10-UNC Revised 10/17/2016

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 [ ] New Course [X]

2. COURSE IDENTIFICATION: Dept **MSL** Course # **464** No. of Credits **2**

Justify upper/lower division status & 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: **Every Spring**

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 2017**

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, computer labs**					

9. CONTACT HOURS PER WEEK: **1** 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)

MSL F464 Ecological and Evolutionary Genomics
2 Credits Offered Spring
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: BIOL F260, BIOL F360, BIOL F433, F466, BIOL F481, or F487 or by permission of the instructor. (1+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:	X

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	X

12. COURSE REPEATABILITY:

Is this course repeatable for credit?	YES		NO	X

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:	X	PASS/FAIL:	

RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES	**BIOL F260, BIOL F360, BIOL F433, F466, BIOL F481, or F487 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** | **YES**

If yes, give semester, year, course #, etc.: Spring 2016 as MSL494

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.
Class will be offered to remote students by distance delivery.

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	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 is unique in its focus on practical skills in bioinformatics and does not significantly overlap with existing course offerings. This course will also provide valuable skills for graduate students.

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 Minor in Marine Science and part of the B.S. in FOS, Ocean Sciences concentration. 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, fisheries, and conservation biology. This course will become part of the MSL Minor in Marine Science and the B.S. in FOS, Ocean Sciences concentration.

APPROVALS: Add additional signature lines as needed.

DocuSigned by:
J. Reynolds
85B1B55B32EE48E...
Signature, Chair, Program/Department of: Oceanography — Date: September 15, 2016

DocuSigned by:
8688705E293D406...
Signature, Chair, College/School Curriculum Council for: SFOS — Date: September 15, 2016

DocuSigned by:
8688705E293D406...
Signature, Dean, College/School of: SFOS — Date: September 15, 2016

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

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

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

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

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

Signature, Chair, Program/Department of: — Date

Signature, Chair, College/School Curriculum Council for: — Date

Signature, Dean, College/School of: — Date

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

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 F464 (1+3)

Instructor: Eric Collins
Office: 234 Irving II
Hours: M 11:45—12:45 or by request
Phone: 474-6482
Email: recollins@alaska.edu

Prerequisites: Undergraduate course in genetics or evolution (BIOL F260, BIOL F360, BIOL F433, F466, BIOL F481, or F487) or equivalent or graduate standing or by permission of the instructor. (1+3)

Meeting time: lecture M 2:15—3:15, lab M 3:15—4:15 & F2:15—4:15
Location: O'Neill 214

Catalog Description:
MSL F464 Ecological and Evolutionary Genomics
2 Credits Offered Spring
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: BIOL F260, BIOL F360, BIOL F433, F466, BIOL F481, or F487 or by permission of the instructor. (1+3)

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

Supplemental Reading:
"Practical Computing for Biologists" by Haddock and Dunn. ISBN:0878933913. 1st Ed. (*recommended*)
"Introduction to Ecological Genomics" by van Straalen and Roelofs. ISBN:0199594694. 2nd Ed. (*recommended*)

Supplies: Internet-enabled portable computer is required. A dozen laptops are available from the SFOS 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.

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:
Upon completion of the course students will be able to:

1. Use a command-line environment to conduct routine tasks on the computer (e.g. the bash shell).
2. Write simple scripts in at least one programming language (e.g. perl, python, matlab, or R).
3. Find, download, install, and use software and datasets from public repositories (e.g. from github or BioLinux).
4. Apply genomic concepts and algorithms in ecology and evolution (e.g. annotation, blast, mcl, k-mers, maximum likelihood).
5. 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	*http://swcarpentry.github.io/shell-novice*
Week 2	next generation sequencing + Cloud Computing + BaseSpace	*https://developer.basespace.illumina.com/docs/content/documentation/getting-started/overview http://bmcbioinformatics.biomedcentral.com/articles/10.1186/1471-2105-13-42*
Week 3	diversity + mothur	*http://aem.asm.org/content/early/2013/06/17/AEM.01043-13* http://www.mothur.org/wiki/MiSeq_SOP
Week 4	database searching + BioLinux + BLAST + DIAMOND	*http://environmentalomics.org/bio-linux/ https://en.wikipedia.org/wiki/BLAST http://www.nature.com/nmeth/journal/v12/n1/full/nmeth.3176.html*
Week 5	taxon assignment + kraken + Phylosift	*http://www.genomebiology.com/2014/15/3/R46*
Week 6	metagenomics + MG-RAST	*http://www.ncbi.nlm.nih.gov/pubmed/18803844*
Week 7	ecogenomics + functional networks + MetaCyc + KEGG	*http://nar.oxfordjournals.org/content/42/D1/D459.long http://www.ncbi.nlm.nih.gov/pubmed/24214961*
Week 8	assembly of meta+genomes + Spades	*http://bioinf.spbau.ru/spades*
Week 9	annotation of genomes + RAST	*http://www.biomedcentral.com/1471-2164/9/75*

Week 10	whole genome comparisons + IMG/m	*http://nar.oxfordjournals.org/content/40/D1/D115.full*
Week 11	genomic architecture + Galaxy	*http://www.genomebiology.com/2010/11/8/R86*
Week 12	gene expression + bowtie + IMG/w	
Week 13	molecular evolution + MrBayes + PhyML	*http://www.ncbi.nlm.nih.gov/pubmed/11524383* *https://peerj.com/articles/243/*
Week 14	population structure + structure	*http://www.ncbi.nlm.nih.gov/pubmed/10835412*

Evaluation: Students will be evaluated based on class and computer lab participation, a writing project, and a final presentation. Grading is absolute.

Class Participation **(10%, 100 points),** including on-time attendance at both lecture and lab, and engagement with classmates, will be expected of each student, and evaluated according to the following rubric (also available at https://www.cmu.edu/teaching/assessment/examples/courselevel-bycollege/cfa/tools/participationrubric-cfa.pdf)

	Exemplary (90%- 100%)	**Proficient (80%-90%)**	**Developing (70%-80%)**	**Unacceptable (>70%)**
Frequency of participation in class	Student initiates contributions more than once in each recitation.	Student initiates contribution once in each recitation.	Student initiates contribution at least in half of the recitations	Student does not initiate contribution & needs instructor to solicit input.
Quality of comments	Comments always insightful & constructive; uses appropriate terminology. Comments balanced between general impressions, opinions & specific, thoughtful criticisms or contributions.	Comments mostly insightful & constructive; mostly uses appropriate terminology. Occasionally comments are too general or not relevant to the discussion.	Comments are sometimes constructive, with occasional signs of insight. Student does not use appropriate terminology; comments not always relevant to the discussion.	Comments are uninformative, lacking in appropriate terminology. Heavy reliance on opinion & personal taste, e.g., "I love it", "I hate it", "It's bad" etc.
Listening Skills	Student listens attentively when others present materials, perspectives, as indicated by comments that build on others' remarks, i.e., student hears what others say & contributes to the dialogue.	Student is mostly attentive when others present ideas, materials, as indicated by comments that reflect & build on others' remarks. Occasionally needs encouragement or reminder from T.A of focus of comment.	Student is often inattentive and needs reminder of focus of class. Occasionally makes disruptive comments while others are speaking.	Does not listen to others; regularly talks while others speak or does not pay attention while others speak; detracts from discussion; sleeps, etc.

Computer Lab Exercises **(40%, 400 points)** will be consist of a short report on each computer lab. Students are expected to attend every 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 Github. Reports will be graded complete/incomplete based on the expectations and objectives provided in each lab. Reports in which each objective is completed will be required for at least 4/7 of the first half exercises and 4/7 of the second half. Complete reports earn 50 points each to a maximum of 400 points. Incomplete reports will receive no points.

A ***Research Project*** **(40%, 400 points)** will be required. The product will be organized as a scientific manuscript (>2500 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. Simulating the scientific process, students will submit their manuscripts for anonymous peer-review by classmates. Final decisions will be made by the instructor, acting as Editor in Chief. Publishing criteria from the journal PLoS ONE will be used as guidance: http://journals.plos.org/plosone/s/criteria-for-publication

The ***Final Presentation*** **(10%, 100 points)** 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 (https://www.uaf.edu/catalog/catalog_00-01/undergrad/regs3.html). 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) 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.

Curriculum Committee SFOS

Members: Trent Sutton (Chair)
Gordon Kruse
Sarah Hardy
Jennifer Reynolds

18 August 2016

Trial or New Course
Course Number: MSL 464
Course Title: Ecological and Evolutionary Genomics
Instructor: Collins
First Time of Offering: No

General Recommendations:
Perhaps consider cross-listing this course with FISH to increase enrollment.

Faculty Senate Form:

Clarify and Address the following:

- Section 2. Change MSL 4xx to 464.
- Section 6. Will this course generate sufficient enrollment to be offered every spring?
- Section 10. Change MSL 4xx to 464. For an undergraduate course, offering it "as demand warrants" usually means that the course does not get offered because there is never demand for it. The committee recommends choosing a semester (spring or fall) and year (odd or even) and consistently offering as part of the B.S. in FOS and Minor in Marine Science (note that in section 6 it says every spring fo the offering of this course). For Prerequisites, need specific courses and their numbers (the Registrar will only recognize course numbers, not course topics as listed). Remove "Undergraduate course in genetics or evolution" and "or equivalent". Just list the courses that you have and "permission of instructor".
- Section 14. Same comments as above on prerequisites.
- Section 18. Will this course be distance delivered? May want to consider that.
- Section 20. Anne Beaudreau in Fisheries teaches a conservation biology course. Would be a good idea to talk to her to make sure there is no to minimal overlap in your courses (she does cover genetics in her course). Should also note that this course would benefit graduate students as well.
- Section 21. Should add that this course will be part of the B.S. in FOS, Ocean Sciences concentration. There could be a negative impact in that the course could overlap in content with Anne Beaudreau's conservation biology course (see above comment).
- Justification. Making the course available to fisheries students (and stating that in the justification) could increase your enrollment. Should also mention here that the course is part of the Minor in Marine Science.

Syllabus:

- Change MSL 494 to MSL 464.
- The committee recommends reorganizing the syllabus a bit. Move the instructor information to below the course title and the catalog description to below the instructor information and above the textbook information. Changes to the catalog description from the form apply to the syllabus as well (e.g., course number, prerequisites, etc.).
- For supplies, how many laptops are available in Academic Programs? Also, Academic Programs is SFOS not GPMSL.
- Need to provide the point totals for the assignments. For example, how many points are available for class participation, lab exercises, etc.? The UAF Curriculum Review Committee will scrutinize how you evaluate class participation so include additional information on how you will assign a score to students for this category.
- Course policies. Include the weblink to the UAF Honor Code. Also make sure that your cheating and plagiarism penalties are consistent with UAF policy.