Justification for change of cumulative credits:

The School of the Environment is requesting a change in total cumulative credits for SOE 592 Special Topics from 4 credits to 6 credits. We are a highly interdisciplinary unit. Prior to 2018, SOE had several special topics course numbers under Env_Sci, NATRS and Geol prefixes. The intent of bringing all the disciplines together under the SOE prefix was not to limit the course opportunities nor interdisciplinary options of our students. Increasing the number of credits in this course prefix retains this flexibility for program breadth that is vital to the program. These courses are most often offered as 3-credit courses. The current limit, 4 credits, means that graduate students are limited to a single 3-credit course. Moreover, with new tenure track faculty developing graduate courses across our 5 campus system, it is valuable to both graduate students and new faculty to offer students the ability to take special topics courses with multiple faculty and in multiple areas. We expect these new courses offered by new faculty to use the SOE 592 course number on a temporary basis. Once a class is developed and working well, we expect to follow the usual process of formally preparing a course proposal to submit for review as a standard course. Thus, increasing the number of credits to a maximum of 6 is of great benefit to our program.

The example special topics syllabus below passed Catalog sub committees spring 2018.

SOE 592 Advanced Topics in Environmental and Natural Resource Sciences Spring 2020
Advanced Environmental Systems Modeling
Wednesday 1pm-2pm or by determination of enrolled student's schedules.
Variable credits 1-4. May be repeated for credit; cumulative maximum 8 hours. Course Prerequisite: By interview only.
This syllabus serves as an example of an Advance Topics Graduate course and will be subject to change by instructors who use SOE 592 for a special topics course. SOE 592 will be made available for both fall and spring offerings

Dr. Allyson Beall King
Office: Fulmer 208; email: abeall@wsu.edu; phone: 335-4037. Office hour: tbd. I am also available by appointment and email.

Course prerequisite: SOE 555 Modeling the Environment

Class website: Blackboard

This is a variable credit opportunity - For each hour of credit students should expect to work a minimum 3 hours per week in addition to the 1 hour class. Open to SOE students at Pullman, Vancouver and Tri Cities Campuses. Students who are not on the Pullman Campus will meet via Blackboard Collaborate.

Required text (from SOE 555): *Modeling the Environment 2nd edition.* Andrew Ford, 2010. ISBN 13: 978-1-59726-473-0 Available at the Bookie, Crimson and Gray, or Amazon. The web support for the text or "bweb" may be accessed at http://public.wsu.edu/~forda/

Software: Please discuss your research with me to determine the most appropriate software for you to use.

Stella: You may purchase your own copy of Stella at http://www.iseesystems.com or you may use one of my lab licenses on your personal computer until the end of the semester. As of August 2016, Stella was available to students in a scheduled class @ $59 for a six-month student license and @ $129 for a perpetual student copy. It is available for both Macs and Windows computers. The software is also available on the Webster 1149 lab computers.

Vensim: You may purchase your own copy of Vensim at Vensim.com. Educational licenses are available with documentation that you are a student beginning at $89 per license.

Course fee: none

Overview: This course is designed to help students continue developing expertise for analyzing the complexities of human interactions with environmental systems using system dynamics and computer simulation. It is assumed that students have learned introductory system dynamics modeling in SOE 555. This course is designed to help students develop models that may be utilized as part of their MS or PhD thesis research.

Outcome: Students will utilize system dynamics to analyze the dynamic problems that are related to their MS or PhD research.

Learning Objectives and goals:

The objective is to expand upon your modeling experience from SOE 555 to further develop understanding and proficiency in the development and use of system dynamics based computer simulation models.

Course Objectives

Course objectives will be attained utilizing the following learning goals: Critical and Creative Thinking; Quantitative Reasoning; Scientific Literacy; Information Literacy; Communication; and Depth, Breadth and Integration of Learning. Due to the interdisciplinary nature of environmental systems these goals cannot be attained, or topics described or understood in isolation. Therefore, the class will build upon many concepts and skills simultaneously.

Learning Goals	At the end of this course students will be able to:	Course topics that advance these learning goals:	The objectives will be evaluated primarily by the following:
Critical and Creative Thinking Quantitative Reasoning Scientific Literacy Information literacy Communication Depth, Breadth and Integration of Learning.	Utilize the elements of system dynamics and system thinking that distinguish this method of inquiry and analysis on a research question related to your major. Describe patterns of dynamic behavior related to the problem being modeled Differentiate between exogenous and endogenous behavior Describe how endogenous elements of a system creates behavior Evaluate the impacts of time delays and feedback loops Evaluate the impact of policy on dynamic environmental systems	Iterative development and analysis of stock and flow simulation models that integrate information from multiple disciplines Iterative development of causal loop diagrams Iterative development, exploration and analysis of policy scenarios	Students will enhance their critical and creative thinking through the development of an advanced stock and flow model that solve through numeric simulation. Students will use writing to communicate information about models, feedbacks, time delays and policy within their models and model interfaces. Students will use verbal communication to describe models, feedbacks, time delays and policy during in class discussions. Students will collect and utilize scientific information and apply quantitative reasoning to their research.

A	92.5 -100%
A-	89.5 -92.4 %
B+	86.5-89.4 %
B	82.5-85.5 %
B-	79.5-82.4 %
C+	76.5-79.4 %
C	72.5-76.4 %
C-	69.5-72.4 %
D+	66.5-69.4 %
D	59.5-66.4 %
F	< 59.5 %

Time expectations: This is a variable credit class - Students should expect to spend one hour in class and at least three additional hours on research per credit per week. Research projects will be designed to be appropriate for the time commitment of the enrolled credits.

Grading: Students should attend all classes, and participate in discussions. Grades will be calculated as a percentage of 1000 points and rounded up to the nearest tenth. There are no exams or quizzes.

Project proposal 300 pts (due week 3)
Final model 700 pts (due last week of classes)

Project: You will be developing a model applicable to your MS or PhD research. Your proposal will include a statement about how system dynamics is potentially an appropriate tool for your research, potential limitations of using this method of modeling, the dynamic nature of the problem you are exploring, and a causal diagram of proposed endogenous and exogenous variables.

Final Model: Your model must be fully documented with appropriate references, and assumptions. It must be a stand-alone product that is web ready for your committee or potential stakeholders in your field to explore. The model interface should include instructions such that an inexperienced user can quickly learn to interact with the model. If you have discovered that this method of modeling is not appropriate for your field of research then the model should include documentation that describes how system dynamics does not help solve your dynamic problem.

Attendance policy and late work: Please notify me via email in advance of any excused absences such as field trips or conferences. In the event you are ill or have a family emergency please email me as soon as it is practical. Late work will be accepted without penalty for excused absences. For absences that are not excused late work will be accepted at a 10% per day penalty.

Reasonable Accommodation: "Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center or Disability Services at your campus address on your campus] to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center or Disability Services. For more information contact a Disability Specialist on your home campus." **Pullman or WSU Online**: 509-335-3417, Washington Building 217 http://accesscenter.wsu.edu, Access.Center@wsu.edu
Spokane: https://spokane.wsu.edu/studentaffairs/disability-resources/
Tri-Cities: http://www.tricity.wsu.edu/disability/
Vancouver: 360-546-9138 http://studentaffairs.vancouver.wsu.edu/student-resource-center/disability-services

Academic Integrity: "Academic integrity is the cornerstone of higher education. As such, all members of the university community share responsibility for maintaining and promoting the principles of integrity in all activities, including academic integrity and honest scholarship. Academic integrity will be strongly enforced in this course. Students who violate WSU's Academic Integrity Policy (identified in Washington Administrative Code (WAC) 504-26-010(3) and -404) *will fail the course*, will not have the option to withdraw from the course pending an appeal, and will be reported to the Office of Student Conduct.
Cheating includes, but is not limited to, plagiarism and unauthorized collaboration as defined in the Standards of Conduct for Students, WAC 504-26-010(3). You need to read and understand all of the definitions of cheating: http://app.leg.wa.gov/WAC/default.aspx?cite=504-26-010. If you have any questions about what is and is not allowed in this course, you should ask course instructors before proceeding.
If you wish to appeal a faculty member's decision relating to academic integrity, please use the form available at conduct.wsu.edu."

Classroom Safety Statement: *"Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the "***Alert, Assess, Act***," protocol for all types of emergencies and the "Run, Hide, Fight" response for an active shooter incident.*

Remain ALERT *(through direct observation or emergency notification),* ASSESS *your specific situation, and* ACT *in the most appropriate way to assure your own safety (and the safety of others if you are able).*
Please sign up for emergency alerts on your account at MyWSU. For more information on this subject, campus safety, and related topics, please view the FBI's Run, Hide, Fight video *and visit the* WSU safety portal*."*

Topics and readings for weekly schedule will be determined by the topics of the research projects. An example of a student focus on collaborative water resource management is provided below.

Wk	Weekly class topics	Readings - Pdfs of literature will be made available on Blackboard
1	<u>Stella and Vensim Pro Demonstrations – which software suits your needs?</u> Discussion of specific interests for research	Stave *Participatory System Dynamics Modeling for Sustainable Environmental Management: Observations from Four Cases*
2	Review Levels, rates and accumulation – what is the focus of your research – lakes or rivers? Developing model boundaries: Project discussion; modeling complex systems: where and how to start when the system is fully inter connected? Discuss reading from week 1	Cockerill, Passell and Tidwell *Cooperative Modeling: Building Bridges Between Science and the Public*
3	<u>Our mental models and the impact they have on communication, assumptions, and the questions we raise</u> Discuss reading from week 2 **Project proposals due**	Langsdale et. al *Collaborative Modeling for Decision Support in Water Resources: Principals and Best Practices. See also https://labs.wsu.edu/collaborativemodeling/*
4	<u>What can we learn from the Mono Lake model?</u> <u>Ford chapter 5 – build Mono lake model before we meet</u> Discuss reading from week 3	Read Ford Ch 15 and Videria et. al *How and Why Does Participatory Modeling Support Water Policy Processes? The Baixo Guadiana Experience*
5	<u>The Tucannon and the impact of dams on salmon - how do we deal with river flows and model timesteps?</u> Discuss reading from week 4	Beir, A. *Simulating a thermal water quality trading market for education and model Development.* Journal of Environmental Management 2010
6	<u>Incorporating multiple types of data and information into models. Integrating peer reviewed science, professional experience, the unknown</u> Discuss reading from week 5	Beall and Ford *Reports from the Field: Assessing the Art and Science of Participatory Environmental Modeling* International Journal of Information Systems and Social Change, 1(2), 72-89, April-June 2010
7	What makes for a quality model interface? Discuss reading from week 6	**Students choose two readings for list below and lead discussion the following week**
8	How are you going to validate? What tests will you use? Discuss reading from week 7	**Students choose two readings for list below and lead discussion the following week**
9	Challenges on models to date Discuss reading from week 8	**Students choose two readings for list below and lead discussion the following week**
10	Challenges on models to date Discuss reading from week 9	**Students choose two readings for list below and lead discussion the following week**
11	Challenges on models to date Discuss reading from week 10	**Students choose two readings for list below and lead discussion the following week**
12	Challenges on models to date Discuss reading from week 11	**Students choose two readings for list below and lead discussion the following week**

13	Challenges on models to date Discuss reading from week 12	**Model peer review. Each student will provide a model file for review by up to two other students.**
14	Challenges on models to date Discuss peer review	
15	Informal ungraded Project presentations. If two class periods are not sufficient time for the number of students we will move presentations to include class time during week 13/14. This decision will be made by the end of week 2.	Consider this an opportunity to defend the model that you have created as you would do in your thesis defense.

Additional readings below and also see references in Ford's book pages 367- 373 and at the System Dynamics Society website proceedings pages for past conferences https://www.systemdynamics.org/past-conferences

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Bourget, E.C. (ed.) (2011). *Converging Waters: Integrating Collaborative Modeling with Participatory Processes to Make Water Resources Decisions*. Alexandria, VA: Institute for Water Resources Maass-White Series. [Available at: http://www.iwr.usace.army.mil/docs/maasswhite/Converging_Waters.pdf]
Canadian Environmental Assessment Agency. 2009. *Adaptive Management Measures under the Canadian Environmental Assessment Act*. Operational Policy Statement. [Available at: http://www.ceaa.gc.ca/default.asp?lang=En&n=50139251-1].
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Jeong, S. M., J.H. Ryu, J.H. Lee, and R.N. Palmer. 2003. Development of a shared vision model for optimal water distribution, *Korean Society of Civil Engineers*, 23(3B), 191-199.
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Management and the 1998 Annual Conference on Environmental Engineering, W. Whipple, Jr., ed., Chicago, IL, 221-226.
Palmer, R.N., Werick, W.J., MacEwan, A., and Woods, A.W. 1999. Modeling water resources opportunities, challenges, and trade-offs: The use of shared vision modeling for negotiation and conflict resolution, *Proceedings of the ASCE' s 26th Annual Conference on Water Resources Planning and Management,* Tempe, AZ.
Palmer, R.N., A. Mohammadi, M.A. Hahn, J. Dvorak, and D. Kessler. 2000. Computer assisted decision support system for high level infrastructure master planning: Case of the City of Portland Supply and Transmission Model (STM), *Proceedings of the ASCE' s 2000 Joint Conference on Water Resources Engineering and Water Resources Planning and Management,* Minneapolis, MN.
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