Syllabus for
SBC 201 Systems and Models
Friday 12:00 to 2:40 pm in Earth and Space Science Room 081

Instructor: Dr. James Hoffmann
Office: Sustainability Studies Suite, Room W0517, Melville Library
Phone: 631-632-5366
Email: james.hoffmann@stonybrook.edu
Office Hours: Tuesdays 4:00 to 5:00 pm and Fridays 3:00 to 4:00 pm, and by appointment
Blackboard: blackboard.stonybrook.edu

Course Description: Introduction to the dynamic modeling of complex systems. Students will learn to use simulation software that facilitates the visualization, formulation, and analysis of systems. Students will learn about systems with positive and negative feedbacks, the effects lags on system performance, and the difference between stocks and flows. Systems studied will include ecological models, economic models, chemical models, population models, epidemiological models, and models that include the interactions between population, economic development, and the environment.

Prerequisites: AMS 151 or MAT 125 or MAT 131 or MAT 141; 1 credit

Additional Course Information: System Dynamics (SD) is the focus of this course. SD is a computer simulation-based approach to policy analysis and design. It applies to dynamic problems arising in complex social, managerial, economic, or ecological systems — literally any dynamic systems characterized by interdependence, mutual interaction, information feedback, and circular causality. Through a hands-on approach you will gain experience producing and analyzing dynamic simulation models of systems. You become familiar with the use of an icon-based graphical simulation software package (STELLA) that does not require you to learn computer programming or detailed mathematics to produce models to solve problems. You develop an understanding of modeling concepts such as stocks, flows, non-linear effects, negative and positive feedback, and time lags by exploring well-defined, relevant problems. Emphasis is on understanding the interactive structure and emergent dynamics of the system being modeled, and less so on the underlying mathematics. Systems studied include ecological models, economic models, chemical models, population models, epidemiological models, and models that have interactions between populations, economic development, and the environment.

Class consists of a two hour and 40-minute interactive lecture/lab each week. In the first half of the semester, exercises and models are handed in each week, except for the first few labs when you learn the software. During the second half of the semester you work on your own project. The project topic is a problem chosen by the student and approved by the instructor, and results in a working model and a PowerPoint presentation of your results.

Learning Objectives:

● To define a complex system and give examples from different fields.
To learn and apply “systems thinking” – a holistic approach towards understanding and solving problems involving complex systems in which the interactions among the system parts are as important (if not more so) than the parts themselves.

To show a working knowledge of a software tool (STELLA) for building and simulating the behavior of systems.

To demonstrate an understanding of modeling concepts such as stocks, flows, non-linear effects, negative and positive feedback, and time lags.

To explain how model components (stocks, flows…) when interacting together uniquely define a systems structure and its resulting behavior over time.

To conceive a dynamic model of a system of interest and to construct a working simulation model of the system.

Required Text:
None. Modelling exercises from an instructors manual (Modeling Dynamic Systems: Lessons for a First Course, 3rd Edition (2011) by Diana M. Fisher) are provided as pdf files available on BlackBoard. Additional materials (articles, handouts, web sites…) are posted to BlackBoard.

Course Requirements:

Attendance and participation: Students are responsible for attending all course meetings. Attendance is taken each week at the beginning of class and counts toward your final grade. Unexcused absences, excessive lateness (more than 15 minutes) or leaving class early without prior permission will result in not earning attendance points.

Weekly Exercises: Consist of an electronic copy of your STELLA models (including output graphs and tables) that is emailed to the instructor, and a completed hard copy of the exercise sheet turned into the instructor in class.

Project: Gather information and data of your chosen system, and then construct a working model of the system. The project consists of the following two activities:

1. Create a comprehensive Wiki report of your chosen system that contains all information, research data and files.
2. Build a working STELLA model of your system and post output and model to Wiki.
3. Present an oral summary report of your findings using an annotated PowerPoint file (posted to Wiki).

Specific details of the project assignment will be provided on the class BlackBoard site.

Late Assignment Policy: Lab reports are due on Fridays at the beginning of class, and two weeks after the exercise was introduced in class. Assignments turned in after 4:00 PM on Friday are considered late. Assignments turned in late lose 2.5 points per day starting the day after they were due. Therefore, an assignment that is one-week overdue, will earn you only 50% (at most) of the total possible points that could be earned for that assignment.

Grading:

Attendance and participation 10%
Class Exercises 40%
Project
• Wiki-based report 15%
• STELLA model 20%
• Presentation 15%

<table>
<thead>
<tr>
<th>Percent</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 95</td>
<td>A</td>
</tr>
<tr>
<td>94 - 91</td>
<td>A-</td>
</tr>
<tr>
<td>90 - 88</td>
<td>B+</td>
</tr>
<tr>
<td>87 - 84</td>
<td>B</td>
</tr>
<tr>
<td>83 - 81</td>
<td>B-</td>
</tr>
<tr>
<td>80 - 78</td>
<td>C+</td>
</tr>
<tr>
<td>77 - 74</td>
<td>C</td>
</tr>
<tr>
<td>73 - 71</td>
<td>C-</td>
</tr>
<tr>
<td>70 - 68</td>
<td>D+</td>
</tr>
<tr>
<td>67 - 60</td>
<td>D</td>
</tr>
</tbody>
</table>

Basis for grading:

### Tentative Meeting Schedule:

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1 – 8/30/2013</td>
<td>Introduction to course. Definitions: models, systems, feedbacks, nonlinearity, Systems Thinking, stocks and flows… Begin introduction to STELLA software, start tutorials.</td>
</tr>
<tr>
<td>Week 2 – 9/6/2013</td>
<td>Begin Population Growth I and II</td>
</tr>
<tr>
<td>Week 3 – 9/13/2013</td>
<td>Begin Generic Processes I and II</td>
</tr>
<tr>
<td></td>
<td>Due: Tutorials</td>
</tr>
<tr>
<td>Week 4 – 9/20/2013</td>
<td>Begin Generic Processes III and IV</td>
</tr>
<tr>
<td></td>
<td>Due: Population Growth I and II</td>
</tr>
<tr>
<td>Week 5 – 9/27/2013</td>
<td>Begin Mono Lake: Build a simple stock and flow model to simulate water balance in the lake. Add complexity by introducing multiple water sources and sinks. Explore how</td>
</tr>
</tbody>
</table>
water level changes as water use increases or recharge fluctuates.  
**Due:** Generic Processes I and II

| Week 6 – 10/4/2013 | Begin Easter Island  
**Due:** Generic Processes III and IV |
|---------------------|---------------------------------------------------------------|
| Week 7 – 10/11/2013 | Begin Epidemics  
**Due:** Mono Lake |
| Week 8 – 10/18/2013 | Introduction to Modeling Project.  
**Due:** Easter Island |
| Week 9 – 10/25/2013 | Work on project in class; give progress report  
**Due:** Epidemics |
| Week 10 – 11/1/2013 | Work on project in class; give progress report |
| Week 11 – 11/8/2013 | Work on project in class; give progress report |
| Week 12 – 11/15/2013 | Work on project in class; give progress report |
| Week 13 – 11/22/2013 | Go over Project Presentations format; Continue working on project STELLA models |
| Week 14 – 11/29/2013 | Work on project at home  
**NOTE:** No Class – THANKSGIVING BREAK |
| Week 15 – 12/6/2013 | **Full presentation of project; submit final model** |

**Blackboard:** You can access class information, documents, and assignments on-line at:  
[http://blackboard.stonybrook.edu](http://blackboard.stonybrook.edu)  
If you used Blackboard during the previous semester, your login information (NetID and Password) has not changed.  
If you have never used Stony Brook's Blackboard system: for help or more information see:  
[http://it.stonybrook.edu/services/blackboard](http://it.stonybrook.edu/services/blackboard)  
For problems logging in, go to the helpdesk in the Main Library SINC Site or the Union SINC Site, you can also call: 631-632-9602 or e-mail:  
helpme@ic.sunysb.edu

**Student’s Responsibility:** Students are required to use their Stony Brook University e-mail for all official communications.  
Ensure you have entered a working email account in your Black Board account.  
Access your BB account and make sure that you have access to this class, send yourself a test email using the email option within BB.  
Adhere to deadlines for term paper and other assignments.  
Adhere to the formatting instructions for the term paper.  
Seek help from instructor when problems arise.  
Should you have a disability, follow the regulations spelled out below so that it can be evaluated as soon as possible.

**Cell Phone and Electronic Devices:** Use of cell phones, blackberries, laptop computers, iPods, MP3 players, and other audio and telecommunications devices is strictly prohibited during class.  
The only exceptions are through permission granted by the instructor for special purposes.  
Clickers are excluded from this prohibition, if required for the class.  
During regular class sessions, cell phones must be either in ‘vibrate mode’ or turned off.  
Calls cannot be answered.  
Text messaging is not allowed during class.  
Cell phones must be turned off and enclosed in a case, book bag, briefcase, or the like during tests and exams.  
YOU are responsible for ensuring this policy is followed.  
Students MAY NOT have cell phones, electronic dictionaries,
calculators, pagers or other “information rich” devices (anything that can receive and/or store many pages of text) in their possession during tests and exams.

**Academic Dishonesty Policy:** Academic dishonesty is a serious offense and a breach of academic integrity that may result in failure of the course or failure for the individual paper or assignment. The “Code of Student Conduct” states that all forms of academic dishonesty, including the following are prohibited (see student handbook):

- Plagiarism – the intentional use of ideas or words of another as one’s own paper or other academic assignments. If you are unsure of what constitutes Plagiarism visit this document [http://www.wpacouncil.org/positions/WPAplagiarism.pdf](http://www.wpacouncil.org/positions/WPAplagiarism.pdf) or ask the instructor.
- Cheating during examinations, whether by copying from a fellow student or by using information in the form of unauthorized aids brought to the examination.
- The submission of work for any assignment that has been prepared by another student.

**Academic Integrity Statement:**
Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at [http://www.stonybrook.edu/commcms/academic_integrity/index.html](http://www.stonybrook.edu/commcms/academic_integrity/index.html)

**Classroom Policy:** Students are expected to follow the Stony Brook Code of Conduct while in the classroom. If you are not familiar with the Code you can find it at: [http://studentaffairs.stonybrook.edu/sites/handbook/Code_1-22-03.pdf](http://studentaffairs.stonybrook.edu/sites/handbook/Code_1-22-03.pdf)

Behavior that is disruptive to the function of the class, other students, or the instructor will not be tolerated. Poor class behavior or violations to the Code of Conduct will lead to removal from the class, possible withdrawal, or suspension. Food is not permitted in class. Beverages are OK, but please bring a container the can be closed to reduce spills. If a spill occurs please clean it up immediately.

**Instructional Responsibilities:** The University's statement of *Minimal Instructional Responsibilities* and *Minimal Undergraduate Student Responsibilities* are protocols with which you may already be familiar. They were established by the University Senate in 1996. If you have not already done so, please review them carefully. Both statements may be found beginning on page 81 of the *Academic Policies and Regulations* section of the on-line *Undergraduate Bulletin*: [http://www.stonybrook.edu/ugrdbulletin/current/index.shtml](http://www.stonybrook.edu/ugrdbulletin/current/index.shtml)

**DISABILITY SUPPORT SERVICES (DSS) STATEMENT**
If you have a physical, psychological, medical or learning disability that may impact your coursework, please contact Disability Support Services, ECC (Educational Communications Center)
Building, room128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website:  
http://www.stonybrook.edu/ehs/fire/disabilities

CRITICAL INCIDENT MANAGEMENT:
Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

Course Content:
Course material accessed from Blackboard, SB Connect, SB Capture or a Stony Brook Course website is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor and/or the copyright holder.

Duplication of materials protected by copyright, without permission of the copyright holder is a violation of the Federal copyright law, as well as a violation of Stony Brook's Academic Integrity and Student Conduct Codes

http://www.stonybrook.edu/uaa/academicjudiciary/policies.shtml

Electronic Communication Statement
Email and especially email sent via Blackboard (http://blackboard.stonybrook.edu) is one of the ways the faculty officially communicates with you for this course. It is your responsibility to make sure that you read your email in your official University email account. For most students that is Google Apps for Education (http://www.stonybrook.edu/mycloud), but you may verify your official Electronic Post Office (EPO) address at http://it.stonybrook.edu/help/kb/checking-or-changing-your-mail-forwarding-address-in-the-epo.

If you choose to forward your official University email to another off-campus account, faculty are not responsible for any undeliverable messages to your alternative personal accounts. You can set up Google Mail forwarding using these DoIT-provided instructions found at http://it.stonybrook.edu/help/kb/setting-up-mail-forwarding-in-google-mail.

If you need technical assistance, please contact Client Support at (631) 632-9800 or supportteam@stonybrook.edu.