CURRICULUM COMMITTEE REPORT

The Curriculum Committee met on October 9th, 2018 and recommends the following courses to the Graduate Board for approval at its November 1st, 2018 meeting.

New Courses:

EDT 570 Leveraging Crowd-Based Knowledge in K-12 Classrooms

SMS 564 Marine Resource Management

ERS 501 Paleoceanography

BIO 501 Evolutionary Theory and Application

*** ECO 532** Applied Time Series Econometrics: *discussed at September's Curriculum Committee – pending College Dean's signature*

October 2, 2018

To: Curriculum Committee:
Scott Delcourt
Qian Xue
Stuart Marrs
Craig Mason
Grant Miles
Josh Kelley
Deborah Rollins
Lisa Stilley

Fr: Kacey Beckwith, Administrative Specialist

Re: **Curriculum Committee, October 9, 2018 Stodder Hall, Room #48**

The following courses will be presented on **Tuesday, October 9th at 2:15 p.m**. in the Graduate School's Conference Room, 48 Stodder Hall.

1. 2:20-2:30 **EDT 570**
   Justin Dimmel
2. ~~2:30-2:40 **BMS 605**~~
   ~~Ian Meng~~
3. 2:40-2:50 **SMS ~~551~~ 564**
   Keith Evans
4. 2:50-3:00 **ERS 501**
   Katherine Allen
5. 3:00-3:10 **BIO 501**
   Brian Olsen

THE UNIVERSITY OF MAINE

NEW COURSE PROPOSAL/MODIFICATION/ELIMINATION FORM FOR GRADUATE COURSES

Graduate course proposals, modifications, or eliminations must be submitted to the Graduate School no later than the 3rd of each month. Please refer to the Graduate School website for the Curriculum Committee meetings schedule. Electronic signatures and submission is required.

Please return the completed e-form with appropriate signatures and documentation to the Graduate School by saving the form to your desktop and sending as an attachment to graduate@maine.edu. Please include in the subject line 'Course Proposal' and the course designator and number.

GRADUATE PROGRAM/UNIT Master of Education - Instructional Technology

COURSE DESIGNATOR EDT COURSE NUMBER 570 EFFECTIVE SEMESTER Spring 2019

COURSE TITLE Leveraging Crowd-Based Knowledge in K-12 Classrooms

REQUESTED ACTION

NEW COURSE (check all that apply, complete Section 1, and submit a complete syllabus):

- ☐ New Course
- ■ New Course with Electronic Learning
- ☐ Experimental

MODIFICATION (Check all that apply and complete Section 2):

- ☐ Designator Change
- ☐ Number Change
- ☐ Title Change
- ☐ Description Change
- ☐ Prerequisite Change
- ☐ Credit Change
- ☐ Cross Listing (must be at least 400-level)[1]
- ☐ Other (specify) _____

ELIMINATION:

- ☐ Course Elimination

ENDORSEMENTS

Please sign using electronic signatures. If you do not already have a digital signature, please click within the correct box below and follow the on-screen instructions.

Leader, Initiating Department/Unit(s)

Johanna Prince

Digitally signed by Johanna Prince
DN: cn=Johanna Prince, o, ou, email=Johanna.prince@maine.edy, c=US
Date: 2018.04.27 10:27:48 -04'00'

College(s) Curriculum Committee Chair(s) [if applicable]

College Dean(s)

Graduate School [sign and date]

1. Courses cross-listed below 400-level require the permission of the Graduate School.

SECTION 1 (FOR NEW COURSE PROPOSALS)

Proposed Catalog Description (include designator, number, title, prerequisites, credit hours):

Course: EDT 570
Course Title: Leveraging Crowd-Based Knowledge in K-12 Classrooms
Catalog Description: This course is an inquiry into crowd-based knowledge and the affordances and challenges of such knowledge for K-12 teachers. We will consider different interfaces (e.g., wiki, question and answer, discussion forum) that manage interactions between large groups of users and examine questions of reliability, access, and participation. The course will be project and discussion oriented.
Credits: 3
Prerequisites: None

Components (type of course/used by Student Records for MaineStreet) – *Multiple selections are possible for courses with multiple non-graded components:*

☐ Applied Music ☐ Clinical ☐ Field Experience/Internship ☐ Research ☐ Studio
☐ Laboratory ■ Lecture/Seminar ☐ Recitation ☐ Independent Study ☐ Thesis

Text(s) planned for use:

Bonney et al, (2016): Can Citizen Science Enhance Public Understanding of Science?
Kobori at al, (2016): Citizen Science: a new approach to advance, ecology, education, and conservations; and Sauerman and Franzoni (2014): Crowd science user contribution patterns and their implications. Students read a mixture of academic research papers and more diverse content that is available on crowd-based learning platform

Course Instructor (include name, position, teaching load):

Justin Dimmel, Assistant Professor COEHD, 1 course per

Reason for new course:

This course was taught Spring 2017 as a special topics course. There was very positive feedback for the content of the course as relavent and timely for those working with educational technology in K-12 classrooms. We would like to transition this course to a standing course now.

Does the course addition require additional department or institutional facilities, support and/or resources, e.g. new lab facilities, computer support and services, staffing (including graduate teaching assistants), or library subscriptions and resources?

◯ No. The department will not request additional resources for this course.

◯ Yes. Please list additional resources required and note how they will be funded or supported.

What other departments/programs are affected (e.g. course overlap, prerequisites)? Have affected departments/programs been consulted? Any concerns expressed? Please explain.

How often will this course be offered? Will offering this course result in overload salary payments, either through the college or CED, either to the instructor of this course or to anyone else as a result of rearranging teaching assignments?

We will offer this course 1 time every other year.

College of Education and Human Development
Graduate Course Proposal Routing Slip

Date April 27, 2018

From: **College of Education of Education & Human Development**

Course Proposals (Write in Course Designator & Title of Course)

Course Prefix and Number	Course Title
EDT 570	Leveraging Crowd-Based Knowledge in K-12 Classrooms

* *

Please forward to the next person or department on the list below.

Date	Initials/Signature	Name	Role
4/18/18		Johanna Prince	EDT Program Coordinator
9/19/18		Mary Ellin Logue	Chair, School of Learning and Teaching
9/18/18		Sherri Weeks	Chair, COEHD Curriculum Committee
9/17/18		Jim Artesani	Associate Dean of Graduate Education, Research, & Outreach
9/18/18	Timothy Reagan	Tim Reagan	Dean

* *

Sent to (who) _____ in Graduate School on (date) _____ for Graduate Curriculum Committee Review

Course: EDT 570
Course Title: Leveraging Crowd-Based Knowledge in K-12 Classrooms
Credit Hours: This is a three credit hour course
Catalog Description: This course is an inquiry into crowd-based knowledge and the affordances and challenges of such knowledge for K-12 teachers. We will consider different interfaces (e.g., wiki, question and answer, discussion forum) that manage interactions between large groups of users and examine questions of reliability, access, and participation. The course will be project and discussion oriented.
Prerequisites: None
Date Approved for 680 Endorsement: as 598 via Janet Gallagher 4/7/16 via email to JRP

Program Vision

The University of Maine Master's program in Instructional Technology is offered fully online and is designed to help students become leaders in effective and innovative uses of current and emerging technology. The required coursework, research, and clinical experiences are designed for educators working in a variety of contexts. Students will engage in inquiry-based curriculum and build capacity to continually assess their local context; implement technology to enhance teaching, learning and assessment; build professional learning networks to support ongoing professional development; and develop expertise in current and emerging instructional technologies. Essential to this program is a commitment to local community, advocacy for accessibility, and social justice, especially in the context of the potential for new technology to influence local educational settings.

Course Objectives: Students will:

1. Examine how crowds of people generate knowledge.
2. Investigate micro credentials, badges, and social reputation, and specifically consider how these markers of progress and participation affect learner experiences within crowd-based knowledge communities.
3. Develop strategies for integrating crowd-based knowledge into their work as educators. For classroom teachers, this could mean planning activities or units that would guide how students draw on crowd-based knowledge to further their learning. For technology educators that work with teachers, this could mean planning professional development activities to help teachers learn about crowd-based knowledge and incorporate it into their teaching.

How does the course explore the central questions?

Question 0=not at all | 1= introduction | 2=moderate | 3==extensive	**Depth of Engagement**
Learning Environments: How do educators leverage technology to create environments that support the development of diverse skills, and emphasize challenging learning experiences?	**3**
Teaching and Learning: How can technology enhance teaching and learning partnerships that support and promote innovative models of deeper learning?	**3**
Digital Citizenship: How can educators promote an understanding of the social, ethical and legal issues and responsibilities related to a globally connected society?	**3**
Professional Practice: How can educators develop and model pedagogical and andragogical principles of learning to promote professional growth and practice in a globally connected society?	**2**
Leadership: How can educators align vision, implementation, and practice to foster learning enhanced by technology?	**1**

Computational Thinking

		Depth of Engagement 0=not at all 1= introduction 2=moderate 3==extensive
Collecting and Creating Data	Textual and Numerical	**2**
	Images and Graphics	**1**
	Video	**1**
	Audio	**1**
Analysis and Presentation	Written narrative	**3**
	Website	**3**
	Graphs and Charts	**1**
	Graphics	**2**
	Video	**1**
	Audio	**1**
	Database	**2**
Collaboration	Content Collaboration	**3**
	Discussion Collaboration	**3**

Potential Other Topics

Collecting and Creating Data	Geo-Spatial	**1**
Analysis and Presentation	Geographic Information Systems	**1**
	Statistics	**1**
	Textual analysis Stats Plugin	**1**

Potential Course Outline

Module	Example Topics
Epistemology	What is knowledge? How do we know when a claim is true? How can we be certain of the things we think we know?
Introduction to Crowd-based learning	Students will identify a source of crowd-based knowledge and use that source of knowledge teach themselves something new.
When the crowd becomes a mob...	Students consider the life-long implications of being the subject of a viral social media posting and reflect on how their schools are preparing children or this fact of digital life.
Bringing the crowd into the classroom	Students will review and reflect on various crowd-based knowledge platforms and weigh the opportunities and risks of using those resources with students in K-12 schools.

Potential Course Readings and Other Materials:
Students read a mixture of academic research papers and more diverse content that is available on crowd-based learning platforms (e.g., Reddit, StackExchange, SwarmAI, Citizen Science). Students are also responsible for researching, identifying, and analyzing their own potential sources for crowd-based knowledge. They participate in crowd-based learning communities and track their participation through platform-specific microcredentials. These tools provide valuable contexts or students to consider how crowd-based communities could be used in schools. Examples of recently used academic readings include

Bonney et al, (2016): Can Citizen Science Enhance Public Understanding of Science?

Kobori et al., (2016): Citizen Science: a new approach to advance, ecology, education, and conservation; and

Sauerman and Franzoni (2014): Crowd science user contribution patterns and their implications. As the academic literature on crowd-based knowledge matures, new readings will be incorporated into the course.

Potential Activities and Assignments:
40% of your grade (100/250 points) will be based on participation on the blog and completion of the discussion assignments. There will be a total of 10 discussion assignments, which means these will occur not quite weekly. Assignments will be posted to the course blog on Tuesdays. Assignments will be due at 23:59:59 on the ensuing Monday. Discussion assignments will be

graded on a 1-10 scale. I will provide comments on your work both through the blog and also through email.

60% of your grade (150/250 points) will be based on your completion of the 3 course projects. Each course project is worth 50 points. Projects will be assigned on the course blog.

University of Maine Policies. Please visit: https://umaine.edu/citl/teaching-resources-2/required-syllabus-information/

THE UNIVERSITY OF MAINE

NEW COURSE PROPOSAL/MODIFICATION/ELIMINATION FORM FOR GRADUATE COURSES

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GRADUATE PROGRAM/UNIT School of Marine Sciences

COURSE DESIGNATOR SMS COURSE NUMBER 564 EFFECTIVE SEMESTER Fall 2019

COURSE TITLE Marine Resource Management

REQUESTED ACTION

NEW COURSE (check all that apply, complete Section 1, and submit a complete syllabus):

- [x] New Course
- [ ] New Course with Electronic Learning
- [ ] Experimental

MODIFICATION (Check all that apply and complete Section 2):

- [ ] Designator Change
- [ ] Number Change
- [ ] Title Change
- [ ] Description Change
- [ ] Prerequisite Change
- [ ] Credit Change
- [ ] Cross Listing (must be at least 400-level)[1]
- [ ] Other (specify) _____

ELIMINATION:

- [ ] Course Elimination

ENDORSEMENTS

Please sign using electronic signatures. If you do not already have a digital signature, please click within the correct box below and follow the on-screen instructions.

Leader, Initiating Department/Unit(s)

David Townsend

College(s) Curriculum Committee Chair(s) [if applicable]

George K. Cronin 9/25/18

College Dean(s)

Graduate School [sign and date]

1. Courses cross-listed below 400-level require the permission of the Graduate School.

SECTION 1 (FOR NEW COURSE PROPOSALS)

Proposed Catalog Description (include designator, number, title, prerequisites, credit hours):

SMS-564 Marine Resource Management.
This course uses the economic lens to explore issues related to the use and management of the oceans. Traditional biological/economic approaches to resource management are addressed. Frontier approaches, challenging traditional methods, are also discussed. This course draws on game theory and natural resource economics to explore topics, such as drawing lines in the sea, the management of wild capture fish stocks, recreation, tourism, aquaculture and pollution from land-water interactions.
Prerequisite: none.
Credits. 3

Components (type of course/used by Student Records for MaineStreet) – *Multiple selections are possible for courses with multiple non-graded components:*

☐ Applied Music ☐ Clinical ☐ Field Experience/Internship ☐ Research ☐ Studio
☐ Laboratory ■ Lecture/Seminar ☐ Recitation ☐ Independent Study ☐ Thesis

Text(s) planned for use:

This course will draw on readings from various journal articles (see attached reading list) as well as excerpts from books such as Economics of the Oceans: Rights, Rents and Resources by Paul Hallwood (2014) and Coastal Governance by Richard Burroughs (2011).

Course Instructor (include name, position, teaching load):

Keith S. Evans, Assistant Professor of Marine Resource Economics
Current teaching load: 50%

Reason for new course:

A similar graduate-level course (SMS-551 Fisheries Management) was taught in the past, but has not been offered for several years (approximately 10) and is no longer on the books. Reintroducing this course and broadening its focus to the management of marine resources will fill a gap in the marine policy graduate program.

I have taught a special topics version of this course and received strong interest among graduate students inside marine sciences (across all four programs) as well as in other schools/departments (e.g., economics, anthropology, and communications).

Does the course addition require additional department or institutional facilities, support and/or resources, e.g. new lab facilities, computer support and services, staffing (including graduate teaching assistants), or library subscriptions and resources?

◉ No. The department will not request additional resources for this course.

○ Yes. Please list additional resources required and note how they will be funded or supported.

What other departments/programs are affected (e.g. course overlap, prerequisites)? Have affected departments/programs been consulted? Any concerns expressed? Please explain.

This class does not adversely affect any other departments; rather, it positively affects them, as graduate students and senior undergraduates from departments other than SMS (e.g., SOE), may choose to enroll.

How often will this course be offered? Will offering this course result in overload salary payments, either through the college or CED, either to the instructor of this course or to anyone else as a result of rearranging teaching assignments?

This course will be offered once per year and become part of my regular course load. This will not result in overload salary payments.

SMS 564: MARINE RESOURCE MANAGEMENT Syllabus (F19)

Instructor. Dr. Keith S. Evans, ✉ keith.evans@maine.edu
SMS Office. Libby Hall 210-A, ☎ 207-581-4324
SOE Office. Winslow Hall 302-B, ☎ 207-581-3178
Office hours. *By appointment*.
Class Meeting. XXXday XX:XX X.m. - XX:XX X.m., XXX XXXXX Hall
Class website. Google classroom. [class code: `XXXXX`]

Course Description. This course uses the economic lens to explore issues related to the use and management of the oceans. Traditional biological/economic approaches to resource management are addressed. Frontier approaches, challenging traditional methods, are also discussed. This course draws on game theory and natural resource economics to explore topics, such as drawing lines in the sea, the management of wild capture fish stocks, recreation, tourism, aquaculture and pollution from land-water interactions.

Texts. This course will draw on readings from various journal articles as well as excerpts from books (see Reading List posted to the Google classroom). Readings will be updated throughout the semester – see the course website for updates to this list.

Here are some helpful texts (not required)

- Paul Hallwood, *Economics of the Oceans: Rights, Rents and Resources*, 1st Edition, Routledge, 2014.
- Ola Flaaten, *Fisheries Economics and Management*, Available online
- Richard Burroughs, *Coastal Governance*, Island Press/Center for Resource Economic, 2011.

Prerequisite Knowledge. There is no formal pre-requisite for this course, other than having graduate or senior undergraduate standing. This course is primarily designed for graduate students (either first-year or advanced) interested in the challenges of managing human behavior in our oceans. This course emphasizes the role of intuition over mechanical calculation. Despite this fact, we may use algebra, geometry, and basic calculus to illustrate key concepts. If you are concerned with this, please make an appointment to meet with me to discuss options.

Learning outcomes. Students will be able to:

- Develop an appreciation of the challenges and policy issues related to managing human behavior in marine ecosystems.
- Illustrate the constraints faced in developing and applying marine policy in both domestic and international waters.
- Analyze and evaluate the tradeoffs inherent in designing policy to manage resources.
- Identify the strengths and limitations of different policy tools for the management of marine and coastal resources.

- Integrate, synthesize and communicate different ideas and concepts gained from:
  - Course readings, discussion and lectures; Other courses from your graduate program or previous training; and Personal and professional experiences.

Grading. Your final grade is based on the weighted average of points earned from homework, case-studies, participation, and class projects (weights provided below). The corresponding percentage points are mapped to letter grades as follows: A [94-100], A- [90-93], B+ [87-89], B [83-86], B- [80-82], C+ [77-79], C [73-76], C- [70-72], D+ [67-69], D [63-66], D- [60-62], F [<60].

Homework. (20%) There are 3 homework assignments in Part 1 (9/4 – 10/16) of the course. These assignments offer an opportunity to connect readings or videos to class concepts. Timely and thoughtful completion of homework assignments is expected. All homework assignments will written in a Google document and submitted through the Google classroom. Homework will be graded using a $\surd-$ (marginal, 70% of points), $\surd$ (acceptable, 80% of points), $\surd+$ (excellent, 100% of points) system.

Case studies. (20%) Students will research and present 1-2 "case studies" in Part 2 (10/23 – 12/10) of the course. These assignments offer an opportunity to connect class concepts with real-world examples and issues. Case studies will include a brief write-up (approx. 2 pages) and presentation, followed by a student-led discussion of the case study and class readings; this will take up **one hour** of the class session. To ensure success, students are expected to come to class with a written plan for how to steer group discussion, a list of key prompts/questions and perhaps a planned activity (be creative and have fun). Case study material (write-up and slides) will be posted to the class website for access by the rest of the class. Details for case study assignments will be provided later in the course.

Class projects. (40%) A significant portion of a scientist's time is spent on communication (whether or not the scientist is in academia). Unfortunately, as noted by economist Deirdre N. McClosky, this is a skill that is underdeveloped during our undergraduate (and even into graduate) studies. To provide an opportunity to develop this skill (among others), this course includes two empirical projects that will be incorporated into the content of the course.

Project #1. (partner project - 20%) (Due **10/16**) In the first project, you will work with a partner (pseudo-randomly assigned) and prepare a brief management report on a marine policy issue of your choice. This report should include a basic description of the resource, an analysis of the policy issue(s) (including the property rights, externalitities, etc.), a discussion of relevant policy tools, and preliminary recommendations (with justification). Project #1 will produce two main outputs:

- Poster (digital)
- Report (≤1,500 words)

Project #2. (individual project - 20%) (Due **12/11** and **12/18**) In the second project, you will be asked to imagine that you work as a marine resource manager and must prepare a management report for a selected marine resource issue (or species). Your management report will include an analysis of the status of the marine resource, the related environment, human dimensions, historical management practices, and a recommendation for future management (with justification). Project #2 will produce two main outputs:

- Video presentation (digital)
- Report (≤2,000 words)

Progress on students' individual project (Project #2) will be incorporated into class discussion (or at the start of class). Be prepared to present updates on your work. At the end of the semester, each student will present their policy recommendation to the class and justify their position. Details regarding the format of the management report and presentation will be provided in class.

Participation. (20%) This is a mixed lecture-seminar style course. Each course will feature a short lecture, a series of activities, e.g., games, structured debates, tool development, and/or a group discussion of the readings. This means that student participation is vital to the success of this class. As such, participation is worth 20% of your final grade and will be calculated according to your engagement in (1) class discussion, (2) class games/experiments, (3) assigned readings, and (4) presentations. Please note, the quality of participation is as important as the quantity. Specifically, students are responsible for:

1. Reading ALL of the assigned material BEFORE and AFTER class.
2. Attending class – you cannot participate if you are not here.
3. Actively engaging in class discussion.
    a. Participating in conversation led by another student or the instructor.
    b. Leading class discussion on an assigned topic.

Email: I will answer your emails as quickly as possible (within 48 hours during the workweek). Long, involved questions are best left for in-person conversations. Class announcements will be posted on the course website. It is your responsibility to frequently check your university email and class website.

Additional information: University policies toward academic honesty, student accessibility services, observance of religious holidays/events, sexual discrimination reporting, and course schedule disruptions can be found on the Center for Innovation in Teaching and Learning website: https://umaine.edu/citl/teaching-resources-2/required-syllabus-information/

This is a living course. That is, it is designed to be adaptive to the needs and interests of the students. As such, it is each student's responsibility to actively engage in class and introduce new topics for the course. All policies and material outlined in this syllabus, including the lecture and assignment schedule are subject to change at my discretion to accommodate the flow of the course.

Example lecture schedule.

Week	Date	Theme	Topics
1	**9/4**	Marine institutions and policy	*The nature and management of marine resources* . Course overview; how economist view the environment; what is marine policy; what are marine resources; levels of management (local, state, federal, international)
2	**9/11**		*Property rights, externalitites, and the ocean.* Nature of the resource (characteristics); tragedy of the commons; property rights (defn., holders, regimes, quality of rights); externalities.
3	**9/18**		*Enclosure of the ocean.* Brief history; UNCLOS I-III; defining marine boundaries; why enclosure; enclosure vs. international governance; disputes; joint development zones.
4	**9/25**		*Benefit-cost analysis in marine resource management.* Valuing the marine environment; why use money; total vs. economic values; direct and indirect eliciation; benefit-cost analysis; cost effectiveness; tradeoff analysis; discount rates.
5	**10/2**	Tools for managing marine resources	*Policy tools for regulating marine activities* . Catch share programs; command and control methods; performance standards; market mechanisms; voluntary approaches.
6	**10/9**		*Guest panel discussion* : marine resource manager (e.g., Maine DMR), non-governmental organization (e.g., Maine Center for Coastal Fisheries), and marine resource user (e.g., Maine lobsterman)
7	**10/16**		*Posters session.* Students will present their project.
8	**10/23**	Sector-based management	*Wild-capture fisheries: the economics of fisheries management* . Social trap; fishery objectives; externalities; management; mixed fisheries and mutliple fleets; valuing commercial and recreation fisheries; Magnason-Stevens Act of 1976.
9	**10/30**		*Wild-capture fisheries; the political economics of high seas fisheries management* . The last open access resouce; IUU fishing; prospects in the absence of effective governance; subsidies, incentives, and property rights.
10	**11/6**		*Marine farms.* Degree of control, production decisions, and site choice; production in the US and abroad; dual nature of externalities; fish meal markets; pollution.
	11/13		**NO CLASS**
11	**11/20**		*Recreation and toursim* . Importance of coastal and marine tourism and recreation; valuing non-consumptive uses of marine and coastal systems; tourism and working waterfronts.
12	**11/27**		*Wastwater and pollution* . Point and non-point source pollution; land and water-based pollution; invasive species; dredging; benefits and costs of regulating marine pollution.
13	**12/4**	Spatial management	*Coastal zones and marine spatial planning.* Nature of interactions among uses; spatial management; conflicts; coastal zones; Coastal Zone Management Act of 1972.
14	**12/11**	Ecosystem-based management	*Ecosystem governance* . Ecosystem-based management (defn, types); cumulative impacts; ecosystem services; operationalizing management; the coastal economy; the coastal ocean economy.
F	**12/18**		*Digital presentations.* Students will present their project.

Example assignment deadlines.

Week	Date	Theme	Assignments	Project
1	9/4	Marine institutions and policy	HW#1 (due 9/11)	
2	9/11			
3	9/18		HW#2 (due 9/25)	Project #1 proposal (due 9/18)
4	9/25			Project #2 meeting (due 9/28)
5	10/2	Tools for managing marine resources	HW #3 (due 10/16)	
			Case studies (sign-up for dates)	
6	10/9			
7	10/16			Project #1 report, poster, and
				flash presentation (due 10/16)
8	10/23		Case study #1: Fishery management	
9	10/30	Sector-based management	Case study #2: High seas	
10	11/6		Csae study #3: Aquaculture	
	11/13		**NO CLASS**	
11	11/20		Case study #4: Recreation/Tourism	
12	11/27		Case study #5: Pollution	
13	12/4	Spatial management	Case study #6: Spatial management	
14	12/11	Ecosystem-based management	Case study #7: Ecosystem-based management	Project #2 paper (due 12/11)
F	12/18			Project #2 video (due 12/18)

SMS564: MARINE RESOURCE MANAGEMENT Readings (F19)

I. Marine institutions and policy.

Week #1: The Nature and Management of Marine Resources

* Fullerton, D. and Stavins, R. (1998) How economist see the environment. *Nature* 395(1): 433-434.

  Hallwood, P. (2014) Ocean Resources, Ocean Governance. In *Economics of the Oceans*, 3-14.

* Hoagland, P. and Ticco, P.C. (2010) Marine Policy Overview. P. Hoalgand (Eds.) In *Marine Policy and Economics*, 3-10.

* Schwab, R.M. (2005) Chapter 19. Environmental Federalism. In *The RFF Reader in Environmental Economics and Resource Policy*: 109-114.

  "Troubled waters." (2008) *The Economist*.

* Whitty, J. (2006) "Fate of the oceans." *Mother Jones*.

Week #2: Property Rights, Externalities, and the Ocean

* Christy, F.T. (1975) Property Rights in the World Ocean. *Natural Resources Journal* 15: 695-712.

† Coase, R.H. (1960) The Problem of Social Cost. *The Journal of Law & Economics* 56(4): 837-877.

  Demsetz, H. (1967) Toward a Theory of Property Rights. *The American Economic Review* 57(2): 347-359.

* Feeny, D., Berkes, F. McCay, B.J., Acheson, J.M. (1990) The Tragedy of the Commons: Twenty-Two Years Later. *Human Ecology* 18(1): 1-19.

* Grafton, R.Q. (2000) Governance of the Commons: A Role for the State? *Land Economics* 76(4): 504-517.

  Hardin, G (1968) The Tragedy of the Commons. *Science* 162: 1243-1248.

* Schlager E. and Ostrom E. (1992) Property-Rights Regimes and Natural Resources: A Conceptual Analysis. *Land Economics* 68(3), 149-262.

Week #3: Drawing Lines in the Sea

* Acheson, J. (1988) Territories. In *Lobster Gangs of Maine*, 71-83.

  Chaudhry, F. (2006) Minding the Timor Gap *Dollars & Sense*.

  Griffiths, S. (2010) "US-Canada Arctic border dispute key to maritime riches" *BBC News*.

* Hallwood, P. (2007) An Economic Analysis of Drawing Lines in the Sea. *Ocean & Coastal Management*. 51: 405-409.

* McKenzie, F. (2014) Cold Rush: Canada Defends the Northwest Passage. In *Windfall: The Booming Business of Global Warming*, 14-40.

† United Nations Convention Law of the Sea (1982)

II. Tools for managing marine resources.

Week #4: Benefit-cost analysis in marine resource activities

* Ackerman, F., V.K. Smith, and L. Heinzerling. (2004) "Choice Cuts." *American Prospect*.

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* Holland, D.S., Sanchirico, J.N., Johnston, R.J., and Joglekar, G. (2010) Chapter 2: Frameworks for Economic Valuation. In *Economic Analysis for Ecosystem-Based Management*: 10-50.

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Week #5: Policy tools for regulating marine activities

Boyd, J., Burtraw, D., Krupnick, A., McConnell, V., Newell, R.G., Palmer, K., Sanchirico, J.N., and Walls, M. (2005) Chapter 10. Trading Cases: Five Examples of the Use of Markets in Environmental and Resource Management. In *The RFF Reader in Environmental Economics and Resource Policy*: 56-65.

* Field, B.C., and Field, M.K. (2013) Chapter 11: Command-and-control strategies: the case for standards. In *Environmental Economics: An Introduction* 6th edition. 206-225.

* Field, B.C., and Field, M.K. (2013) Chapter 12: Incentive-based strategies: emission charges and subsidies. In *Environmental Economics: An Introduction* 6th edition. 226-250.

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Portney, P.R. (2005) Chapter 9. Market-Based Approaches to Environmental Policy: A 'Refresher' Course. In *The RFF Reader in Environmental Economics and Resource Policy*: 51-55.

III. Sector-based management.

Week #7: Wild-capture fisheries: the economics of fisheries management

† Adler, J. and Stewart, N. (2014) Learning How to Fish: Catch Shares are Vital to the Future of Fishery Conservation. *Regulation* 46-51.

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Grainger, C.A. and Parker, D.P. (2013) The Political Economy of Fishery Reform *Annual Review of Resource Economics* 5: 369-386.

* Hilborn, R. (2007) Defining Successes in Fisheries and Conflicts in Objectives. *Marine Policy* 31: 153-158.

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* Townsend, R.E. (1985) An Economic Evaluation of Restricted Entry in Maine's Soft-Shell Clam Industry *North American Journal of Fisheries Management* 5(1): 57-64.

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Wilen, J.E., Cancino, J. and Uchida, H. (2012) The Economics of Territorial Use Rights Fisheries, or TURFS *Review of Environmental Economics and Policy* 6(2): 237-257.

Week #8: Wild-capture fisheries: the political economics of high seas fisheries management

‡ Bjørndal, T. and Munro, G. (2012) The Economic Management of Capture Fisheries at the International Level. In *The Economics and Management of World Fisheries*, 173-232

‡ Bjørndal, T. and Munro, G. (2012) Empirical Examples of International Fisheries. In *The Economics and Management of World Fisheries*, 233-258

‡ Charles, A.T., Mazany, R.L., and Cross, M.L. (1999) The Economics of Illegal Fishing: A Behavioral Model. *Marine Resource Economics* 15, 95-110.

* Coelho, M.P., Filipe, J.A.B., and Ferrerira, M.A. (2009) "Crime and Punishment" – An Economic Analysis of Illegal Fishing. *Anales de economía aplicada*. 23: 1-8.

* Cullis-Suzuki, S. and Pauly, D. (2010) Failing the High Seas: A Global Evaluation of Regional Fisheries Management Organizations *Marine Policy* 34: 1036-1042.

* Hannesson, R. (2011) Rights Based Fishing on the High Seas: Is it Possible? *Marine Policy* 35: 667-674.

Thébaud, O. (1997) Transboundary Marine Fisheries Management. Recent Developments and Elements of Analysis. *Marine Policy* 21(3): 237-253.

* White, C. and Costello, C. (2014) Close the High Seas to Fishing? *PLOS Biology* 12(3): 1-5.

Week #9: Marine farms

* Asche, F. (2008) Farming the Sea. *Marine Resource Economics*. 23: 527-547.

† Anderson, J.L. Aquaculture and the Future: Why Fisheries Economists Should Care. *Marine Resource Economics*. 17: 133-151

D'Anna, L.M. and Murray, G.D. (2015) Perception of Shellfish Aquaculture in British Columbia and Implication for Well-Being in Marine Social-Ecological Systems. *Ecology and Society* 20(1): 57

* Evans, K.S., Chen, X, and Robichaud, C. (2017) A Hedonic Analysis of the Impact of Marine Aquaculture on Coastal Housing Prices in Maine. *Agricultural and Resource Economics Review*.

‡ Hoagland, P., Jin, D. and Kite-Powell, H. (2003) The Optimal Allocation of Ocean Space: Aquaculture and Wild-Harvest Fisheries. *Marine Resource Economics* 18: 129-147.

Knapp, G. (2008) Chapter 8. Potential Economic Impacts of U.S. Offshore Aquaculture. M. Rubino (Eds) In *Offshore Aquaculture in the United States: Economic Considerations, Implications & Opportunities*: Silver Spring, MD; USA. NOAA Technical Memorandum NMFS F/SPO-103. 161-188.

* Knapp, G. and Rubino, M.C. Rubino (2016) The Political Economics of Marine Aquaculture in the United States, Reviews in Fisheries Science & Aquaculture, 24:3, 213-229.

* Naylor, R.L., Goldburg, R.J., Primavera, J.H., Kautsky, N., Beveridge, M.C.M., Caly, J., Folke, C. Lubchenco, J., Mooney, H., and Troell, M. (2000) Effect of Aquaculture on World Fish Supplies. *Nature* 405: 1017-1024.

Schlag, A.K. (2010) Aquaculture: An Emerging Issue for Public Concern. *Journal of Risk Research* 13(7): 829-844.

Whitmarsh, D. and Palmieri, M.G. (2008) Chapter 8. Aquaculture in the Coastal Zone: Pressures, Interactions and Externalities. In *Aquaculture in the Ecosystem*: 251-269.

Week #10: Recreation, Tourism, and Coastal Development

* Holland, D.S., Sanchirico, J.N., Johnston, R.J., and Joglekar, D. (2010) Case Study 2: Offshore Sand and Gravel Mining for Beach Nourishment. In *Economic Analayis for Ecosystem-Based Management* 180-188.

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* Landry, C.E., Keeler, A.G., Kriesel, W. (2003) An Economics Evaluation of Beach Erosion Management Alternatives. *Marine Resource Economics* 18: 105-127.

Week #11: Wastewater and Pollution

† Delaney, J., Jacobson, S. (2014) Those Outsiders: How Downstream Externalities Affect Public Good Provision. *Journal of Environmental Economics and Management* 67: 340-352.

* Eagle, L., Hamann, M., Low, D.R. (2016) The role of social marketing, marine turtles and sustainable tourism in reducing plastic pollution *Marine Pollution Bulletin* 107:324-332.

* Evans, K.S., Athearn, K., Chen, X., Bell, K.P., and Johnson, T. (2016) Measuring the impact of pollution closures on commercial shellfish harvest: The case of soft-shell clams in Machias Bay, Maine. *Ocean & Coastal Management* 130: 196-204.

* Kean, S. (2010) Fishing for Gold in The Last Frontier State. *Science* 327(5963): 263-265.

* Rabotyagov, S.S., Kling, C.L., Gassmanz, P.W., Rabalais, N.N., and Turner R.E. (2014) The Economics of Dead Zones: Causes, Impacts, Policy Challenges, and a Model of the Gulf of Mexico Hypoxic Zone. *Review of Environmental Economics and Policy* 8(1): 58-79.

Oil Pollution Act 33 U.S.C. §2701 et seq. (1990).

IV. Spatial management.

Week #12: Managing Coastal and Ocean Spaces

Bates, A.W. (2017) Revisiting Approaches to Marine Spatial Planning: Perspectives on and Implications for the United States. *Agricultural and Resource Economics Review*.

* Blau, J and L. Green (2015) Assessing the impact of a new approach to ocean management: Evidence to date from five ocean plans. *Marine Policy* 56: 1-8.

* Coastal Zone Management Act of 1972 (16 U.S.C. 1451-1464).

Dalton, T., Thompson, R., and Jin, D. (2010) Mapping Human Dimensions in Marine Spatial Planning and Management: An Example from Narragansett Bay, Rhode Island. *Marine Policy* 34: 309-319.

* Plasman, I. C. (2008). Implementing Marine Spatial Planning : A Policy Perspective. *Marine Policy* 32: 811–815.

Pomeroy, R., and F. Douvere (2008) The Engagement of Stakeholders in the Marine Spatial Planning Process. *Marine Policy* 32: 816–822.

* Young, O., Osherenko, G., Ekstrom, J., Crowder, L., Wilson, J., Day, J., Douvere, F., Ehler, C., Mcleod, K., Halpren, B., Peach, R. (2010) Solving the Crisis in Ocean Governance: Place-Based Management of Marine Ecosystems. *Environment: Science and Policy for Sustainable Development*. 49(4): 20–32.

V. Ecosystem-based management.

Week #13: Ecosystem Governance

Browman, H.I., Cury, P.M., Hilborn, R., Jennings, S., Lotze, H.K., Mace, P.M., Murawski, S., Pauly, D., Sissenwine, M., Stergiou, K.I. and Zeller, D. (2004) Perspectives on Ecosystem-Based Approaches to the Management of Marine Resources. *Marine Ecology Progress Series* 274: 269-303.

* "The Blue Economy: Growth, Opportunity and a Sustainable Ocean Economy." (2015) *The Economist*.

de Groot, R.S., Wilson, M.A., Boumans, R.M.J. (2002) A Typology for the Classification, Descriptions and Valuation of Ecosystem Functions, Goods and Services. *Ecological Economics* 41: 393-408.

Hilborn, R. (2011) Future directions in ecosystem based fisheries management: A personal perspective. *Fisheries Research* 108: 235-239.

Klinger, D.H., Eikeset, A.M., Davíðsdóttir, B., Winter, AM (2018) The mechanics of blue growth: Management of oceanic natural resource use with multiple, interacting sectors. *Marine Policy* 87: 356-362.

Marshall, K.N., Levin, P.S., Essington, T.E., Koehn, L.E., Anderson, L.G., Bundy, A., Carothers, C., Coleman, F., Gerber, L.R., Grabowski, J.H., Houde, E., Jensen, O.P., Mollmann, C., Rose, K., Sanchirico, J., Smith, A.D.M. (2018) Ecosystem-based fisheries management for social-ecological systems: renewing the focus in the United States with *Next Generation* fishery ecosystem plans. *Conservation Letters* 11(1): 1-7.

* Pardy, B. (2003) Changing Nature: The Myth of the Inevitability of Ecosystem Management. *Pace Environmental Law Review*: 675-692.

* Patrick, W.S. and Link, J.S. (2015) Myths that Continue to Impede Progress in Ecosystem-Based Fisheries Management. *Fisheries* 40(4): 155-160.

Patrick, W.S. and Link, J.S. (2015) Hidden in Plain Sight: Using Optimum Yield as a Policy Framework to Operationalize Ecosystem-Based Fisheries Management. *Marine Policy* 62: 74-81.

* Rosenberg, A.A. and Sandifer, P.A. (2009) Chapter 2. What Do Managers Need? K. McLeod and H. Leslie (Eds.) In *Ecosystem-Based Management for the Oceans* 13-32.

Note. * denotes a *required* reading. † denotes a *recommended* reading. ‡ denotes an *advanced* or *technical* reading.

Last updated September 10, 2018

THE UNIVERSITY OF MAINE

NEW COURSE PROPOSAL/MODIFICATION/ELIMINATION FORM FOR GRADUATE COURSES

Graduate course proposals, modifications, or eliminations must be submitted to the Graduate School no later than the 3rd of each month. Please refer to the Graduate School website for the Curriculum Committee meetings schedule. Electronic signatures and submission is required.

Please return the completed e-form with appropriate signatures and documentation to the Graduate School by saving the form to your desktop and sending as an attachment to graduate@maine.edu. Please include in the subject line 'Course Proposal' and the course designator and number.

GRADUATE PROGRAM/UNIT School of Earth and Climate Sciences

COURSE DESIGNATOR ERS COURSE NUMBER 501 EFFECTIVE SEMESTER SPRING 2019

COURSE TITLE Paleoceanography

REQUESTED ACTION

NEW COURSE (check all that apply, complete Section 1, and submit a complete syllabus):

- ☒ New Course
- ☐ New Course with Electronic Learning
- ☐ Experimental

MODIFICATION (Check all that apply and complete Section 2):

- ☐ Designator Change
- ☐ Number Change
- ☐ Title Change
- ☐ Description Change
- ☐ Prerequisite Change
- ☐ Credit Change
- ☐ Cross Listing (must be at least 400-level)[1]
- ☐ Other (specify) _____

ELIMINATION:

- ☐ Course Elimination

ENDORSEMENTS

Please sign using electronic signatures. If you do not already have a digital signature, please click within the correct box below and follow the on-screen instructions.

Leader, Initiating Department/Unit(s)

Scott E. Johnson Digitally signed by Scott E. Johnson Date: 2018.09.17 10:48:45 -04'00'

College(s) Curriculum Committee Chair(s) [if applicable]

College Dean(s)

Graduate School [sign and date]

1. Courses cross-listed below 400-level require the permission of the Graduate School.

SECTION 1 (FOR NEW COURSE PROPOSALS)

Proposed Catalog Description (include designator, number, title, prerequisites, credit hours):

ERS 501: Paleoceanography (3 credit hours)
No prerequisites

The ocean plays a central role in regulating climate and supporting life on our planet, and it has not always operated as it does today. Throughout Earth history the ocean has undergone dramatic changes in circulation, temperature, chemical composition, and more. In this course, students will explore our ocean's dynamic past, which provides insight into its present and future behavior. We will discuss key research techniques, major discoveries, and emerging frontiers in the field of paleoceanography. Students will read and discuss key research articles each week that complement lecture material. They will also work with both modern and paleo datasets to enhance their skills and deepen their understanding of how scientists infer past ocean conditions from geologic archives. ERS 401 and ERS 501 cannot both be taken for credit. This course will typically be offered in the Spring semester of odd years.

Components (type of course/used by Student Records for MaineStreet) – *Multiple selections are possible for courses with multiple non-graded components:*

- ☐ Applied Music
- ☐ Clinical
- ☐ Field Experience/Internship
- ☐ Research
- ☐ Studio
- ☐ Laboratory
- ■ Lecture/Seminar
- ☐ Recitation
- ☐ Independent Study
- ☐ Thesis

Text(s) planned for use:

Earth's Climate: Past and Present by William F. Ruddiman

Course Instructor (include name, position, teaching load):

Katherine Allen, Assistant Professor, 50% teaching

Reason for new course:

Our department offers courses that explore Earth's past, but none of these focuses on the ocean, which covers most of the planet and has existed for most of Earth history. To close this knowledge gap, we propose to offer a course in paleoceanography that also immerses students in the primary scientific literature and enhances their data exploration skills. In the past we offered a related course, but is has been long absent from our offerings due to retirement of that course's instructor.

Does the course addition require additional department or institutional facilities, support and/or resources, e.g. new lab facilities, computer support and services, staffing (including graduate teaching assistants), or library subscriptions and resources?

◉ No. The department will not request additional resources for this course.

○ Yes. Please list additional resources required and note how they will be funded or supported.

What other departments/programs are affected (e.g. course overlap, prerequisites)? Have affected departments/programs been consulted? Any concerns expressed? Please explain.

The School of Marine Sciences has expressed interest in this course and may add it as an elective for SMS degrees in the future, similar to ERS 460/560. This has not been confirmed and will be discussed further after the course has been established.

There is some minor topical overlap with ERS 460/560 Marine Geology, which primarily deals with modern ocean processes and long-term processes that shape the morphology of the sea floor. Marine Geology covers ocean sedimentation in great depth; the proposed course will merely provide a brief review of this topic before delving into novel material. Unlike Marine Geology, the proposed paleoceanography course focuses on ocean circulation, chemistry, and climate.

How often will this course be offered? Will offering this course result in overload salary payments, either through the college or CED, either to the instructor of this course or to anyone else as a result of rearranging teaching assignments?

Every 2 years. No overload.

Paleoceanography (ERS 401/501)

Spring 2019

Instructor: Prof. Katherine Allen, katherine.a.allen@maine.edu
217 Bryand Global Sciences Center, (207) 581-2163
Office hours: I have an open-door policy; stop by any time. However, making an appointment ensures we will connect and promotes the most efficient use of our time.

Course description: The ocean plays a central role in regulating climate and supporting life on our planet, but it has not always operated as it does today. Throughout Earth history the ocean has undergone dramatic changes in circulation, temperature, chemical composition, and more. In this course, students will explore our ocean's dynamic past, which provides insight into its present and future behavior. We will discuss key research techniques, major discoveries, and emerging frontiers in the field of paleoceanography (the study of the global ocean's circulation, chemistry, biology, and geology through geologic time). Students will read and discuss key research articles each week that complement lecture material. They will also work with both modern and paleo datasets to enhance their skills and deepen their understanding of how scientists infer past ocean conditions from geologic archives.

Prerequisites: Any 100-level ERS course

Course typically offered: Spring of alternating years

Credits: 3

Meeting time and place: 203 BGSC, Tuesday/Thursday X:XX – X:XX

Textbook: Earth's Climate: Past and Future (Third Edition) by William F. Ruddiman

Class communication: Announcements will be posted in Blackboard and emailed to the class. Please check your email and the Blackboard course page frequently.

Course Goals:

To examine the key physical, biological, and chemical processes that have driven major changes in ocean conditions during Earth history, with a particular focus on the past 5 million years.

To investigate the long-term dynamics of Earth's linked ocean and climate system by examining past trends and events.

Course Learning Outcomes:

After successful completion of the course, students will be able to:

- Explain how past ocean conditions can be inferred from the sediment record.
- Assess strengths and weaknesses of paleo proxies and identify steps for proxy improvement.
- Describe the roles that precession, obliquity, and eccentricity of Earth's orbit play in modulating the delivery of solar energy to Earth's surface.
- Graph solar insolation curves using Analyseries software.
- Create maps and bathymetry profiles using GeoMapApp software.
- Describe the environmental controls on the $\delta^{18}O$ composition of marine carbonates and explain the utility (and limitations) of $\delta^{18}O$ records for understanding paleoclimate.
- Identify important planktonic and benthic foraminifera using the microscope.
- Explain the key "problems" of ice ages that drive current research.
- List the major factors involved in ocean-climate dynamics.
- Communicate ideas verbally to an audience, lead an in-depth discussion.
- Manipulate data in Excel and create clear, informative graphs that support/enhance arguments.

Learning assessment

Assessment of course learning outcomes will be based on the following items:

Topic discussion (verbal and written): Each week, students will read assigned scientific articles and/or book chapters. One weekly class period will be devoted to in-depth discussion of these readings. ***Prior to*** each discussion session, students will be required to submit a short paragraph to the class Blackboard site in response to the weekly question. Students will be expected to participate in both small-group and whole-class discussions. Each discussion session will include the following components: 1) An overview of the major question/motivation driving the research, 2) Review of methods applied, including strengths and weaknesses of techniques, 3) Highlights of major outcomes of the work, 4) Assessment of uncertainties and remaining unknowns, 5) Discussion of future work that could move the field forward. Occasionally, small in-class groups will be asked to produce either a written statement or a map/graph to support an argument. Each week, 2-3 students will be designated as discussion leaders, which will involve giving an initial summary of articles' relevant background and context (why is it important and how does it fit into the big picture?) and providing a list of discussion questions for the class. Grades for discussion participation will be based primarily on students' preparation and performance as discussion leaders, and will be assessed using a rubric that will be provided at the beginning of the course. Written responses will be graded on their content (90%) and clarity of writing (10%). Graduate students (enrolled in 501, not 401) will be required to respond to an additional, advanced question each week.

Class participation: On class days not dedicated to article discussion, there will be a mixture of lectures and in-class activities. Activities will include working with software programs such as GeoMapApp and Analyseries. Both are free and can be downloaded to students' personal computers or accessed using an adjacent computer lab. Any products (graphics, maps) to be shared or used in discussion will be uploaded to Blackboard for discussion as a whole class. Students will be graded on the completeness, thoughtfulness, clarity, and overall quality of submitted materials (e.g., axes and maps are all labeled; everything is legible; answers are complete).

Exams: There will be a mid-term and a final exam on material from lectures and readings. Exams will consist of a mixture of short-answer and essay questions. Students will be graded on the completeness and clarity of responses, and will be expected to include examples and insights from lecture, readings, and class activities.

Debate: Near the end of the semester, we will hold a debate on a statement bearing on a key concept or controversy, for example: "*Variations in solar insolation (energy from the sun) drove Pleistocene ice age cycles*." The class will be divided into two teams and given detailed instructions on debate format. Some class time will be dedicated to preparation of arguments. Students should draw upon class material and also seek outside resources (e.g., through the university library). Grading will be based on: 1) Clarity and relevance of opening statements (must also be submitted in writing beforehand), 2) Depth and breadth of resources used to build arguments, 3) Ability to respond to other team's statements, 4) General oral presentation (clear, audible, articulate speech). Each student will be graded on their *individual contribution* to the debate by the instructor, and the outcome of the debate will be decided by a guest ocean-climate expert, who will attend the debate and serve as an impartial judge.

Grading summary:
Mid-term exam 30%
Final exam 30%
Weekly article discussion: 10%
Weekly written response: 15%
Weekly class participation: 5%
Debate: 10%

Rubric:

A	90 – 100
B	80 – 89
C	70 – 79
D	60 – 69

Course policies:

Attendance is key to success in this course. A significant proportion of the course grade depends on active participation in discussions and class activities. However, if you are ill, you are strongly encouraged to stay home. I will be glad to help you catch up. A doctor's note excusing the absence is preferred. Students must take exams during the designated exam period OR make arrangements with the instructor in advance. Exceptions may be made to accommodate an emergency situation or unexpected illness.

Weekly written responses must be submitted on time in Blackboard for full credit. Late responses will be penalized 10% per day.

University policies:

- **Academic Honesty Statement:** Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

- **Students Accessibility Services Statement:** If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services, 121 East Annex, 581.2319, as early as possible in the term. Students who have already been approved for accommodations by SAS and have a current accommodation letter should meet with the course instructor privately as soon as possible.

- **Course Schedule Disclaimer (Disruption Clause):** In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

- **Observance of Religious Holidays/Events:** The University of Maine recognizes that when students are observing significant religious holidays, some may be unable to attend classes or labs, study, take tests, or work on other assignments. If they provide adequate notice (at least one week and longer if at all possible), these students are allowed to make up course requirements as long as this effort does not create an unreasonable burden upon the instructor, department or University. At the discretion of the instructor, such coursework could be due before or after the examination or assignment. No adverse or prejudicial effects shall result to a student's grade for the examination, study, or course requirement on the day of religious observance. The student shall not be marked absent from the class due to observing a significant religious holiday. In the case of an internship or clinical, students should refer to the applicable policy in place by the employer or site.

Sexual Discrimination Reporting

The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of **sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or**

any form of gender discrimination involving members of the campus, **your teacher is required to report** this information to the campus Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity.

If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

For *confidential resources on campus*: **Counseling Center: 207-581-1392** or **Cutler Health Center: at 207-581-4000**.

For *confidential resources off campus*: **Rape Response Services:** 1-800-310-0000 or **Partners for Peace**: 1-800-863-9909.

Other resources: The resources listed below can offer support but may have to report the incident to others who can help:

For *support services on campus*: **Office of Sexual Assault & Violence Prevention: 207-581-1406**, **Office of Community Standards: 207-581-1409**, **University of Maine Police: 207-581-4040 or 911**. Or see the OSAVP website for a complete list of services at http://www.umaine.edu/osavp/

Week	Date	Topic	Activity	Reading
1	1/22/19	**Introduction to course themes**		Ruddiman text - Chapters 1 and 2: Overview of Climate Science and Earth's Climate System Today
	1/24/19	**Paleo proxies**	*Lecture & in-class activity: Micropaleontology*	Ruddiman text, Chapter 3: Climate archives, data, and models; Introduction to foraminifera
2	1/29/19	**Paleo proxies, continued**	*Lecture & in-class activity: Micropaleontology, continued*	Oxygen isotope papers (Ravelo and Hillaire-Marcel 2007)
	1/31/19		DISCUSSION: Paleotemperature and paleo CO2	Royer (2014) Atmospheric CO2 and O2 during the Phanerozoic
3	2/5/19	**Carbon dioxide (CO2) and Climate**	Lecture	Ruddiman text, Chapter 4: CO2 and Long-term Climate
	2/7/19		DISCUSSION: Cenozoic cooling	Zachos et al. (2001) and (2008)
4	2/12/19	**CO2 in Seawater**	*Lecture & in-class activity: GeoMapApp*	Millero (2013) The Carbonate System
	2/14/19		DISCUSSION: What controls ocean carbon storage?	Palike et al. (2012) A Cenozoic Record of equatorial Pacific Carbonate Compensation Depth
5	2/19/19	**Ocean circulation: Fundamentals**	*Lecture & in-class activity: Ocean Data View*	Talley text - Chapter 5: Mass, Salt, Heat Budgets and Wind Forcing
	2/21/19		DISCUSSION: What drives ocean circulation?	Talley (2013) Closure of the Global Overturning Circulation
6	2/26/19	**Marine sediments**	*Lecture & in-class activity: GeoMapApp*	Chamberlin and Dickey, Exploring the World Ocean, Chapter 5 "Ocean Sediments"
	2/28/19		DISCUSSION: Where do marine sediments come from?	TBD
7	3/5/19	**The Pliocene**	Lecture	Ruddiman text - Chapter 6: Greenhouse climate
	3/7/19		DISCUSSION: What creates a warmer world?	TBD
8	3/12/19		REVIEW for exam	
	3/14/19	**MID-TERM EXAM**		
9	3/19/19	SPRING BREAK		
	3/21/19	SPRING BREAK		
10	3/26/19	**Solar insolation**	*Lecture & in-class activity: Analyseries*	Ruddiman text - Chapter 8: Astronomical control of solar insolation
	3/28/19		DISCUSSION: Solar insolation in time and space	TBD
11	4/2/19	**The Plio-Pleistocene Transition**	Lecture	Ruddiman text - Chapter 10: Insolation Control of Ice Sheets
	4/4/19		DISCUSSION: What makes ice sheets grow?	TBD
12	4/9/19	**The Mid-Pleistocene Transition**	*Lecture & in-class activity: Analyseries*	Ruddiman text - Chapter 11: Orbital-scale Changes in Carbon Dioxide and Methane
	4/11/19		DISCUSSION: Why the pacing change?	Hönisch et al. (2009)
13	4/16/19	**Late Pleistocene Ice Age Cycles**	Lecture	Ruddiman text - Chapter 12: Orbital-scale Interactions, Feedbacks, and Unsolved Mysteries
	4/18/19		DISCUSSION: The 100 ky problem	Hays, Imbrie, and Shackleton (1976) Variations in the Earth's Orbit: Pacemaker of the Ice Ages
14	4/23/19	**The Last Glacial Termination**	Lecture	Ruddiman text - Chapters 13 and 14: The Last Glacial Maximum; Climate During and Since the Last Glacial Maximum
	4/25/19	Debate preparation	In-class team workshop	
15	4/30/19	Debate preparation	In-class team workshop	
	5/2/19	DEBATE		
16		**FINAL EXAM**		

THE UNIVERSITY OF MAINE

NEW COURSE PROPOSAL/MODIFICATION/ELIMINATION FORM FOR GRADUATE COURSES

Graduate course proposals, modifications, or eliminations must be submitted to the Graduate School no later than the 3rd of each month. Please refer to the Graduate School website for the Curriculum Committee meetings schedule. Electronic signatures and submission is required.

Please return the completed e-form with appropriate signatures and documentation to the Graduate School by saving the form to your desktop and sending as an attachment to graduate@maine.edu. Please include in the subject line 'Course Proposal' and the course designator and number.

GRADUATE PROGRAM/UNIT School of Biology & Ecology

COURSE DESIGNATOR BIO COURSE NUMBER 501 EFFECTIVE SEMESTER sp 2019

COURSE TITLE Evolutionary Theory and Application

REQUESTED ACTION

NEW COURSE (check all that apply, complete Section 1, and submit a complete syllabus):

- [x] New Course
- [ ] New Course with Electronic Learning
- [ ] Experimental

MODIFICATION (Check all that apply and complete Section 2):

- [ ] Designator Change
- [ ] Number Change
- [ ] Title Change
- [ ] Description Change
- [ ] Prerequisite Change
- [ ] Credit Change
- [ ] Cross Listing (must be at least 400-level)[1]
- [ ] Other (specify) _____

ELIMINATION:

- [ ] Course Elimination

ENDORSEMENTS

Please sign using electronic signatures. If you do not already have a digital signature, please click within the correct box below and follow the on-screen instructions.

Leader, Initiating Department/Unit(s)

Farahad Dastoor Digitally signed by Farahad Dastoor DN: cn=Farahad Dastoor, o=University of Maine, ou=School of Biology & Ecology, email=farahad.dastoor@maine.edu, c=US Date: 2018.09.12 13:27:55 -05'00'

College(s) Curriculum Committee Chair(s) (if applicable)

George Cruner Assoc. Dean

College Dean(s)

Graduate School (sign and date)

1. Courses cross-listed below 400-level require the permission of the Graduate School.

SECTION 1 (FOR NEW COURSE PROPOSALS)

Proposed Catalog Description (include designator, number, title, prerequisites, credit hours):

BIO 501, Evolutionary Theory & Application, 3 credits (no pre-requisites):
This course is a graduate-level survey of modern evolutionary theory. The course emphasizes an understanding of the interplay between different evolutionary forces in wild populations. Through lecture, student-led discussion, and problem sets students will gain a working familiarity with modern evolutionary theory and practice many of the quantitative approaches used to study evolution in wild populations.

Components (type of course/used by Student Records for MaineStreet) – *Multiple selections are possible for courses with multiple non-graded components:*

☐ Applied Music ☐ Clinical ☐ Field Experience/Internship ☐ Research ☐ Studio
☐ Laboratory ☒ Lecture/Seminar ☐ Recitation ☐ Independent Study ☐ Thesis

Text(s) planned for use:

selections from the primary literature

Course Instructor (include name, position, teaching load):

Brian Olsen, Associate Professor, 20% teaching appointment in the School of Biology & Ecology

Reason for new course:

This course has been offered twice before (with enrollments of 4 and 12 students) under a special topics designator. It serves as a basic, graduate-level evolution course that benefits a wide variety of programs across NSFA and CLAS (e.g., DoA, EES, SBE, SFA, SFR, SMS, SoE, and WFCB).

Does the course addition require additional department or institutional facilities, support and/or resources, e.g. new lab facilities, computer support and services, staffing (including graduate teaching assistants), or library subscriptions and resources?

◉ No. The department will not request additional resources for this course.

○ Yes. Please list additional resources required and note how they will be funded or supported.

What other departments/programs are affected (e.g. course overlap, prerequisites)? Have affected departments/programs been consulted? Any concerns expressed? Please explain.

There are no other basic graduate evolution courses offered on campus.

How often will this course be offered? Will offering this course result in overload salary payments, either through the college or CED, either to the instructor of this course or to anyone else as a result of rearranging teaching assignments?

The course will be offered every other year and will result in no overload payments.

Last updated: 26 Sep 2018

EVOLUTIONARY THEORY & APPLICATION

BIO 501
SPRING 2019
3 CREDITS

INSTRUCTOR

Dr. Brian Olsen
Contact: 200 Roger Clapp Greenhouse, *p:* 581-2542, *e:* brian.olsen@maine.edu
Office Hours: by appointment (please email)

MEETING TIMES

1 hour and 15 minutes, Tuesdays & Thursdays, in a room on campus with video conferencing capabilities and the ability to discuss in the round (e.g., 101 or 105 Norman Smith Hall)

COURSE DESCRIPTION

This course is a graduate-level survey of modern evolutionary theory. The course emphasizes an understanding of the interplay between different evolutionary forces in wild populations. Through lecture, student-led discussion, and problem sets students will gain a working familiarity with modern evolutionary theory and practice many of the quantitative approaches used to study evolution in wild populations.

COURSE GOALS

The overall goal of this course is to give students a working knowledge of evolutionary theory and its application to real-world problems.

STUDENT LEARNING OUTCOMES

By the end of the semester students will increase their skills in:

1. Discussing and explaining prominent evolutionary theory to others
2. Interpreting primary literature on the evolution of wild populations
3. Applying standard quantitative approaches used in the study of evolution in wild populations

INSTRUCTIONAL OBJECTIVES

More specifically, students should be able to:

1. Describe the interplay between selection, immigration, mutation, and drift in wild populations
2. Measure the strength of selection from multiple sources on a wild population
3. Partition variation in a trait among genetic and environmental sources and calculate heredity
4. Calculate the degree of differentiation among subpopulations at multiple loci using F_{ST} and G_{ST}
5. Interpret phylogenetic trees and test hypotheses regarding trait evolution using them
6. Interpret genomic data for two taxa in the process of differentiation and discuss the environmental changes that would alter the probability of speciation
7. Hypothesize systems where evolution alters population, community and ecosystem dynamics and describe how those changes could feedback to shape further evolution
8. Explain potential evolutionary outcomes for a trait under multi-level selection
9. Compare and contrast the similarities between genetic and cultural evolution

PREREQUISITES

No formal prerequisites are required. A bachelor's degree in a field of the life sciences will be sufficient in almost all cases. A basic understanding of genetics and evolution will be assumed. If you are interested in taking this course, however, and you are concerned about your preparation, please come see me, and I will provide more information or some preliminary readings to get you up to speed.

COURSE FORMAT

Classes will be generally of two types:

Lecture Classes – At the beginning of each new topic, I will assign a reading to be completed before the first day we discuss it (usually a foundational paper from the literature, a good review article, or a book chapter). During these "Lecture Classes", I will lead a discussion-based lecture to make sure that everyone has the major points of theory under their belts. The "lecture" will be question driven, so it is important that you do the reading. I will then focus the lecture on portions of the reading that were the most confusing to folks and spend time filling in background for topics that need it.

Discussion Classes – On the other days, we will discuss a more contemporary article from the primary literature on the same topic as the previous class. The idea is to talk through an application of the theory in a real system. These discussions will be run almost entirely by students, and I expect you to come to class 1) having read the article and 2) with at least two questions or comments prepared to spur discussion. I will mostly try to keep my mouth shut (a task at which I do **not** excel), unless there are misconceptions that need to be addressed.

GRADING

Grades will be based on six problem sets, which each count for 10% of your grade, and participation in class during both the lecture and discussion classes (the remaining 40%). A full grade for participation can be expected if you have good attendance, have clearly come to class having done the reading with prepared questions, and you engage in the discussions. You do not need to demonstrate a perfect understanding of the concepts. That is what the problem sets are for. Participation is about making a good faith effort to engage the material and speaking up when you are confused. Poor attendance and/or clear signs that you are not doing the reading will impact our grade negatively. You are welcome to ask the instructor for your current progress at any point during the semester.

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

ONLINE COURSE CONTENT

Readings and any updates to the course schedule will be emailed directly to the class and posted in a Google Classroom (access code XXXXXX). If you would like me to use an email address other than the one listed in MaineStreet (generally your "maine.edu" address), please let me know immediately. You will receive an invitation to join the Google Classroom. Please watch your email.

Online Attendance: If you are off campus for all or part of the semester, we can set up remote-access for class periods, provided you have reliable internet access and a computer capable of running video conferencing software (e.g., Zoom, Google Hangouts).

Last updated: 26 Sep 2018

ACCOMMODATIONS
If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services (SAS), 121 East Annex, 581-2319, as early as possible in the term. Students who have already been approved for accommodations by SAS and have a current accommodation letter should meet with me privately as soon as possible.

ACADEMIC HONESTY DISCLAIMER
All of your problem sets need to be your own, and any indication that they are plagiarized from any source is a violation of the Academic Honesty Code. That being said, I have no problem with you working in groups to do the problem sets. You should make sure that you go through all of the steps yourself, however, and do not (obviously, I hope) just copy someone else's work to turn in. It should be clear that you worked through your own problems and can explain the work you did.

Academic honesty is very important. It is dishonest to copy work or submit work written by another person. Students committing or aiding in any of these violations may be given failing grades for an assignment or for the entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

So yeah, ultimately, do your own work. But brainstorming as a group and talking through your approach with someone else sounds awesome. That's increasingly called **S**cience. And if you have *any* questions about what is appropriate in this class in terms of collaboration, or where the line between collaboration and cheating is, please just ask me. I'm happy to discuss it in more detail. Here's the link to the Conduct Code, if you want to know what happens when things go horribly awry: https://umaine.edu/handbook/policies-regulations/student-conduct-code/

EPIDEMIOLOGICAL & END-OF-DAYS DISCLAIMER
In the event of campus-wide disruptions in classroom activities due to any unforeseen, large-scale disturbance (swine flu, bird flu, monkey pox, whirling disease, meteors, zombies, etc.), the format of this course may be modified to enable its completion. In that event, you will be provided an addendum to this syllabus that will supersede this version. You are on your own for the zombies.

OTHER UMAINE REQUIRED STATEMENTS
This course follows the required policies of the University of Maine in regards to academic honesty, student accessibility, course disruptions, observance of religious holidays/events, and sexual discrimination reporting. For more details on all of these polices please see:
https://umaine.edu/citl/teaching-resources-2/required-syllabus-information/

Last updated: 26 Sep 2018

TENTATIVE SCHEDULE

UNIT 1: ***Mechanisms of Evolution***		**Deadlines** *all readings should be done* **before** *class*
Week 1	Tenets of Evolution	
Week 2	Selection	
UNIT 2: ***Measuring Evolution***		
Week 3	Quantitative Genetics	Prob. Set #1 Due: *Measuring Selection*
Week 4	Gene Flow	Problem Set #2 Due: *Heritability*
Week 5	Population Structure	
Week 6	Metapops & Landscape Genetics	Problem Set #3 Due: *Structure*
Week 7	Phylogenetics: Using Trees	
UNIT 3: ***Effects of Evolution***		
Week 8	Speciation I (Reproductive Isolation) Speciation I (Geographic Modes)	Problem Set #4 Due: *Phylogenetics*
Week 9	SPRING BREAK	
Week 10	Speciation II (Ecological Speciation) Speciation II (Sexual vs. Natural Selection)	
Week 11	Evolutionary Ecology I	Problem Set #5 Due: *Genomics of Speciation*
Week 12	Evolutionary Ecology II	
Week 13	Eco-Evolutionary Dynamics	
Week 14	Multi-level Selection	Problem Set #6 Due: *Eco-evolutionary feedbacks*
Week 15	Cultural Evolution	

THE UNIVERSITY OF MAINE

NEW COURSE PROPOSAL/MODIFICATION/ELIMINATION FORM FOR GRADUATE COURSES

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Please return the completed e-form with appropriate signatures and documentation to the Graduate School by saving the form to your desktop and sending as an attachment to graduate@maine.edu. Please include in the subject line 'Course Proposal' and the course designator and number.

GRADUATE PROGRAM/UNIT School of Economics

COURSE DESIGNATOR ECO COURSE NUMBER 532 EFFECTIVE SEMESTER Spring 2019

COURSE TITLE Applied Time Series Econometrics

REQUESTED ACTION

NEW COURSE (check all that apply, complete Section 1, and submit a complete syllabus):

- [x] New Course
- [ ] New Course with Electronic Learning
- [ ] Experimental

MODIFICATION (Check all that apply and complete Section 2):

- [ ] Designator Change
- [ ] Number Change
- [ ] Title Change
- [ ] Description Change
- [ ] Prerequisite Change
- [ ] Credit Change
- [ ] Cross Listing (must be at least 400-level)[1]
- [ ] Other (specify) _____

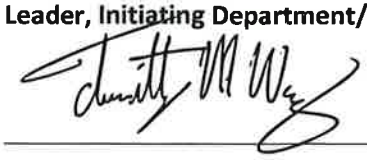
ELIMINATION:

- [ ] Course Elimination

ENDORSEMENTS

Please sign using electronic signatures. If you do not already have a digital signature, please click within the correct box below and follow the on-screen instructions.

Leader, Initiating Department/Unit(s)



College(s) Curriculum Committee Chair(s) [if applicable]

George Criner

George Criner, Assoc. Dean 10/17/18

College Dean(s)

Graduate School [sign and date]

1. Courses cross-listed below 400-level require the permission of the Graduate School.

SECTION 1 (FOR NEW COURSE PROPOSALS)

Proposed Catalog Description (include designator, number, title, prerequisites, credit hours):

ECO 532, Applied Time Series Econometrics
This is a graduate course in applied <me series econometrics. Theorems and proofs will not be emphasized in this course. Instead, we will work to develop both a significant understanding of the role of <me series econometrics in empirical economics and a strong ability to execute applied <me series econometrics in the development of economic models and in the analysis of economic policy. Iden<fica<on, es<ma<on, evalua<on, hypothesis tes<ng, forecas<ng, and simula<on will be emphasized. Both univariate and mul<variate <me series processes will be covered and applica<ons will include both microeconomic and macroeconomic models. 3 credit hours.

Prerequisites: ECO 530, or instructor permission

Components (type of course/used by Student Records for MaineStreet) – *Multiple selections are possible for courses with multiple non-graded components:*

☐ Applied Music ☐ Clinical ☐ Field Experience/Internship ☐ Research ☐ Studio
☐ Laboratory ☐ Lecture/Seminar ☐ Recitation ☐ Independent Study ☐ Thesis

Text(s) planned for use:

Walter Enders, Applied Econometric Time Series, 4e (John Wiley & Sons, Inc., 2015).

Course Instructor (include name, position, teaching load):

Gary L. Hunt, Professor, 3 fall courses, 3 summer courses.

Reason for new course:

Although technically a new course, it is not new in the sense that Professor Hunt has taught this course as part of the new MS in Economics. Here we seek to make this course more official by giving it a unique identified to highlight it within the degree. It is a key requirement of that MS degree.

Does the course addition require additional department or institutional facilities, support and/or resources, e.g. new lab facilities, computer support and services, staffing (including graduate teaching assistants), or library subscriptions and resources?

◉ No. The department will not request additional resources for this course.

◯ Yes. Please list additional resources required and note how they will be funded or supported.

What other departments/programs are affected (e.g. course overlap, prerequisites)? Have affected departments/programs been consulted? Any concerns expressed? Please explain.

No.

No other departments offer time series analysis or econometrics courses or are affected in other ways.

How often will this course be offered? Will offering this course result in overload salary payments, either through the college or CED, either to the instructor of this course or to anyone else as a result of rearranging teaching assignments?

The course will be offered every other year, starting in the spring of 2019. We do not plan this course for overload teaching of any time.

ECO 532
Applied Time Series Econometrics
Spring 2020

Gary L. Hunt
Suite 200 Winslow Hall
Office Hours: by appointment
Email: gary.hunt@maine.edu

Course Description:

This is a graduate course in applied time series econometrics. Theorems and proofs will not be emphasized in this course. Instead, we will work to develop both a significant understanding of the role of time series econometrics in empirical economics and a strong ability to execute applied time series econometrics in the development of economic models and in the analysis of economic policy. Identification, estimation, evaluation, hypothesis testing, forecasting, and simulation will be emphasized. Both univariate and multivariate time series processes will be covered, and applications will include both microeconomic and macroeconomic models. 3 credit hours

Class Meetings: Tuesdays and Thursdays, 3:30PM – 4:45PM; Winslow Hall Room 201

Prerequisites: ECO 530 or permission

Textbook: Walter Enders, Applied Econometric Time Series, 4th edition (John Wiley & Sons, Inc., 2015).

Software: The student version of the econometric software, EViews, is required. It is expected that students complete all econometric work for assignments with EViews. The instructor will support only EViews. EViews for PC and Mac is available for purchase and downloading from: http://www.eviews.com/EViews9/EViews9SV/evstud9.html ($39.95)

Grading: The overall grade for the course will be determined by the following weights:

- Homework problem sets 50%
- Univariate project 20%
- Multivariate project 30%

Final grades will be assigned as follows: A (90+); B (80-89); C (65-79); D (50-64); F (< 50).
Incompletes will be given only in well-documented and extraordinary cases.

Required Syllabus Information:
Please read the policies on academic honesty, student accessibility, course scheduling, religious holidays, and sexual discrimination reporting: https://umaine.edu/citl/teaching-resources-2/required-syllabus-information