

AUG 26 2015

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**  
(Attach copy of syllabus)

**SUBMITTED BY:**

Department	MSL	College/School	SFOS
Prepared by	Eric Collins	Phone	X6482
Email Contact	recollins@alaska.edu	Faculty Contact	Eric Collins

**1. ACTION DESIRED**

(CHECK ONE):

Trial Course	<input checked="" type="checkbox"/>	New Course	<input type="checkbox"/>
--------------	-------------------------------------	------------	--------------------------

**2. COURSE IDENTIFICATION:**

Dept	MSL	Course #	494	No. of Credits	2
------	-----	----------	-----	----------------	---

Justify upper/lower division status &amp; number of credits:

Lecture/discussion and computer-based course for students with biology background, graduate standing or permission of instructor. Class will have 14 hours of lecture and 42 hours of computer lab for 2 credits (1 + 3).

**3. PROPOSED COURSE TITLE:**

Ecological and Evolutionary Genomics

**4. To be CROSS LISTED?**

YES/NO

NO

If yes, Dept:

Course #

NOTE: Cross-listing 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 #

How will the two course levels differ from each other? How will each be taught at the appropriate level?:

\* Use only one Format 1 form for the stacked course (not one for each level of the course!) and attach syllabi. 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 Demand Warrants

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

**7. SEMESTER & YEAR OF FIRST OFFERING**

(Effective AY2015-16 if approved by 3/31/2015; otherwise AY2016-17)

Spring 2016

**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)

<input type="checkbox"/>	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input type="checkbox"/>	5	<input checked="" type="checkbox"/>	6 weeks to full semester
--------------------------	---	--------------------------	---	--------------------------	---	--------------------------	---	--------------------------	---	-------------------------------------	--------------------------

OTHER FORMAT (specify)

Mode of delivery (specify

lecture, field trips, labs, etc)

Lecture, computer labs

**9. CONTACT HOURS PER WEEK:**

1

LECTURE  
hours/weeks

3

LAB  
hours /weekPRACTICUM  
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)

MSL F494 Ecological and Evolutionary Genomics  
2 Credits Offered As Demand Warrants

Uses free, open-source bioinformatics software to teach concepts in the fields of ecology and evolution while providing a basic background in computing and programming. Covers methods in genomics, metagenomics, and transcriptomics using example datasets derived from the marine environment. Prepares students for other quantitative graduate-level courses. Prerequisites: Undergraduate course in genetics or evolution ( BIOL F260, or BIOL F433, BIOL F445, or BIOL F481) or equivalent or by permission of the instructor. (1+3)

or graduate standing, or

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:

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

O = Oral Intensive, Format 6  W = Writing Intensive, Format 7  X = Baccalaureate Core

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  NO

12. **COURSE REPEATABILITY:**

Is this course repeatable for credit? YES  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: Changing the grading system for a course later on constitutes a Major Course Change - Format 2 form.

LETTER:  PASS/FAIL:

**RESTRICTIONS ON ENROLLMENT (if any)**

14. **PREREQUISITES** Undergraduate course in genetics or evolution (e.g. BIOL F260, BIOL F433, BIOL F445, or BIOL F481) or equivalent or by permission of the instructor

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

15. **SPECIAL RESTRICTIONS, CONDITIONS** NONE

**16. PROPOSED COURSE FEES**

\$0

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

NO

If yes, give semester, year, course #, etc.:

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

New course development for faculty member.  
 Course will fulfill part of instructional workload for faculty member.  
 Room serving up to 12 students will be needed.  
 Extended classroom usage will be needed for 3hr computer lab.

**19. LIBRARY COLLECTIONS**

Have you contacted the library collection development officer ([kljensen@alaska.edu](mailto: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

X

Contacted Karen Jensen 7/23/15. Necessary resources are available online and at UAF libraries

**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)

Course will be offered to students in all UAF departments. This course will focus on modern computational tools available to students in environmental fields including marine biology, biological oceanography, wildlife biology, and conservation biology. This course does not significantly overlap with existing course offerings.

**21. POSITIVE AND NEGATIVE IMPACTS**

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

A positive impact will be the offering of a new, exciting course for undergraduates available with the MSL Oceanography Minor. This course will focus on modern computational tools available to students in environmental fields including marine biology, biological oceanography, wildlife biology, and conservation biology. This course does not significantly overlap with existing course offerings.

**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.

Recent advances in DNA sequencing technology have turned biology from a data-sparse into a data-rich field. Over the past decade, the cost to sequence DNA has dropped by over 1000-fold, making the ability to access these data an integral training requirement for the next generation of biologists. This course will focus on modern computational tools available to students in environmental fields including marine biology, biological oceanography, wildlife biology, and conservation biology.

**APPROVALS: Add additional signature lines as needed.**

DocuSigned by: <i>Brenda Konar</i>	Date
Signature, Chair, Program/Department of: <i>6PMSL</i>	

DocuSigned by: <b>J. Andrés López</b>	Date
Signature, Chair, College/School Curriculum Council for: <b>SFOS (Ana Aguilar-Isias)</b>	<b>August 24, 2015</b>

DocuSigned by: <i>Trent M Sutton</i>	Date
Signature, Dean, College/School of: <b>sfos</b>	<b>August 24, 2015</b>

**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: <input type="checkbox"/> Curriculum Review <input type="checkbox"/> GAAC	
<input type="checkbox"/> Core Review <input type="checkbox"/> 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:	

**ATTACH COMPLETE SYLLABUS (as part of this application).** This list is online at:

<http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/uaf-syllabus-requirements/>

The Faculty Senate 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 (or changes to it) may 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 (see #6)**

##### **6. Student Learning Outcomes (more specific)**

##### **7. 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.).

##### **8. 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.

##### **9. Course policies:**

Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

##### **10. 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.)  Publicize UAF regulations with regard to the grades of "C" and below as applicable to this course. (Not required in the syllabus, but is a convenient way to publicize this.) Link to PDF summary of grading policy for "C":

[http://www.uaf.edu/files/uafgov/Info-to-Publicize-C\\_Grading-Policy-UPDATED-May-2013.pdf](http://www.uaf.edu/files/uafgov/Info-to-Publicize-C_Grading-Policy-UPDATED-May-2013.pdf)

##### **11. Support Services:**

Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

**12. Disabilities Services:** Note that the phone# and location have been **updated**. <http://www.uaf.edu/disability/> The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials.

State that you will work with the Office of Disabilities Services (208 WHITAKER BLDG, 474-5655) to provide reasonable accommodation to students with disabilities.

**Ecological and Evolutionary Genomics**  
**MSL F494 (1+3)**

**Prerequisites:** Undergraduate course in genetics or evolution (BIOL F260, BIOL F433, BIOL F445, or BIOL F481) or equivalent or graduate standing or by permission of the instructor. (1+3)

**Meeting time:** W 11:45—12:45 + lab (XXX)

**Location:** O'Neill 201

**Instructor:** Eric Collins

**Office:** 234 Irving II

**Hours:** M 11:45—12:45 or by request

**Phone:** 474-6482

**Email:** [recollins@alaska.edu](mailto:recollins@alaska.edu)

**Textbook:** None. Readings will be taken from the primary literature

**Supplemental Reading:**

“Practical Computing for Biologists” by Haddock and Dunn. ISBN:0878933913. 1<sup>st</sup> Ed.  
(*recommended*)

“Introduction to Ecological Genomics” by van Straalen and Roelofs. ISBN:0199594694. 2<sup>nd</sup> Ed. (*recommended*)

**Supplies:** Internet-enabled portable computer is required. Some laptops are available from the GPMSL academic office, please contact the instructor for assistance.

**Course Content:** Recent advances in DNA sequencing technology have turned biology from a data-sparse into a data-rich field. Over the past decade, the cost to sequence DNA has dropped by over 1000-fold, making the ability to access these data an integral training requirement for the next generation of biologists. This course will focus on modern computational tools available to students in environmental fields including marine biology, biological oceanography, wildlife biology, and conservation biology.

**Expected Proficiencies:** Undergraduate-level understanding of genetics and evolution.

**Catalog Description:**

MSL F494 Ecological and Evolutionary Genomics

2 Credits Offered As Demand Warrants

Uses free, open-source bioinformatics software to teach concepts in the fields of ecology and evolution while providing a basic background in computing and programming. Covers methods in genomics, metagenomics, and transcriptomics using example datasets derived from the marine environment. Prepares students for other quantitative graduate-level courses. Prerequisites: Undergraduate course in genetics or evolution (BIOL F260, BIOL

F433, BIOL F445, or BIOL F481) or equivalent or graduate standing or by permission of the instructor. (1+3)

**Course Goals:** The goal of this course is to introduce modern computational tools in ecological and evolutionary genomics to students in environmental fields like marine biology, biological oceanography, fisheries, wildlife biology, and conservation biology.

**Student Learning Outcomes:**

Students will gain:

1. The ability to use a command-line environment to conduct routine tasks on the computer (e.g. the bash shell).
2. The skills to write simple scripts in at least one programming language (e.g. perl, python, matlab, or R).
3. Ability to find, download, install, and use software and datasets from public repositories (e.g. from github or BioLinux).
4. Basic skills applying genomic concepts and algorithms in ecology and evolution (e.g. annotation, blast, mcl, k-mers, maximum likelihood).
5. Ability to analyze a real environmental genomics dataset.

**Instructional Methods:** The course time will be split between lectures and computer labs where students will gain hands-on experience working with real datasets.

**Tentative Course Calendar:**

Date	Topic (lecture + lab)	Background reading material
Week 1	basic skills in computing and bioinformatics + CLI, bash shell, github	<a href="http://swcarpentry.github.io/shell-novice">http://swcarpentry.github.io/shell-novice</a>
Week 2	database searching + BioLinux and BLAST	<a href="http://environmentalomics.org/bio-linux/">http://environmentalomics.org/bio-linux/</a>
Week 3	next generation sequencing + BaseSpace	<a href="https://basespace.illumina.com/home/index">https://basespace.illumina.com/home/index</a>
Week 4	taxon assignment + kraken	<a href="http://www.genomebiology.com/2014/15/3/R46">http://www.genomebiology.com/2014/15/3/R46</a>
Week 5	population structure + structure	<a href="http://www.ncbi.nlm.nih.gov/pubmed/10835412">http://www.ncbi.nlm.nih.gov/pubmed/10835412</a>
Week 6	diversity + mothur	<a href="http://aem.asm.org/content/early/2013/06/17/AEM.01043-13">http://aem.asm.org/content/early/2013/06/17/AEM.01043-13</a>
Week 7	metagenomics + MG-RAST	<a href="http://www.ncbi.nlm.nih.gov/pubmed/18803844">http://www.ncbi.nlm.nih.gov/pubmed/18803844</a>
Week 8	ecogenomics + MetaCyc	<a href="http://nar.oxfordjournals.org/content/42/D1/D459.long">http://nar.oxfordjournals.org/content/42/D1/D459.long</a>
Week 9	molecular evolution + MrBayes, PhyML	<a href="http://www.ncbi.nlm.nih.gov/pubmed/11524383">http://www.ncbi.nlm.nih.gov/pubmed/11524383</a>
Week 10	genomic architecture + Galaxy	<a href="http://www.genomebiology.com/2010/11/8/R86">http://www.genomebiology.com/2010/11/8/R86</a>
Week 11	functional networks + KEGG	<a href="http://www.ncbi.nlm.nih.gov/pubmed/24214961">http://www.ncbi.nlm.nih.gov/pubmed/24214961</a>
Week 12	whole genome comparisons + IMG/m	<a href="http://nar.oxfordjournals.org/content/40/D1/D115.full">http://nar.oxfordjournals.org/content/40/D1/D115.full</a>
Week 13	concatenated phylogenies + Phylosift	<a href="https://peerj.com/articles/243/">https://peerj.com/articles/243/</a>
Week 14	annotation of genomes + RAST	<a href="http://www.biomedcentral.com/1471-2164/9/75">http://www.biomedcentral.com/1471-2164/9/75</a>

**Evaluation:** Students will be evaluated based on their level of enrollment, but each grade will be based on class and computer lab participation, a writing project, and a final presentation. Grading is absolute.

**Class Participation (10%),** including on-time attendance and engagement with classmates, will be expected of each student. For each late arrival or absence 1% will be subtracted from the final grade to a maximum of 10%.

**Computer Lab Exercises (40%)** will be completed by small teams of students who complete a short report on each computer lab. The reports will be tailored to each lab, but may include reproducible computer code, computer logs, plots of results, and brief explanations of each output. Each student will have one week to upload his or her report to a personal github account. Reports will be graded complete/incomplete based on the expectations provided in each lab. Incomplete reports will receive 0 points. Complete reports will be required for 8 of 14 labs (at least 4 of the first 7 and 4 of the second 7).

A **Research Project (40%)** will be required. The product will be a scientific manuscript (~4000 words) based upon an independent computational analysis using skills developed in class. The topic of the *Research Project* will be agreed upon with the instructor by week 4, and may use public datasets or the student's own dataset. Students may use computer lab time to work on their research projects.

The **Final Presentation (10%)** will be based on the *Research Project*; students are expected to explain their findings in a professional manner in a 15-minute conference-style presentation during Finals Week.

**Course Policies:** Students are expected to read the relevant material prior to the lectures and attend class in a timely manner. Active participation is expected. The use of cell phones or other electronic communications (e.g. email, twitter, facebook etc.) during class is considered inappropriate. Students should be familiar with the UAF Honor Code (you'll find it in the catalog). Cheating and plagiarism will not be tolerated. Any student found cheating during the exams or to have plagiarized or fabricated statements (including passages from web pages) will receive an automatic 'F' for the **class**.

*The following non-curved grading system will be used for the entire course:*

A+ >95%  
A >90 – 95%  
A- >85 – 90%  
B+ >80 – 85%  
B >75 – 80%  
B- >70 – 75%  
C+ >67 – 70%  
C >63 – 67%  
C- >60 – 63%

*Grades below C- will not count toward the major or minor degree requirements*  
D 50 – 60%  
F <50



**Support Services:** At UAF, the Office of Disability Services (203 Whitaker Bldg; 474-5655; TTY 474-1827; [fydso@uaf.edu](mailto:fydso@uaf.edu)) ensures that students with physical or learning disabilities have equal access to the campus and course materials. If you have specialized needs, please contact this office or the instructor to make arrangements. The UAF Writing Center (801 Gruening Bldg) is available for helping students in brainstorming and generating topics, organizing ideas, developing research strategies, the use of citations, and editing for clarity and correctness. Contact them at <http://www.uaf.edu/english/writing-center>.