FORMAT 2

Submit originals (including syllabus) and one copy and electronic copy to the **Faculty Senate Office**
See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/ for a complete description of the rules governing curriculum & course changes.

RECEIVED
SEP 26 2016
Dean's Office
College of Natural Science & Mathematics

CHANGE COURSE (MAJOR) and DROP COURSE PROPOSAL

Attach a syllabus, except if dropping a course.

SUBMITTED BY:

Department	Biology & Wildlife	College/School	CNSM
Prepared by	Derek Sikes	Phone	907-474-6278
Email Contact	dssikes@alaska.edu	Faculty Contact	Derek Sikes

1. COURSE IDENTIFICATION: As the course now exists.

Dept	Course #	No. of Credits
BIOL	F615	4

COURSE TITLE: Systematic and Comparative Biology

2. ACTION DESIRED: √ Check the changes to be made to the existing course.

Change Course	If Change, indicate below what is changing.	Drop Course
x		

NUMBER		TITLE		DESCRIPTION	
PREREQUISITES•				FREQUENCY OF OFFERING	

•Prerequisites will be *required* before a student is allowed to enroll in the course.

CREDITS (including credit distribution)				COURSE CLASSIFICATION	
ADD A STACKED LEVEL (400/600) *Include syllabi.*	x	Dept.	BIOL	Course #	415

How will the two course levels differ from each other? How will each be taught at the appropriate level?:	The exams will be down-weighted for undergraduates with other course assignments up-weighted, and a greater participation weight for undergraduates (see syllabi for details). Additionally, each graduate student will be responsible for leading discussions of papers during the weekly discussion section, whereas undergraduates will not.

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.

ADD NEW CROSS-LISTING		Dept. & No.		Requires approval of both departments and deans involved. Add lines at end of form for additional signatures.
STOP EXISTING CROSS-LISTING		Dept. & No.		Requires notification of other department(s) and mutual agreement. Attach copy of email or memo.
OTHER (specify)				

3. *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 **and** the appropriate Faculty Senate curriculum committee. 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 all that apply)												
Mode of delivery (specify lecture, field trips, labs, etc.)	lectures and labs											

4. COURSE CLASSIFICATIONS: (undergraduate courses only. Use approved criteria found in Chapter 12 of the curriculum manual. If justification is needed, attach separate sheet.)

H = Humanities		S = Social Sciences					
Will this course be used to fulfill a requirement for the baccalaureate core?	YES		NO	x			

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

O = Oral Intensive, •**Format 6** also submitted		W = Writing Intensive, •**Format 7** submitted		X = Baccalaureate Core	

4.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

5. 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 with variable credit, what is the maximum number of credit hours that may be earned for this course?		CREDITS		

6. <u>COMPLETE</u> CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking, clearly showing the changes you want made. (<u>Underline new wording</u> ~~strike through old wording~~ and use complete catalog format including dept., number, title, credits and cross-listed and stacked.)

Example of a <u>complete</u> description:

PS F450 Comparative ~~Aboriginal~~ <u>Indigenous</u> Rights and Policies (s)

3 Credits

Offered As Demand Warrants

~~Case-study~~ <u>Comparative</u> approach ~~in assessing Aboriginal~~ <u>to analyzing Indigenous</u> rights and policies in different nation-state systems. ~~Seven Aboriginal situations~~ <u>Multiple countries and specific policy developments</u> examined for factors promoting or limiting self-determination. Prerequisites: Upper division standing or permission of instructor. (Cross-listed with ANS F450.) (3+0)

BIOL F615 Systematic and Comparative Biology
4 Credits

Offered Fall Even-numbered Years

Concepts of systematic biology basic to a rigorous and complete understanding of modern evolutionary theory. Systematics provides the historical framework critical to a variety of comparative analyses in biology. Recent innovations in phylogenetic analyses will be explored in lecture and lab

Prerequisites: Graduate standing; or permission of instructor.
Stacked with BIOL F415

Lecture + Lab + Other: 3 + 3 + 0

BIOL F415 Systematic and Comparative Biology
4 Credits

Offered Fall Even-numbered Years

Concepts of systematic biology basic to a rigorous and complete understanding of modern evolutionary theory. Systematics provides the historical framework critical to a variety of comparative analyses in biology. Recent innovations in phylogenetic analyses will be explored in lecture and lab

Prerequisites: BIOL F481
Stacked with BIOL F615

Lecture + Lab + Other: 3 + 3 + 0

7. COMPLETE CATALOG DESCRIPTION AS IT SHOULD APPEAR AFTER ALL CHANGES ARE MADE:

BIOL F615 Systematic and Comparative Biology
4 Credits

Offered Fall Even-numbered Years

Concepts of systematic biology basic to a rigorous and complete understanding of modern evolutionary theory. Systematics provides the historical framework critical to a variety of comparative analyses in biology. Recent innovations in phylogenetic analyses will be explored in lecture and lab

Prerequisites: Graduate standing; or permission of instructor.
Stacked with BIOL F415

Lecture + Lab + Other: 3 + 3 + 0

BIOL F415 Systematic and Comparative Biology
4 Credits

Offered Fall Even-numbered Years

Concepts of systematic biology basic to a rigorous and complete understanding of modern evolutionary theory. Systematics provides the historical framework critical to a variety of comparative analyses in biology. Recent innovations in phylogenetic analyses will be explored in lecture and lab

Prerequisites: BIOL F481

Stacked with BIOL F615

Lecture + Lab + Other: 3 + 3 + 0

8. *GRADING SYSTEM: Specify only one.*

LETTER: [x] PASS/FAIL: [ ]

9. *ESTIMATED IMPACT*

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

None, the graduate level course is usually low-enrollment so there is plenty of room to add undergraduate students to the facility (classroom & lab).

10. *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 [x] Yes [ ] No need for library collections etc. for the course

11. *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)

Biological Sciences BA and BS– I emailed Diane Wagner, Biological Sciences Undergraduate Program Chair who confirmed this via email (15 Sep 2016).

12. *POSITIVE AND NEGATIVE IMPACTS*

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

Few, adding Biol F481 as a prereq might slightly increase enrollment in that course, but this is actually not likely. Most students interested in systematics would have already taken Biol F481. This would create for the first time, an undergraduate level course in Biological Systematics at UAF. I've had undergraduates enroll in this course as a grad course previously so there is an interest.

13. *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. If you ask for a change in # of credits, explain why; are you increasing the amount of material covered in the class? If you drop a prerequisite, is it because the material is covered elsewhere? If course is changing to stacked (400/600), explain higher level of effort and performance required on part of students earning graduate credit. Use as much space as needed to fully justify the proposed change and explain what has been done to ensure that the quality of the course is not compromised as a result.

This course was developed as an undergraduate course at the University of Calgary. When I began teaching it at UAF as a graduate level course I modified it to include a section for discussion of readings of the primary literature and increased the difficulty of the exams. This has worked well and the students who have taken this course have reviewed it favorably (My IAS scores for Bio 615 are strong: combined items 1-4, 2012: 4.8, 2014: 4.6.). To create a stacked version I have modified the grading rubric to down-weight the exams for the undergraduates and up-weight the assignments (which are easier). This should allow the

undergraduates to fully benefit from all the course material and still perform well without the full rigor of the graduate level exams. Additionally, each graduate student will be responsible for leading discussions of papers during the weekly discussion section, whereas undergraduates will not.

APPROVALS: (Forms with missing signatures will be returned. Additional signature blocks may be added as necessary.)

[signature]	Date	9/19/16	
Signature, Chair, Program/Department of:	Biology & Wildlife		
[signature]	Date	9-26-16	
Signature, Chair, College/School Curriculum Council for:	CNSM		
[signature]	Date	9/27/16	
Signature, Dean, College/School of:	CNSM		

Offerings above the level of approved programs must be approved in advance by the Provost (e.g., non-graduate level program offering of a 600-level course):

	Date	
Signature of Provost (if applicable)		

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; add more blocks as necessary.)

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

Note: If removing a cross-listing, you may attach copy of email or memo to indicate mutual agreement of this action by the affected department(s).

If degree programs are affected, a Format 5 program change form must also be submitted.

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.

5/21/2013

Systematic and Comparative Biology

Fall 2016

Biol 415 (4 credits) CRN = ????

Instructor: Derek S. Sikes
Museum
474-6278
dssikes@alaska.edu

Website: https://classes.uaf.edu/webapps/login (Blackboard)
Office Hours: Wednesdays 12-1, Museum (or by appt.)

Lectures: Museum classroom (151), Monday, Wednesday, Friday 9:15-10:15

Lab: Mondays, 3:30-6:30pm Murie 302. 3h

Required Textbook: The Phylogenetic Handbook: A Practical Approach to Phylogenetic Analysis and Hypothesis Testing, Salemi, M. and Vandamme, A.-M. (eds). Cambridge Univ. Press., 2nd Edition (2009). Additional required papers will be available via Blackboard.

Course description: Concepts of systematic biology basic to a rigorous and complete understanding of modern evolutionary theory. Systematics provides the historical framework critical to a variety of comparative analyses in biology. Recent innovations in phylogenetic analyses will be explored in lecture and lab. The methods covered apply equally to all eukaryotic taxa, based on either morphological or molecular characters. Training in key software packages will take place in lab. Some of the topics and methods covered:

Taxonomy. Species demarcation / concepts, phylogeography, description / diagnosis, naming, rules of nomenclature, DNA barcoding, the "taxonomic bottleneck," digitization of taxonomic data / bioinformatics, homology / characters (alignment 1)

Phylogenetics. History & development, Phenetics, Cladistics, homology of sequences (alignment 2), taxon and character sampling, distance methods, parsimony, maximum likelihood, Bayesian, MCMC, model selection, branch support, ancestral state reconstruction, divergence dating, biogeography, fossil data, trouble-shooting, species trees.

Course prerequisites: BIOL F481 –Principles of Evolution.

Course instruction will consist of 1h lectures 2x a week, 1h reading group on Fridays, a weekly 3h lab, textbook and lab readings, and classroom discussion. Expect to spend 6h per week preparing and reading outside of class.

Goals of the course: Students successfully completing the course should be able to evaluate the quality of, and know how to produce, both traditional taxonomic and statistical phylogenetic studies.

Student learning outcomes: Students will learn how to describe a new species using both morphological and molecular methods and will learn the rules of the International

Code of Zoological Nomenclature. Students will learn how to estimate the phylogeny of a group of taxa or populations using various marker systems and analytical methods.

Instructional methods: lecture, lab, group discussion of primary literature, preparation of an project involving a phylogenetic analysis.

Evaluation: The course grade will be based on the following:

Component	**Proportion of grade**
Lab & take home exercises	40%
Midterm exam	10%
Project	30%
Final exam (cumulative in part)	10%
Participation	10%

A +	96.7	-	100 %	C +	76.7	-	79 %
A	93.4	-	96.6 %	C	73.4	-	76.6 %
A -	90	-	93.3 %	C -	70	-	73.3 %
B +	86.7	-	89 %	D +	66.7	-	69 %
B	83.4	-	86.6 %	D	63.4	-	66.6 %
B -	80	-	83.3 %	D -	60	-	63.3 %
				F	< 60%		

Participation: 10% of your grade is based on participation. Attendance and participation in all lectures, labs, and reading discussion groups, and production of a peer-review report, is required to obtain all 10 points. One point is lost per unexcused absence. Late arrivals to class or lab, if habitual (>3), and/or lack of participation in reading discussion groups will also result in lost participation points.

Lab & take home exercises: Labs will be used to learn software and methods of analysis that you will use to produce your final project. Four of the labs have exercises that will be graded (see schedule for due dates) the rest are opportunities to work on your project with your professor's help.

Reading Discussion group: Friday lecture period will be used to discuss readings assigned the previous Friday. These will consist of approximately 4 papers per week. Read each and highlight sections about which you have questions to ask or ideas to discuss.

Bonus: 2.5% bonus points are available. Simply write down 5 of your best questions asked of me during lecture *and their answers* and submit this list during the first week of December. If I agree they are good questions (beneficial to the course goals) and the answers are correct each will be worth 0.5% extra towards your grade.

Project: Write one scientific manuscript that is no more than 25 pages: (1) a review or re-analysis of published phylogenetic data, (2) analyzes new character data collected in your research, or (3) considers conceptual and theoretical issues in phylogenetic systematics. The manuscript should be based on work that is not already completed, and

it should be prepared for publication in a peer-reviewed journal (include title page, abstract, keywords, intro, methods, results, discussion, acknowledgements, and literature cited); with figures and captions embedded in their appropriate locations. The target journal should be identified, and the manuscript should be formatted to conform to journal guidelines. Manuscripts will be friendly "peer-reviewed" by the class and submitted to your instructor for final "editorial" review and grading after the final exam. Note: your peer-reviewed copy must be turned in with your final version; also, the peer-reviewer must write a short report about the paper with suggested changes to the editor (me) in which they recommend one of the following: publish as is, publish after minor changes, publish after major changes, reject. The review will not graded but, if missing, points will be lost from the participation portion of the course. The draft will be graded (see below). See additional handouts on the project.

Project Milestones (see course calendar for due dates).

1) topic description – one paragraph describing the question or questions your project will attempt to answer (5%)

2) outline – within these larger sections add details: title, abstract, introduction, methods, results, discussion, acknowledgments, literature cited, figures, tables (5%)

3) annotated bibliography – a list of the references you plan to cite with notes on where in your paper they'll be used & why (5%)

4) final draft for peer review – *the closer this draft is to your final version the better for you*. If you think it is 100% finished your peer-reviewer will probably find things to improve that you didn't think of, which will raise your final grade. If you think your draft is not 100% finished, your peer-reviewer will find things to improve that you had probably intended to fix anyhow and, depending on how far from final your draft is, you will likely introduce new problems to your work that will cost you points (these problems could have been caught and fixed during peer review if your draft had been more complete). *Therefore, the draft for peer review should not be 'rough,' it should be as close to final as you can make it.* (5%)

Plagiarism: "Plagiarism is the overt or covert use of other people's work or ideas without acknowledgement of the source. This includes using ideas or data from a classmate or colleague without permission and acknowledgement, including sentences from journal articles (either in their entirety or with minor changes) in your writing without citing the author, or copying parts of a website into your essay. You cannot use someone's ideas without citing the originator; you cannot use someone's words without quoting the writer. Any deviation from this will be regarded as plagiarism.
When you plagiarize you are stealing the currency which science (and many other endeavors) uses: knowledge. Plagiarism and cheating are serious offenses that violate the student code of conduct may result in an "F" in the course and / or referral to the university disciplinary committee." (Mulder, Biol. 693-03, 2009 syllabus).

When in doubt – cite it!

Note for students with disabilities: If you have a disability of any kind for which you think you may need an adjustment in the classroom, you must contact the Office of Disability Services (203 WHIT, 474-5655). I will work with the office to provide reasonable accommodation, but I require a letter from this office.

Course Calendar

DATE		LECTURE TOPIC	READINGS
Aug	29(m)	lec. 1. Introduction to biological systematics (value)	will be emailed
	29(m)	lab. 1. – taxonomy on the web (web exercise due at lab 2)	
	31(w)	lec. 2. Introduction continued; History of taxonomy	
Sep	2(f)	Discussion of readings assigned last week	
	5(m)	*Labor day – no classes*	
	7(w)	lec. 3. Species & taxonomy	
	9(f)	Discussion of readings assigned last week	
	12(m)	lec. 4. Nomenclature & Classification	
	12(m)	lab. 2. – taxonomic literature (& nomenclature exercise due at lab 3)	
	14(w)	lec. 5. Specimens, collections, curation	
	16(f)	Discussion of readings assigned last week	
	19(m)	lec. 6. Modern Taxonomy – DNA barcodes, etc	
	19(m)	lab. 3. - beetle exercise: characters; descriptions, diagnoses, due at lab 5	
	21(w)	lec. 7. Phylogenetic inference – history / introduction	
	23(f)	Discussion of readings assigned last week	
	26(m)	lec. 7. Phylogenetic inference2	
	26(m)	lab. 3b. work on Beetle exercise	
	28(w)	lec. 8. Homology	
	30(f)	Discussion of readings assigned last week	
Oct	3(m)	lec. 9. Molecular homology, alignment	
	3(m)	lab. 4. - beetle exercise: keys	
	5(w)	lec. 10. Trees – Parsimony	
	7(f)	Discussion of readings assigned last week	
	10(m)	lec. 11. Distance methods	
	10(m)	lab. 5. – Alignment exercise, Clustal: (due at lab 6)	
	12(w)	**MIDTERM EXAM – take home**	
	7(f)	Discussion of readings assigned last week	
	17(m)	lec. 12. Large datasets – heuristic searching	
	17(m)	lab. 6. – Introduction to PAUP* I: Distances & Parsimony	
	19(w)	lec. 13. Models, correcting data, model choice	
	21(f)	Discussion of readings assigned last week & PROJECT TOPIC DUE	
	24(m)	lec. 14. Maximum Likelihood	
	24(m)	lab. 7. – PAUP* II	
	26(w)	lec. 15. Accuracy & performance	
	28(f)	Discussion of readings assigned last week	

	31(m)	lec. 16. MP & ML continued, assessment, tree confidence
	31(m)	lab. 8. – Model Choice, PROJECT OUTLINE DUE
Nov	2(w)	lec. 17. Assessment, tree confidence: Consensus, bootstrap
	4(f)	Discussion of readings assigned last week
	7(m)	lec. 18. Bayesian Phylogenetic Inference 1
	7(m)	lab. 9. Lab –bootstrapping, decay values
	9(w)	lec. 19. Bayesian Phylogenetic Inference 2
	11(f)	Discussion of readings assigned last week
	14(m)	lec. 20. Bayesian Inference 3 & Ancestral state reconstruction
	14(m)	lab. 10. – MrBayes, PROJECT ANNOTATED BIBLIOGRAPHY DUE
	16(w)	lec. 21. Next Gen Sequencing & Systematics [guest lecture, Katie Everson]
	18(f)	Discussion of readings assigned last week
	21(m)	lec. 22. Ancestral state reconstruction 2
	21(m)	lab. 11. – work on projects or optional ACSR labs
	23(w)	lec. 23. Troubleshooting Phylogenies
	25(f)	*Thanksgiving break*
	28(m)	lec. 24. Molecular Divergence Dating
	28(m)	lab. 12. – work on projects
	30(w)	lec. 25. Fossils and Phylogenies
Dec	2(f)	Discussion of readings assigned last week
	5(m)	lec. 26. Recent methods - Species Trees, DRAFT PROJECT DUE
	5(m)	lab. 13. – work on projects or Optional Divergence Dating lab
	7(w)	Discussion of readings assigned last week
	9(f)	**FINAL EXAM – in class**
	16(f)	**PROJECTS DUE** (both your final version & peer-reviewed versions)

Systematic and Comparative Biology

Fall 2016

Biol 615 (4 credits) CRN = 74110

Instructor: Derek S. Sikes
Museum
474-6278
dssikes@alaska.edu

Website: https://classes.uaf.edu/webapps/login (Blackboard)
Office Hours: Wednesdays 12-1, Museum (or by appt.)

Lectures: Museum classroom (151), Monday, Wednesday, Friday 9:15-10:15

Lab: Mondays, 3:30-6:30pm Murie 302. 3h

Required Textbook: The Phylogenetic Handbook: A Practical Approach to Phylogenetic Analysis and Hypothesis Testing, Salemi, M. and Vandamme, A.-M. (eds). Cambridge Univ. Press., 2nd Edition (2009). Additional required papers will be available via Blackboard.

Course description: Concepts of systematic biology basic to a rigorous and complete understanding of modern evolutionary theory. Systematics provides the historical framework critical to a variety of comparative analyses in biology. Recent innovations in phylogenetic analyses will be explored in lecture and lab. The methods covered apply equally to all eukaryotic taxa, based on either morphological or molecular characters. Training in key software packages will take place in lab. Some of the topics and methods covered:

Taxonomy. Species demarcation / concepts, phylogeography, description / diagnosis, naming, rules of nomenclature, DNA barcoding, the "taxonomic bottleneck," digitization of taxonomic data / bioinformatics, homology / characters (alignment 1)

Phylogenetics. History & development, Phenetics, Cladistics, homology of sequences (alignment 2), taxon and character sampling, distance methods, parsimony, maximum likelihood, Bayesian, MCMC, model selection, branch support, ancestral state reconstruction, divergence dating, biogeography, fossil data, trouble-shooting, species trees.

Course prerequisites: Graduate standing in Biology or by permission of instructor
Note: Offered Alternate Fall. Recommended: Mathematical Modeling, Math 660.

Course instruction will consist of 1h lectures 2x a week, 1h reading group on Fridays, a weekly 3h lab, textbook and lab readings, and classroom discussion. Expect to spend 6h per week preparing and reading outside of class.

Goals of the course: Students successfully completing the course should be able to evaluate the quality of, and know how to produce, both traditional taxonomic and statistical phylogenetic studies.

Student learning outcomes: Students will learn how to describe a new species using both morphological and molecular methods and will learn the rules of the International Code of Zoological Nomenclature. Students will learn how to estimate the phylogeny of a group of taxa or populations using various marker systems and analytical methods.

Instructional methods: lecture, lab, group discussion of primary literature, preparation of an project involving a phylogenetic analysis. Students will be expected to lead the discussions of papers.

Evaluation: The course grade will be based on the following:

Component	**Proportion of grade**
Lab & take home exercises	25%
Midterm exam	20%
Project	20%
Final exam (cumulative in part)	30%
Participation	5%

A +	96.7	-	100 %	C +	76.7	-	79 %
A	93.4	-	96.6 %	C	73.4	-	76.6 %
A -	90	-	93.3 %	C -	70	-	73.3 %
B +	86.7	-	89 %	D +	66.7	-	69 %
B	83.4	-	86.6 %	D	63.4	-	66.6 %
B -	80	-	83.3 %	D -	60	-	63.3 %
				F	< 60%		

Participation: 5% of your grade is based on participation. Attendance and participation in all lectures, labs, and reading discussion groups, and production of a peer-review report, is required to obtain all 5 points. One point is lost per unexcused absence. Late arrivals to class or lab, if habitual (>3), and/or lack of participation in reading discussion groups will also result in lost participation points.

Lab & take home exercises: Labs will be used to learn software and methods of analysis that you will use to produce your final project. Four of the labs have exercises that will be graded (see schedule for due dates) the rest are opportunities to work on your project with your professor's help.

Reading Discussion group: Friday lecture period will be used to discuss readings assigned the previous Friday. These will consist of approximately 4 papers per week. You will be assigned one paper to lead the discussion on but will be expected to read each paper and participate in its discussion thoughtfully.

Bonus: 2.5% bonus points are available. Simply write down 5 of your best questions asked of me during lecture *and their answers* and submit this list during the first week of December. If I agree they are good questions (beneficial to the course goals) and the answers are correct each will be worth 0.5% extra towards your grade.

Project: Write one scientific manuscript that is no more than 25 pages: (1) a review or re-analysis of published phylogenetic data, (2) analyzes new character data collected in your research, or (3) considers conceptual and theoretical issues in phylogenetic systematics. The manuscript should be based on work that is not already completed, and it should be prepared for publication in a peer-reviewed journal (include title page, abstract, keywords, intro, methods, results, discussion, acknowledgements, and literature cited); with figures and captions embedded in their appropriate locations. The target journal should be identified, and the manuscript should be formatted to conform to journal guidelines. Manuscripts will be friendly "peer-reviewed" by the class and submitted to your instructor for final "editorial" review and grading after the final exam. Note: your peer-reviewed copy must be turned in with your final version; also, the peer-reviewer must write a short report about the paper with suggested changes to the editor (me) in which they recommend one of the following: publish as is, publish after minor changes, publish after major changes, reject. The review will not graded but, if missing, points will be lost from the participation portion of the course. See additional handouts on the project.

Plagiarism: "Plagiarism is the overt or covert use of other people's work or ideas without acknowledgement of the source. This includes using ideas or data from a classmate or colleague without permission and acknowledgement, including sentences from journal articles (either in their entirety or with minor changes) in your writing without citing the author, or copying parts of a website into your essay. You cannot use someone's ideas without citing the originator; you cannot use someone's words without quoting the writer. Any deviation from this will be regarded as plagiarism.
When you plagiarize you are stealing the currency which science (and many other endeavors) uses: knowledge. Plagiarism and cheating are serious offenses that violate the student code of conduct may result in an "F" in the course and / or referral to the university disciplinary committee." (Mulder, Biol. 693-03, 2009 syllabus).

When in doubt – cite it!

Note for students with disabilities: If you have a disability of any kind for which you think you may need an adjustment in the classroom, you must contact the Office of Disability Services (203 WHIT, 474-5655). I will work with the office to provide reasonable accommodation, but I require a letter from this office.

Course Calendar

DATE		LECTURE TOPIC	READINGS
Aug	29(m)	lec. 1. Introduction to biological systematics (value)	will be emailed
	29(m)	lab. 1. – taxonomy on the web (web exercise due at lab 2)	
	31(w)	lec. 2. Introduction continued; History of taxonomy	
Sep	2(f)	Discussion of readings assigned last week	
	5(m)	*Labor day – no classes*	
	7(w)	lec. 3. Species & taxonomy	
	9(f)	Discussion of readings assigned last week	
	12(m)	lec. 4. Nomenclature & Classification	
	12(m)	lab. 2. – taxonomic literature (& nomenclature exercise due at lab 3)	

	14(w)	lec. 5. Specimens, collections, curation
	16(f)	Discussion of readings assigned last week
	19(m)	lec. 6. Modern Taxonomy – DNA barcodes, etc
	19(m)	lab. 3. - beetle exercise: characters; descriptions, diagnoses, due at lab 5
	21(w)	lec. 7. Phylogenetic inference – history / introduction
	23(f)	Discussion of readings assigned last week
	26(m)	lec. 7. Phylogenetic inference2
	26(m)	lab. work on Beetle exercise
	28(w)	lec. 8. Homology
	30(f)	Discussion of readings assigned last week
Oct	3(m)	lec. 9. Molecular homology, alignment
	3(m)	lab. 4. - beetle exercise: keys
	5(w)	lec. 10. Trees – Parsimony
	7(f)	Discussion of readings assigned last week
	10(m)	lec. 11. Distance methods
	10(m)	lab. 5. – Alignment exercise, Clustal: (due at lab 6)
	12(w)	**MIDTERM EXAM – take home**
	7(f)	Discussion of readings assigned last week
	17(m)	lec. 12. Large datasets – heuristic searching
	17(m)	lab. 6. – Introduction to PAUP* I: Distances & Parsimony
	19(w)	lec. 13. Models, correcting data, model choice
	21(f)	Discussion of readings assigned last week
	24(m)	lec. 14. Maximum Likelihood
	24(m)	lab. 7. – PAUP* II
	26(w)	lec. 15. Accuracy & performance
	28(f)	Discussion of readings assigned last week
	31(m)	lec. 16. MP & ML continued, assessment, tree confidence
	31(m)	lab. 8. – Model Choice
Nov	2(w)	lec. 17. Assessment, tree confidence: Consensus, bootstrap
	4(f)	Discussion of readings assigned last week
	7(m)	lec. 18. Bayesian Phylogenetic Inference 1
	7(m)	lab. 9. Lab –bootstrapping, decay values
	9(w)	lec. 19. Bayesian Phylogenetic Inference 2
	11(f)	Discussion of readings assigned last week
	14(m)	lec. 20. Bayesian Inference 3 & Ancestral state reconstruction
	14(m)	lab. 10. – MrBayes
	16(w)	lec. 21. Next Gen Sequencing & Systematics [guest lecture, Katie Everson]
	18(f)	Discussion of readings assigned last week
	21(m)	lec. 22. Ancestral state reconstruction 2
	21(m)	lab. 11. – work on projects or optional ACSR labs
	23(w)	lec. 23. Troubleshooting Phylogenies
	25(f)	*Thanksgiving break*
	28(m)	lec. 24. Molecular Divergence Dating
	28(m)	lab. 12. – work on projects
	30(w)	lec. 25. Fossils and Phylogenies
Dec	2(f)	Discussion of readings assigned last week

5(m)	lec. 26. Recent methods - Species Trees, DRAFT PROJECT DUE
5(m)	lab. 13. – work on projects or Optional Divergence Dating lab
7(w)	Discussion of readings assigned last week
9(f)	**FINAL EXAM – in class**
16(f)	**PROJECTS DUE** (both your final version & peer-reviewed versions)