Systems, Governance and Sustainability
SUS 3250, Florida Institute of Technology

Course Information
Days/Time: 12:30-1:45, Tue and Thur., Shepard Bldg., Rm 108
Pre-requisite for undergraduates: SUS 1500, Introduction to Sustainability
Instructor: Dr. K. Lindeman, Professor, Dept. of Ocean Engineer. & Marine Sciences
Office and Hours: Rm 103 Shepard Bldg., Tue: 1400-1600; Wed, 1300-1700; Thur 1400-1630

Course Description:
The goal is to learn and further explore combinations of tools that can advance innovations in sustainability among complex socio-economic and environmental systems. Principles of governance are examined and integrated using tools that include complexity theory, cybernetics, resilience, behavioral economics, political ecology, social networks, and risk-based decision assessment. Practical applications towards managing self-organizing systems including functioning socio-political systems will be made at local through international scales.

Operational features of system sustainability are emphasized including stocks and flows, feedback loops, limits, response delays, orderly and chaotic perturbations, networks and modularity, resilience and adaptive capacity, system traps, shifting dominance of feedback, tipping points, and post-transition system behaviors. Best practices in maintaining systems through non-equilibrium processes including resilience, complex adaptive theory, and learning organizations are examined. The management of emergent properties and other guaranteed surprises is evaluated using examples from economic, environmental, and social capital. Means to identify, measure, adapt and communicate performance indicators of sustainability are examined in government, business, and non-profit systems.

Textbook:
- Capra, F. and P.L. Luisi. 2014. *The Systems View of Life.* Cambridge Univ. Press. 551 pp.

Additional Reading:
- Senge, P. 2006. *The Fifth Discipline.* Crown Business Publishers. 446 pp.
- Meadows, D. 2008. *Thinking in Systems.* Chelsea Green Publishing. 218 pp.
- Worldwatch Institute. 2014. *Governing for Sustainability: State of the World 2014.* Island Press, Washington, DC. 295 pp.
- Norberg, J. and G.S. Cumming. 2008. *Complexity Theory for a Sustainable Future.* Columbia University Press. 315 pp.
- Walker, B. and D. Salt. 2006. *Resilience Thinking: Sustaining Ecosystems and People in a Changing World.* Island Press, Washington, DC. 174 pp.
- Espinosa, A. and J. Walke. 2011. *A Complexity Approach to Sustainability: Theory and Application.* Imperial College Press, London. 361 pp.

The course will also include journal research articles; government, industry, and NGO reports; and articles from web and print media. Readings will be posted on Canvas.

Grading:
50% Homework, much is in support of the systems analysis project
25% Midterm
25% Final exam

Student Learning Outcomes include

- Familiarity with the history and principles of system dynamics and associated fields as applied in sustainability and governance.
- Understanding of challenges and opportunities for applications of system sciences and cybernetics in real-world governance.
- Recognition of the inherent non-linear and chaotic properties of complex adaptive systems and tools for resilience.
- Ability to interpret the roles of cultural conditioning and other socio-economic drivers in complex systems decision-making.
- Knowledge of basic political components of governance, and factors that may or may not limit the application of sustainability sciences.
- Experience with the measurement of system performance utilizing indicators and other tools.
- Improved critical reading and writing skills