2. COURSE IDENTIFICATION: Dept: B&W | Course #: WLF F6XX | No. of Credits: 3

Justify upper/lower division status & number of credits: 3 credits are based on required skill and topics taught, such as machine learning applications applied to biological and wildlife schemes.

3. PROPOSED COURSE TITLE: Predictive Modeling

4. To be CROSS LISTED? YES/NO: Yes | If yes, Dept: BIOL | Course #: BIOL F6XX

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

5. To be STACKED? YES/NO: No | If yes, Dept. | Course #

Stacked course applications are reviewed by the (Undergraduate) Curricular Review Committee and by the Graduate Academic and Advising Committee. Creating two different syllabi—undergraduate and graduate versions—will help emphasize the different qualities of what are supposed to be two different courses. The committees will determine: 1) whether the two versions are sufficiently different (i.e. is there undergraduate and graduate level content being offered); 2) are undergraduates being overtaxed?; 3) are graduate students being undertaxed? In this context, the committees are looking out for the interests of the students taking the course. Typically, if either committee has qualms, they both do. More info online - see URL at top of this page.

6. FREQUENCY OF OFFERING: As needed, one per fall every second year

Fall, Spring, Summer (Every, or Even-numbered Years, or Odd-numbered Years) – or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (AY2013-14 if approved by 3/1/2013; otherwise AY2014-15): Fall 2013

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 all that apply)	[ ] 1	[ ] 2	[ ] 3	[ ] 4	[ ] 5	[x] 6 weeks to full semester
OTHER FORMAT (specify)						
Mode of delivery (specify lecture, field trips, labs, etc)	Lecture, labs, final project					

RECEIVED
SEP 18 2012
Dean's Office
College of Natural Science & Mathematics

Governance
10/3/12 TLP
Leah Berman
9/19/12 TLP

7. *SEMESTER & YEAR OF FIRST OFFERING* (AY2013-14 if approved by 3/1/2013; otherwise AY2014-15)	**Fall 2013**

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 all that apply)		1		2		3		4		5	x	6 weeks to full semester

OTHER FORMAT (specify)	

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

9. *CONTACT HOURS PER WEEK:*

2	LECTURE hours/weeks	**3**	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-senate/curriculum/course-degree-procedures-/guidelines-for-computing-/ for more information on number of credits.

OTHER HOURS (specify type)	

10. COMPLETE CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking (50 words or less if possible):

Example of a complete description:

FISH F487 W, O Fisheries Management
3 Credits Offered Spring
Theory and practice of fisheries management, with an emphasis on strategies utilized for the management of freshwater and marine fisheries. *Prerequisites: COMM F131X or COMM F141X; ENGL F111X; ENGL F211X or ENGL F213X; ENGL F414; FISH F425; or permission of instructor.* Cross-listed with NRM F487. (3+0)

WLF/BIOL 6XX Predictive Modeling
3 Credits Offered Fall
Predictive Modeling allows for new scientific insights as well as for sustainable management of the earth. Many modern modeling algorithms such as machine learning exist, helping to re-define the spatial distribution of species and biodiversity over time. Integrated and data hungry research projects emerge that require new skills and expertise such as R and use of large online data. This course follows a problem-based learning and critical thinking approach and is based on hands-on computing, www use and discussions. Prerequisites: BIOL 271 (Ecology), STAT200, or permission from the instructor (no R, GIS-, RS- or model software-knowledge required, but helpful). Knowing database theory would be an asset (but not required). (2+3)

11. COURSE CLASSIFICATIONS: Undergraduate courses only. Consult with CLA Curriculum Council to apply S or H classification appropriately; otherwise leave fields blank.

H = Humanities		S = Social Sciences	

Will this course be used to fulfill a requirement for the baccalaureate core? **If YES, attach form.**	**YES:**		**NO:** No

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

O = Oral Intensive, **Format 6**	No	W = Writing Intensive, **Format 7**	No	Natural Science, **Format 8**	Yes

11.A Is course content related to northern, arctic or circumpolar studies? If yes, a "snowflake" symbol will be added in the printed Catalog, and flagged in Banner.

YES	yes	NO	

12. COURSE REPEATABILITY:

Is this course repeatable for credit?	**YES**		**NO**	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 for credit, what is the maximum number of credit hours that may be earned for this course?		**CREDITS**
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: Specify only one. Note: Later changing the grading system for a course constitutes a Major Course Change.

LETTER:	X	**PASS/FAIL:**	

RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES	BIOL 271 (Ecology), or permission from the instructor (no R, GIS-, RS- or model software-knowledge required but helpful). Knowing database theory would be an asset (but not required). Good graduate student standing.

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

Reference the registration implications below due to Banner coding of these terms:
Prerequisite: Course completed and grade of "C" (2.0) or higher prior to registering for the course that requires it.
Concurrent: Course may be taken simultaneously (and allows for a course to have been previously completed).
Co-requisite: Courses MUST be taken simultaneously and does NOT allow for fact that a course was previously completed!

15. SPECIAL RESTRICTIONS, CONDITIONS	This course will primarily focus on IBM PC computers; students using MACs might have to resolve technical problems on their own.

16. PROPOSED COURSE FEES	**None**

Has a memo been submitted through your dean to the Provost 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 2007, WLF F693 / BIOL F693

18. ESTIMATED IMPACT

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

Regular computing lab

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (kljensen@alaska.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	**Yes**	**Anne Christie (Bio Library) has been contacted**

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

This class will provide research skills needed for predictive modeling. This discipline presents front-end science, and helps to bring students to that level.
I cannot see negative impacts.

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 class was taught successfully as a special topics class in fall 2007. Here, I would like to make it permanent and move it into the regular curriculum. I do that because we lack such offerings. Secondly, this class I can teach in the alternating years and when Ornithology and Landscape Ecology are not offered (as was the case in fall 2007). Based on my own science work worldwide and from what I see and read, I find a huge niche for such class and its skills (I teach such classes already elsewhere and get frequently invited for doing so).

APPROVALS: Add additional signature lines as needed.

	Date	18 Sept 2012	
Signature, Chair, Program/Department of:	Biology and Wildlife		
	Date	28 Sept 2012	
Signature, Chair, College/School Curriculum Council for:	CNSM		
	Date	10/1/12	
Signature, Dean, College/School of:	CNSM		

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

	Date	
Signature of Provost (if above level of approved programs)		

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

	Date	
Signature, Chair Faculty Senate Review Committee: ___Curriculum Review ___GAAC ___Core Review ___SADAC		

ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking)

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

		Date	
Signature, Dean, College/School of:			

Predictive Modeling
WLF / BIOL 6XX (Fall 2013)
(tentative, version 27th September 2012)

Instructor: Falk Huettmann **Office:** 419 IAB (Irving I)
Phone: 474 7882 (voice mail) **E-mail:** fhuettmann@aslaska.edu
Office hours: 9:00 – 11:00 a.m. on Tuesday

Lecture: Monday 11:45 –12:45 p.m., 103 Irving 1
Wednesday 12:00 –1:00 p.m., 103 Irving 1

Lab: Wednesday 2:15 – 5:15 p.m., 208 Irving 1

Course Web Page (Blackboard) http://courses.uaf.edu

Course Description: Predictive Modeling allows for new scientific insights as well as for sustainable management of the earth. Many modern modeling algorithms such as machine learning exist, helping to re-define the spatial distribution of species and biodiversity over time. Integrated and data hungry research projects emerge that require new skills and expertise such as R and use of large online data. This course follows a problem-based learning and critical thinking approach and is based on hands-on computing, www use and discussions.

Course Goals: Students will understand and apply the core principles and machine learning algorithms (CART, MARS, TreeNet, RandomForest, ensembles) of spatially explicit predictive modeling. The course is designed as well to understand all relevant research disciplines and modern topics related to the profession of predictive, digital GIS modeling in R and commercial software for global sustainability, biodiversity and wildlife & habitat applications for management and climate change applications.

Pre-requisites: BIOL 271 (Ecology), STAT200, or permission from the instructor (no R, GIS-, RS- or model software-knowledge required but helpful). Knowing database theory would be an asset (but not required). Good graduate student standing. This course will primarily focus on IBM PC computers; students using MACs might have to resolve technical problems on their own.

Credits: 3

Grading Policy: This is a paper-less course and all assignments and course materials have to be handed in digitally (<4MB). Letter grades will be determined from the performance in lectures (60%), labs (20%) and two oral presentations (20% in Powerpoint). Lecture performance will be determined from two exams (mid-term 20 % and final 30%), participation (10%), reading assignments (15%) and student-led discussions (25%). Labs require 4 lab assignments (mostly done in R), and one Final GIS Modeling project assignment with FGDC Metadata in XML/EML (20 % each). The following marking thresholds will be used: A = 100-91%, B = 90-81%, C = 80-71%, D = 70-61%, F < 61%. I do offer extra credit opportunities.

Student-led Discussions and Reading Assignment: Each student will lead two app. 20 minute discussions on latest research topics relevant to Predictive GIS Modeling. According to a sign-up list, selected papers need to be provided by the student to the teacher two weeks prior to the course for approval and confirmation. The research papers will need to be made available by the student on (electronic) reserve for the class one week prior to the discussion. The student in charge will lead through the discussion by compiling a set of questions relevant to the topic and a list of questions (also distributed by the student one week before class). Students will be expected to synthesize material from the readings in a biological science and management context, in addition to summarizing them. All students are required for the 'Reading Assignment' to provide a written two page review of the discussed paper annotated with scientific references following the journal of Ecological Modeling.

Laboratory Assignments and Projects: Weekly 3 hour lab-projects are associated with this class in the student computer labs. If suitable, labs can be completed elsewhere and at any time as suitable to the student. One project covers two weekly labs. Labs are to be handed in bi-weekly in a digital format (<4MB), and deal with specific topics covered in the lecture, e.g. software (R, Excel and SQL databases), GIS (Geographic Information Systems) data processing & model extraction/processing, basic Remote Sensing and internet/www applications. The final modeling project assignment deals with a topic of choice defined by the student in agreement with the lectures and instructor. It has to address a graduate level Predictive Modeling research topic (set up in agreement with the instructor) and requires associated FGDC Metadata in XML/EML.

Exams: A Mid-term and a Final Exam will be required. They consist of Multiple Choice and a few written questions, covering the content of the two Textbooks as well as scientific concepts learned during this course.

Readings: The course will closely follow the standard reference by

-Manly, B.F.J., McDonald, L.L., Thomas, D.L., McDonald, T.L., Erickson, W.P., 2002. Resource selection by animals: statistical design and analysis for field studies. Second edition. Kluwer Academic, Dordrecht, the Netherlands.

An additional reading list of journal papers and books will be made available by the instructor including:

-Drew, C.A, Yo. Wiersma and F. Huettmann (2011) Predictive Species and Habitat Modeling in Landscape Ecology. Springer, New York

-Scott, J.M., Heglund, P.J., Morrison, M.L., Haufler, J.B., Raphael, M.G., Wall, W.A. & Samson, F.B. (2002) Predicting Species Occurrence: Issues of Accuracy and Scale. Island Press, Covelo, CA.

<u>Other details relevant for this class:</u>

STUDENTS WITH DISABILITIES: Students with learning or other disabilities who may need classroom accommodations are encouraged to make an appointment with the

Office of Disability Services (907 474-5655). Please meet with me during office hours so that we can collaborate with the Office of Disability Services to provide the appropriate accommodations and supports to assist you in meeting the goals of the course.

PARTICIPATION: I expect students to participate and contribute actively in this class in order to improve the individual as well as the overall group performance. Lecture participation is required, e.g. for the paper discussions. Labs can be carried out elsewhere and at any time suitable to the student.

ETHICS: I believe in team work, high ethical standards and fair judging. I will follow the Code of Honor outlined in the UAF documents. Plagiarism and any other unethical approaches will not be tolerated in this course and will result into failure.

SUPPLIES REQUIRED: Field and outdoors gear, notebook, pen, computer (word processing, printer) and internet access.

SUPPORT FOR WRITTEN TASKS: Since assignments are in a digital and written format, students may want to make use of the Writing Center (8th floor, Gruening Bldg)

(I keep the right to modify any of the points outlined in this document, whenever required by the course and circumstances)

Lecture Schedule BIOL6XX, WLF6XX
(version 12th September 2012)

Date		General Topic*	Specific Topic
September	10	Introduction	Capturing Ecological Relationships quantitatively
	12	Quantitative Ecology	Applying quantitative relationships elsewhere
	17	Statistical Issues I	Linear vs Non-linear relationships
	19	Definitions and Terms	20 min Student Presentations (A) and Review with Lecturer
	24	No lecture (TWS conference)	No lecture (TWS conference)
	26	Spatial Applications	Spatial Analysis & Modeling
October	1	Statistical Issues II	Research Design
	3	Spatial Tools I	GIS and Data
	8	Spatial Tools II	GIS Overlays and Extractions
	10	Spatial Tools	Remote Sensing
	15	Quantitative Tools	GLMs and AIC
	17	Mid-term	Mid-term
	22	Quantitative Tools	Model Selection in R
	24	Model Quality	Model Assessment
	29	Quantitative Tools I	CARTs
	31	Quantitative Tools II	Biomapper
November	5	Quantitative Tools III	MARS
	7	Quantitative Tools IV	ANNs & Vector Machines
	12	Quantitative Tools V	TreeNet & Random Forest (bagging & boosting)
	14	Quantitative Tools VI	MaxEnt, GARP etc,
	19	Modeling Methodology	Statistical Issues, Scale and 'Tricks' in Spatial Modeling
	21	Project Review	20 min Student Presentations (B) and Review with Lecturer
	26	Ocean Applications	Ocean Modeling
	28	Modeling Methods	Future Habitats
December	3	Project Presentations	Student Presentations
	5	Project Discussion	Final Project Discussion before Submission
	10	Modeling Project	Project work-up
	12	Wrap Up	Summary of Lecture Topics: History & Outlook
	17	Final Exam	Held 10:15-12:15 AM

* weekly student-led discussions are integrated end of September onwards

Lab Assignments (tentative)

Submission Date		Topic
October	1	GIS data
October	15	Apply GLM, AIC in GIS
November	5	"Tree Predictions"
November	19	Model Assessment
December	10	Modeling Project

Important Deadlines (tentative)

Date		Deliverable
3 weeks before presentation		Discussion of topic with instructor
2 weeks before presentation		Papers for discussion provided to instructor
1 week before presentation		Questions for discussion provided to instructor
October	17	Mid-Term
October	17	Start of Final Modeling Lab Assignment
December	10	Final Exam