EST 582 Introduction to Systems Concepts
Thursday 5:30-8:20
ESS 131

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Understanding phenomena as "systems" requires some changes in overall analytical approaches, and a new vocabulary. General systems theory concepts such as feedback, stability, tipping point, resilience, recursion, hierarchy, and complexity will be discussed, with regard to systems drawn from nature, business, technology, and education. The course will address the use of feedback, information and communication, structure, and cybernetics in the management of complex systems. The role and importance of "agents" in current systems thinking will be discussed. Students will prepare a study of a complex system and its management incorporating these general concepts.

Learning Outcomes
“System” is an essential means to understand the world, to develop and analyze technologies, and to assign meaning. The course enables students to recognize systems and systems features that are found in both very simple machines and complex phenomena, like technologies, organizations, and ecologies. With successful completion of the class, students are able to:

1) identify positive and negative feedback processes
2) complete cybernetic analyses of technological, human, and natural systems
3) demonstrate appropriate applications of system concepts, such as stability and complexity, hierarchy, resilience, and emergence within human-formed and natural systems
4) define issues that may be important in the use of models to explain complex phenomena.

Required texts:
(posted on Blackboard)
**Grading:**
Group pre-tests  10%
Homework and reading summaries  30%
Midterm  30%
Paper  30%

**Pre-tests**
Each class will begin with a short quiz, which will be answered by groups (3-5 per group). Students are expected to score 100% on these quizzes.

**Homework, Reading Summaries**
Five homework assignments will be made during the semester. All are due the next week, except the last one which must be completed by class end. The first four will be assigned on BlackBoard and must be submitted through BlackBoard. In addition, students will complete a one-page summary-analysis for each of the three reading assignments, which will also be submitted through BlackBoard.

**Midterm**
A take-home midterm will be assigned. Notes can be used to answer questions. It must be submitted through BlackBoard by 5 pm March 22.

**Paper**
Each student should describe and analyze a system in depth demonstrating clear understanding of key concepts from the class. Students are advised to select a familiar system, although this is not a requirement.

Please do not collaborate without prior permission or use work without attribution. You can conduct research for your systems paper, and must cite all references, including web sites. Submissions without sufficient attributions will be penalized. All papers will be submitted through BlackBoard and will be checked for plagiarism. Due date = May 10, 5 pm EDT, through BlackBoard.

**Plagiarism**
Plagiarism is presenting someone else’s work as your own. It consists of copying, intellectual property theft, and unauthorized collaboration. Do not copy material from the web or other sources for homework, exams, presentations, papers, etc., without properly citing. Do not use someone else’s ideas or work without sufficient attribution (be careful and record “who, what, and where” when researching) (find examples from professional research work for referencing and use that) (do not cite generic websites – [www.wikipedia.org](http://www.wikipedia.org) – as that is a meaningless reference). Do not work with someone else if the work is supposed to be your own.

All plagiarized submissions will be scored as 0. Plagiarism has resulted in failing this class, and even in dismissal from graduate school.
**Course Schedule**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Assignments and other useful information</th>
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<tbody>
<tr>
<td>1/25</td>
<td>Class introduction</td>
<td>Homework #1</td>
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<tr>
<td></td>
<td>Simple systems</td>
<td>Read Truxal pp. 1-38</td>
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<tr>
<td>2/1</td>
<td>Complicated systems</td>
<td>Homework #2</td>
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<td>Truxal summary due</td>
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<td>Read Scheffer Ch 1-3, 7, 12-14, 16, 18</td>
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<tr>
<td>2/8</td>
<td>Complex systems</td>
<td>Homework #3</td>
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<tr>
<td>2/15</td>
<td>System stability and transitions</td>
<td>Scheffer summary due</td>
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<td>Systems dynamics modeling</td>
<td>Read Meadows (all)</td>
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<tr>
<td>2/22</td>
<td>More system transitions</td>
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<td></td>
<td>Socio-technical systems</td>
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<tr>
<td>3/1</td>
<td>Modeling</td>
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<tr>
<td>3/8</td>
<td>Agent models</td>
<td>Meadows summary due</td>
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<td></td>
<td>Midterm review (Firman)</td>
<td>Pick a topic</td>
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<td>Midterm assigned</td>
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<tr>
<td>3/15</td>
<td><strong>No class -- Spring break</strong></td>
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<tr>
<td>3/22</td>
<td>How to write an EST 582 paper</td>
<td>Midterm due 5 pm through BlackBoard</td>
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<td>3/29</td>
<td>General systems theories</td>
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<td>4/5</td>
<td>Economic Systems</td>
<td>2 pts extra credit: watch The Big Short (and prove it)</td>
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<td>4/12</td>
<td>SBU as a system (class exercise)</td>
<td>Homework #4</td>
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<tr>
<td>4/19</td>
<td>Algorithms</td>
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<td>4/26</td>
<td>Wertheim mosquito control project</td>
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<tr>
<td>5/3</td>
<td>Cell phone as a system (class exercise)</td>
<td>Cell phone assignment due at end of class</td>
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<tr>
<td>5/10</td>
<td><strong>No class meeting</strong></td>
<td>Paper due 5 pm through BlackBoard</td>
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**DISABILITY SUPPORT SERVICES (DSS) STATEMENT**

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, Room 128, (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](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.

**ACADEMIC INTEGRITY**

Intellectual honesty is the cornerstone of all academic and scholarly work. Therefore, the University views any form of academic or scholarly dishonesty as a serious matter. Instructors are required to report all allegations of academic or scholarly dishonesty to their Graduate Program Director and the student’s home Graduate Program Director if different. Furthermore, Graduate Program Directors must report all incidents in which a student is found guilty to the Graduate School. Additional details on procedures for hearings and other functions at the judiciary processes are available in the Grievances and Appeals section of the Bulletin ([http://sb.cc.stonybrook.edu/gradbulletin/current/regulations/academic_probation/appeals.php](http://sb.cc.stonybrook.edu/gradbulletin/current/regulations/academic_probation/appeals.php))
Some Topics of Systems Papers (A students, 2009-2017)

Biodiesel Production & Use
A Systems Analysis of Education
Modern Aerial Combat Systems
The Barrier Island Chain
Superorganism Organization in Insect Social Systems
Second Language Acquisition
Systems Thinking in a Coffee Maker
Healthcare Compliance Inc. On-line Compliance Training Software
Passenger Ferry
High School FIRST Robotics Competition
The Marine Corps
Vehicle Stability Systems
Follett Library Software
Island Nursing and Rehab Center
Computer Operating System
Classroom Management
Remediation of MTBE in Nesconset
Smart Buildings
New York State Brownfield Program
Emergency Medical Services
Microsoft Outlook
Automobile Sales Process
Hybrid Cars
Sales Exhibition
Traffic System in Taiwan
Watermark-based Copyright Protection System
Biofuels
Wikis
Web 2.0: the Interconnected System of Independent Interactive Media
Classroom Discipline Plan
Systems Thinking and Consulting
Locating and Accessing Information
The American Economy
Restaurants
The Internet
Dabbawalas of Mumbai
Criminal Justice System of Taiwan
Modern Navigation Bridge
Internet Calling
Smart Classrooms
Banks
The Stock Market
DDC Intranet Training System
The United States Government
Maasai Tribe: Culture, Family, and Age-set System
BNL-CAD: ECI System
Mobile Social Networks
The NFL
Red Light Safety Program
US Patents
The Premier League
OCD: A System Gone Awry
On the Effects of Clean Coal
Software Development
Analysis of Salesforce
Education Governance System -- India
Biomedical IT Systems
Photography
Commercial Aerospace: Airway Transportation Operations
Public Transport System in New Delhi
High Speed Rail as an Integral Part of the Transport System
Net-Flix
Commercial Air Conditioning
School Master Schedule
Advanced Metering Infrastructure
Sunday Sauce System
Systems Theory and Social Science: A Music Program with a Social Purpose
Vehicular Traffic
System of Systems: Complex Systems in the US Military
The FBI
An e-Commerce Website
Brookhaven National Laboratory's Quality Management Office
Prescription Refill Process
Steve Jobs
Town of Islip Lifeguard Corps’ Emergency Action Plan
Positive Behavioral Interventions and Support
Competitive Running
Energy Storage System for Wind Energy in South Korea
Energy-from-Waste Direct Combustion
Remote Patient Monitoring
Backlight and Ambient Light Sensors
Learning an Instrument
Commercial Banking in China
Toy Locomotives
Cruise Control
Basketball Teams
The Failure of Biosphere 2
Resilience in Forest Fire-based Ecosystems
Motorcycles
Online Ticketing
Recruitment Function of a Company
Cold and Hot Water Dispensers
Mangrove Ecosystem
US Congress
Cooking Spaghetti and Meatballs
Mulberry/Cane Dyke Fish Pond Ecosystem
Playing the Violin in an Orchestra
Agricultural Greenhouses
Toyota Star Safety System
How Amazon Works
Ultimate Frisbee
Energy and Nutrition Level of a Pond Ecosystem
Ultrasonic Humidifier in Human Daily Life
Social Network Gaming and Psychological Addiction
Mini Waffle Maker
Security System within a Home Automation System
Agile Web Development
Yellowstone National Park
Autonomic Nervous System
Bitcoin
Bicycle Drivetrain System
Engineering Design Process
Geographic Information Systems
Safety System of a Boiler in a Coal-fired Power Plant
Governmental R&D in South Korea
Wuxing
Korea Natural Gas Industry
Finding Roadside Bombs in Iraq
Foreign Currency Risk Management
Tire Pressure Monitoring System
Anti-lock Braking
Classroom Behavior Management
Taiwanese Student Association
Manufacturing Facilities
Insiders’ Point of View of Public Schools
Quality Management in CETC Organizations as Systems: Veda International Corp.
The End of One Child Policy
Age of Monkey Man
Road Rage
Arms Race System
Population and Environment of Easter Island
Cognitive System

China’s Population System and Government’s Practice to Control It
Inkjet Printers
The Electric Power System
Personal Decision Making
System of Love
Magnetic Pendulum
Staff in Purchasing Department of Goodbaby Co.
Global Climate Change
Ponzi Schemes
Uber System Analysis
The Mahjong System
Micros Point of Sale System
Inventory Management
Football Defense
What is a Marriage and How is It Defined
Acupuncture as a Complex System
Baymax System
Machine Learning as a System
Taobao Online Shopping
Driving as a System
Mountaineering on Mount Everest
Logistics System of Amazon
Subsystems at Ski Resorts
3-D Printing
Acceleration-Deceleration in Automobiles
Promoting E-learning in Korea
Classroom as a System
Web 2.0
Dancing Musical Fountains
3 Gorges Dam
Brewing Beer
Algorithmic Trading
Beijing Subway System
Google Driverless Cars
Chorus as a System
Earth’s Climate System
Victorian Tea Festival
Columbia Electric System
Weight Management
Microsoft Excel Workshop
Enterprise Resource Planning
Forest Ecosystem
Google Drive as a Complex System
NYC Subway System
Tencent Classroom Platform
Traditional Chinese Medicine
Oceans and Climate Change
Systems Thinking at a University