

**Complexity in Public Policy & Management**  
*Analysis for Adaptive Complex Public Enterprises*  
School of Public Affairs  
Arizona State University

**Fall 2008**

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Class Hours:           Thursdays, 5:40-8:30 pm  
Class Location:       Phoenix, UCENT 253  
Class Website:        Blackboard (<http://my.asu.edu>)

Instructor:            Yushim Kim, Ph.D.  
Email:                 ykim@asu.edu  
Office:                 411 N. Central Ave, Ste 445 (Phoenix)  
Office hours:         Thursday 3:00-5:00 pm, and by appointment

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*“The question for research agendas in the 1990s is, Are current research approaches sufficiently subtle and complex to sense and make sensible the subtleties and complexities of organized social action in an increasingly interdependent and turbulent global environment? The answer seems obvious. No one pattern of subtlety and complexity is anywhere near sufficient. The only way we can generate the requisite complexity to grasp the complexity that surrounds us is to become an inquiring community in which there is respectful complementarity, integration, listening to one another, an ethic of mutual helpfulness, and nonstop conversation” (Weick, 1992)*

### **Course Objectives**

The objective of this seminar is to examine complexity in public enterprises. The course will cover the key properties of complexity sciences, especially those that provide insights for public affairs. Students will have an opportunity to develop alternative perspectives that are helpful to define and critically analyze complex problems right now.

That the world we inhabit is complex is not a new idea. The novelty is that (1) we now have a better understanding of complexity and chaos, (2) we have an enhanced ontology to name, represent and explain the underlying concepts, (3) we now also have the computational capacity and wherewithal to model these complexities and generate simulations that mimic some of the complexities that we have observed, and (4) we are beginning to acquire an ability to generate plausible futures, without necessarily being able to predict precise outcomes. This course invites you to this new adventure.

## Course Format

The general format of this course includes reviews of reading materials and discussions. Prior to each class, students are expected to read the required texts and articles. Students are responsible for content included in the readings, even if it is not explicitly reviewed in class. Students are expected to participate actively in class discussions. We will also have guest speakers share with us relevant ideas to which they have contributed serious thought. This will provide opportunities for students to discuss course topics with them. Assignments include weekly readings, memos, class participation, and a research design. The assignments are explained in more detail below.

## Readings (Textbooks)

Simon, H. A. (1996). *The sciences of the artificial* (3<sup>rd</sup> Ed.). Cambridge, MA: The MIT Press.  
 Toulmin, S. (2001). *Return to reason* (2<sup>nd</sup> Ed.). Cambridge, MA: Harvard University.  
 Douglas, K. L. (1994). *Managing chaos and complexity in government*. San Francisco: Jossey-bass Publisher.

We will also read various articles and excerpts during the semester.

## Grading

### *Final Grade Determination:*

There will be no incompletes given, with the exception of serious *unexpected* events that prevent course completion. If I find that your progress is unsatisfactory, I will inform you in person or via email in the middle of the semester. Your final grade will be based on the following assignments:

- |                                   |     |
|-----------------------------------|-----|
| 1. Reading Memos                  | 50% |
| 2. Research Design                | 20% |
| 3. Class Participation/Discussion | 30% |

Letter grades will be given. Substantively, A indicates excellent, B indicates average, and C indicates below average. For graduate students, grades of C and D lead to failure of the course. To earn above a B, you should present excellence beyond the requirements.

## Class Assignments & Evaluations

### *1. Reading Memos/Discussion [50%]*

I expect you to be critical on weekly readings and to share your understanding with others. At minimum, there should be two components in each memo. First, I provided weekly questions in this syllabus. Please read weekly readings and answer the questions in an essay format. Don't frequently recite statements in readings. You should assume that I have read the materials. Try to provide your perspective on the questions based on the theme of weekly readings. Second, you must write two questions at the end of your memo. What questions are raised during/after the weekly readings? You should study unfamiliar concepts by yourself using various resources (i.e. internet, books, and other faculties) before the class. Appropriate questions might be on the issues,

problems, limitations, and weaknesses of the readings and their applications. All of us will discuss these questions in class.

**Format:** You must submit the memo to me using the Digital Drop Box before every Wednesday, 5:00 pm. Single-space and 12-point font size. No cover page is needed. There is no limit on the number of pages in each memo. My general experience is that *the longer the memo, the lower the quality*.

## **2. Research Design [20%]**

In this assignment, there is no restriction on research subjects as long as it touches some part of public affairs. It can be topics in organization, management, or public policy. The main point of this assignment is to examine a topic in an area from an alternative perspective. In other words, you must design your research based on concepts, models, or frameworks we discussed in the class. There is also no restriction on scope, format, or content for this assignment. Each individual can make progress depending upon their understanding of complexity. At a minimum, you must specify a problem, a research question, and an idea on how you will design your research to answer your question from the complexity perspective. You can also explain how your research design is different from previous inquiry and what values your approach will add to the body of knowledge in the area. We will review and discuss your research design in class during the last three week. You will refine your research design based on comments and discussions.

**Format:** Same as the reading memo assignment except that you must submit the assignment to me using the Digital Drop Box no later than 5:00 pm on November 13, November 20, and December 4, 2008.

## **3. Class Participation [30%]**

You will be expected to complete all required reading assignments prior to the class meeting. Your attendance, participation in class discussions, and discussions with me via e-mail or during office hours will influence your participation grade. I value good attitude, passion, and process in the learning environment. If you wish to have clarification of anything that you read or hear in class but do not wish to ask a question in class, send me an email and I will respond to it in the following class session.

I am fully aware that speaking among a group of strangers is often an anxiety-producing experience. However, each student will be asked to contribute to the learning process through discussion. No one will be allowed the luxury of passive anonymity. I want to assure you, therefore, that your thoughts and opinions will always be treated with respect.

I also understand that some of you might be out of town during the semester. Your absences due to work-related issues will not influence your grades on assignments besides participation. If you miss the class more than twice this semester, the best participation grade you will get is a B.

### Schedule of Topics

| <b>Week</b> | <b>Date</b> | <b>Topic</b>                            | <b>Event</b>  |
|-------------|-------------|---|---|
| 1           | 8/28        | Introduction, Built and Natural Systems |   |
| 2           | 9/4         | No Class                                | Minnowbrook III Conference                              |
| 3           | 9/11        | Epistemology                            |   |
| 4           | 9/18        | Rationality                             |   |
| 5           | 9/25        | Complexity                              |   |
| 6           | 10/2        | Scale                                   | Nan Ellin (1 hr)<br><i>Integral Urbanism</i>            |
| 7           | 10/9        | Emergence                               |   |
| 8           | 10/16       | Units of Analysis                       | Edgar Ramirez (1 hr)<br><i>Network Analysis</i>         |
| 9           | 10/23       | Modeling (I)                            |   |
| 10          | 10/30       | Wicked Problems                         |   |
| 11          | 11/6        | Modeling (II)                           | Erik Johnston   |
| 12          | 11/13       | Complexity in PA (1)                    | Rick Shangraw (1 hr)<br><i>Complex Adaptive Systems</i> |
| 13          | 11/20       | Complexity in PA (2)                    |   |
| 14          | 11/27       | No Class                                | Thanks-giving   |
| 15          | 12/4        | Complexity in PA (3)                    |   |
| 16          | 12/11       | Discussion                              |   |

## Reading Assignments

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### Week 1 (8/28): Introduction & Built and Natural Systems

Introduction - Syllabus

We will explore the distinction between built and natural systems.

François, C. (1999). Systemics and Cybernetics in a historical perspective. *System Research and Behavioral Science*, 16, 203-219.

Simon, H. A. (1996). Chapter 1: Understanding the natural and artificial worlds, 1-24.

Hon, G. (1999). Does a living system have a state? In A. Rojszczak, J. Cachro, & G. Kurczewski (Eds.), *Philosophical dimensions of logic and science*. Boston: Kluwer Academic Publishers, 139-150.

Ackoff, R. L. (1999). Reflection on systems and their models. *Systems Research*, 13(1), 13-23.

*Questions 1:*

1. Define systems and provide an example
2. Are built systems different from natural systems?
3. What should be the evaluation criteria for scientific activities when we accept your answer for Q2?

#### **References**

Bertalanffy, L. (1968). *General system theory*. New York: George Braziller

Ashby, W. R. (1952). *Design for a brain*. London, UK: Chapman & Hall Ltd.

Wiener, N. (1948). *Cybernetics: or control and communication in the animal and the machine*. Cambridge, MA: The MIT Press.

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### Week 2 (9/4): No Class (Minnowbrook III Conference)

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### Week 3 (9/11): Epistemology

In light of bounded rationality, the broader definition of evidence and the role of modeling outputs as a source of knowledge, we will revisit our epistemological stance. We will clarify our understanding of knowledge creation and sense-making.

Ackoff, R. L. (1999). Chapter 22: The nature of science and methodology. *Ackoff's Best*. New York: John Wiley & Sons, 293-310.

Ackoff, R. L. (1999). Chapter 23: Objectivity. *Ackoff's Best*. New York: John Wiley & Sons, 311-312.

Lundberg, C. C., & Young, C. A. (2005). Introduction: Themes and exemplars, *Foundation for inquiry: Choices and trade-offs in the organizational sciences*. Stanford, CA: Stanford University Press, 1-8.

Lundberg, C. C., & Young, C. A. (2005). Choices about reality and knowing, *Foundation for inquiry: Choices and trade-offs in the organizational sciences*. Stanford, CA: Stanford University Press, 84-115.

Hildebrand, D. (2008). Public administration as pragmatic, democratic, and objective. *Public Administration Review*, 68(2), 205-406.

*Questions 2:*

1. *Distinguish symbol, data, information, knowledge, and evidence*
2. *What is the legitimate way of building knowledge on built systems and what are limitations of the approach?*
3. *Explain the relationship between knowledge and actions*

### **References**

- Lundberg, C.C., & Young, C.A. (2005.). *Foundations for inquiry: Choices and trade-offs in the organizational sciences*. Stanford, CA: Stanford University Press.
- Maturana, H. R., & Varela, F. J. (1987). *The tree of knowledge: The biological roots of human understanding*. Boston: Shambhala.
- Bateson, G. (2002). *Mind and nature: A necessary unity*. Cresskill, NJ: Hampton Press.
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### **Week 4 (9/18):           Rationality**

It is commonly acknowledged that we function under some form of bounded rationality and that deviations from that rationality are systematic. However, most of the work done in policy sciences focuses on procedural and economic rationality. Little attention is paid to other types of rationality; for instance, political, legal, communicative, or ethical rationalities often offer richer explanations of human behavior than one obtained from the perspective of individuals acting in their economic self-interest.

- Ackoff, R. L. (1999). Chapter 24: Rationality. *Ackoff's Best*. New York: John Wiley & Sons, 313-314.
- Simon, H. A. (1996). Chapter 2: Economic rationality: Adaptive artifice, 25-50.
- Toulmin, S. (2001). *Return to Reason*. Cambridge, MA: Harvard University Press.

#### *Question 3:*

1. *Pick a policy issue that is related to undesirable human behavior in current norms*
  2. *Identify and define different forms of rationality that need to be considered to explain the behavior*
  3. *Pick a form of rationality among the answer in question 2 (except economic and procedural rationality). How can we operationalize the form of rationality to explain the behavior?*
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### **Week 5 (9/25):           Complexity**

We will begin by subscribing to Simon's conjecture that complexity can emerge out of simple decision rules, procedures and organizations interacting with complex environments.

- Weaver, W. (1947). Science and complexity. *American Scientist*, 36, 536-544.
- Anderson, P. W. (1972). More is different. *Science*, 177, 393-396.
- Gell-Mann, M. (1995). What is complexity? *Complexity*, 1(1).
- Manson, S. M. (2001). Simplifying complexity: A review of complexity theory. *Geoforum*, 32, 405-414.
- Simon, H. A. (1996). Chapter 7: Alternative views of complexity, 169-182.

#### *Questions 4:*

1. *How are "complex systems" different from simple or complicated systems?*
2. *Explain the relationship between uncertainty and complexity.*
3. *Explain and critique Simon's conjecture.*

### **References**

- Waldrop, M. M. (1992). *Complexity*. New York, NY: Touchstone.

Gell-Mann, M. (1994). *The quark and the jaguar*. New York, NY: W. H. Freeman and Company.

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**Week 6 (10/2):            Scale**

Guest talk: **Nan Ellen**, Associate Professor, School of Public Affairs – *Integral Urbanism*

The scale of the problem matters. Problems can be classified based on scale, in that some problems are inherently fractal and therefore scale independent and there are others that are scale dependent.

Mandelbrot, B. B. (1967). How long is the coast of Britain? Statistical self-similarity and fractal dimension. *Science*, 156, 636-638.

Liebovitch, L. S., & Scheurle, D. (2000). Two lessons from fractals and chaos. *Complexity*, 5(4), 34-43.

Crompton, A. (2001). The fractal nature of the everyday environment. *Environmental Planning B: Planning and Design*, 28, 243-254.

Buchanan, M. (2002). *Nexus: Small worlds and the groundbreaking theory of networks*. New York, NY: W.W. Norton & Company.

Ramanathan, J. (2005). Fractal architecture for the adaptive complex enterprise. *Communications of the ACM*, 48(5), 51-57.

*Questions 6:*

1. Define fractal and scale-free
2. Provide two examples: one that presents scale independent nature and another that presents scale dependent nature.

**References**

Barabasi, A.-L. (2003). *Linked: How everything is connected to everything else and what it means for business, science, and everyday life*. New York, NY: A Plume Book.

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**Week 7 (10/9):            Emergence**

As a property of natural systems, emergence is a powerful evolutionary concept. We will explore its role in built and virtual systems and in particular, its role in systems that have to have accountability and responsibility embedded in them.

Sawyer, R. K. (2005). Chapter 3: The history of emergence. *Social emergence: Societies as Complex Systems*. New York: Cambridge University Press. 27-45.

Goldstein, J. (1999). Emergence as a construct: History and issues. *Emergence: Complexity and organization*, 1(1), 49-72.

Whitehead, A. N. (1938). Lecture Two: Expression. *Modes of thought*. New York: The Free Press, 20-41.

Schumacher, E. F. (1977). Chapter 2: Levels of being. *A guide for the perplexed*. New York: Perennial, 15-25.

Holland, J. (1999). Chapter 1: Before we proceed. *Emergence: From chaos to order*. Cambridge, MA: Perseus Books Group, 1-15.

*Questions 6:*

1. Define emergence and provide an example in built systems
2. How do we know whether there is emergence?
3. Explain the relationship between self-organizing (or emergence) and accountability (or

*responsibility)*

### **References**

- Bak, P. (1996). *How nature works*. New York, NY: Copernicus.  
Strogatz, S. (2003). *Sync*. New York, NY: Hyperion Special Markets.  
Prigogine, I., & Stengers, I. (1984). *Order out of chaos*. New York, NY: Bantam Books.
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### **Week 8 (10/16): Units of Analysis - Network**

Our unit of analysis will be a transaction (Commons, 1931). Transactions will consist of a scale independent triad of request, execution of the request, and delivery of the response to the request. We will explore interaction/interdependency as a legitimate unit of analysis that requires further attention.

Guest Lecture: **Edgar Ramirez**, Assistant Professor, School of Public Affairs – *Network Analysis*

- Commons, J. R. (1931). Institutional economics. *American Economic Review*, 21, 648-657.  
Granovetter, M. S. (1973). The strength of weak ties. *The American Journal of Sociology*, 78(6), 1360-1380.  
Pfeffer J., & Salancik, G. R. (2003). Chapter 1: An external perspective on organizations” *The External Control of Organizations: A Resource Dependence Perspective*. Stanford: Stanford University Press, 1-19.  
Korukonda, A. R. (1989). Mixing levels of analysis in organizational research. *Canadian Journal of Administrative Sciences* 6, 1-7.

#### *Questions 7:*

1. *Define a network (transaction, interaction, or interdependency) based on the readings.*
  2. *How is network research different from systems research?*
  3. *How should we design research when the unit of analysis is a network (transaction)?*
  4. *How is it related to scale in Week 6?*
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### **Week 9 (10/23): Modeling (I)**

We will explore the role of modeling and simulation as a source of knowledge. We will explore the value of artificial society and agent-based modeling to understanding emergence in social systems.

- Mohr, L. B. (1982). Variance and process theories. *Explaining organizational behavior*, 36-38, 43-45.  
Simon, H. A. (1996). Chapter 3: The psychology of thinking: Embedding artifice in nature, 51-84.  
Holland, J. (1999). Chapter 3: Maps, game theory and computer-based Modeling. *Emergence: From chaos to order*. Perseus Books Group, 28-52.  
Macy, M. W., & Willer, R. (2002). From factors to actors: Computational sociology and agent-based modeling. *Annual Review of Sociology*, 28, 146-166.  
North, M. J., & Macal, C. M. (2007). Chapter 5: The role of ABMs. *Managing business complexity*. New York: Oxford University Press.  
Oreskes, N., Shrader-Frechette, K., & Belitz, K. (1994). Verification, validation, and confirmation of numerical models in the earth sciences. *Science*, 263(5147), 641-646.

#### *Questions 8:*

1. *Can simulation/modeling outputs be a source of knowledge?*

2. *Discuss the relationship between modeling, units of analysis, and knowledge.*
3. *Can models of social systems be validated?*

### **References**

Dreyfus, H. L. (1972). *What computers can't do: A critique of artificial reason*. New York: Harper & Row.  
Axelrod, R. (1984). *The evolution of cooperation*. New York, NY: Basic Books.  
Axelrod, R. (1997). *The complexity of cooperation*. Princeton: Princeton Studies in Complexity.

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### **Week 10 (10/30): Wicked Problems**

We subscribe to the notion that the problems we are interested in addressing are wicked in that they do not lend themselves to solutions and must therefore be managed rather than solved.

Rosenhead, J., & Mingers, J. (2001). Chapter 1: A new paradigm of analysis. *Rational analysis for a problematic world revisited* (Rev. ed.). Chichester, UK: John Wiley & Sons, LTD., 1-20.  
Churchman, C. W. (1967). Wicked problems. *Management Science*, 14(4), B-141-142  
Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4(2), 155-169.  
Lawrence, P. R. (1992). The challenge of problem-oriented research. *Journal of Management Inquiry*, 1, 140-142.  
Weber, E. P., & Khademian, A. M. (2008). Wicked problems, knowledge challenges, and collaborative capacity builders in network settings. *Public Administration Review*, 68(2), 334-349.

#### *Question 9:*

1. *Provide an example of wicked problems and discuss why the example is a wicked problem.*
  2. *What would be an effective way of managing wicked problems and why?*
  3. *What could be evaluation criteria when analysis is performed for wicked problems?*
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### **Week 11 (11/6): Modeling (II)**

Guest lecture: **Erik Johnston**, Assistant Professor, School of Public Affairs

Readings from Erik

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### **Week 12 (11/13): Complexity in PA (1)**

Since we have given some thoughts on basic concepts regarding to complexity, we will explore applications of complexity in public affairs.

Guest Lecture: **Rick Shangraw**, Vice President - *Complex Adaptive Systems*

Readings from Rick

A Desai. (2005). Adaptive Complex Enterprise. *Communications of the Association of Computing Machinery*. 48(5), 32-35, 2005.  
Dooley, K. J. (2004). Complexity science models of organizational change and innovation. In M. S. Poole,

& A. H. Van de Ven. *Handbook of organizational change and innovation*. New York: Oxford University Press, 354-373.

Research Design:

Identify a topic in public affairs (i.e. organization, management, or policy) to which the complexity theory can be applied to or brings different insights. Explain why and how.

**References**

Haeckel, S.H. (1999). *Adaptive enterprises*. Boston, MA: Harvard Business School Press.  
Dörner, D. (1996). *The logic of failure*. New York, NY: Basic Books.

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**Week 13 (11/20): Complexity in PA (2)**

Kiel, L. D. (1994). *Managing chaos and complexity in government*. San Francisco: Jossey-Bass Publishers.  
Stacey, R. D. (1992). Chapter 9: Steps Toward Managing an Unknowable Future. *Managing the unknowable*. San Francisco: Jossey-Bass Publishers. pp.186-203.

Research Design (cont.):

Improve your previous design and submit a revised design

**References**

Stacey, R. D. (1992). *Managing the unknowable*. San Francisco, CA: Jossey-Bass.  
Stacey, R. D. (1996). *Complexity and creativity in organizations*. CA: Berrett-Koehler Publishers, Inc.  
Quinn, R. E. (1991). *Beyond rational management*. San Francisco, CA: Jossey-Bass.

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**Week 14 (11/27): No Class**

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**Week 15 (12/4): Complexity in PA (3)**

Moore, M. H. (1983). Social science and policy analysis: Some fundamental differences. In D. Callahan & B. Jennings (Eds.). *Ethics, the social sciences, and policy analysis*. New York: Plenum Press, 271-304.  
Hodges, J. S. (1987). Uncertainty, policy analysis and statistics. *Statistical Science*, 2(3), 259-291.  
Banks, S. (1993). Exploratory modeling for policy analysis. *Operation Research*, 41(3), 435-449.  
Kim, Y., & Desai, A. Operationalizing complexity: The role of agent-based modeling. Manuscript.  
Innes, J. E., & Booher, D. D. (2003). Collaborative policymaking: Governance through dialogue. In M. Hajer & H. Wagenaar. *Deliberative policy analysis*. Cambridge, UK: Cambridge University Press, 33-59.

Research Design (cont.):

Improve your previous design and submit a final design

**References**

Jantsch, E. (1975). *Design for evolution*. New York, NY: George Braziller.  
Morçöl, G. (2002). *A new mind for policy analysis*. Westport, CT: Praeger Publishers.  
Fischer, F., & Forester, J. (1993). *The argumentative turn in policy analysis and planning* (Eds.). Durham: Duke University Press.

**Week 16 (12/11): Summary**

We will discuss what we do, how we do it, and what to do when we understand public affairs from the complexity perspective.

Kaplan, A. (1964). 45. Behavioral science and policy. *The conduct of inquiry*. San Francisco, CA: Chandler Publishing Company, 398-405.

Moss, S., & Edmonds, B. (2005). Towards good social science. *Journal of Artificial Societies and Social Simulation*, 8(4)13 <<http://jasss.soc.surrey.ac.uk/8/4/13.html>>.

*Discussions:*

*What is "good" social science?*

*What is "good" policy science?*

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**Other**

***Academic Integrity***

Both the university and I take issues related to academic integrity very seriously. If you have any questions about how to cite someone else's work, please ask. Though it may be acceptable to cut and paste without attribution into documents or reports, the academic community has a different set of standards in this regard. If I find that a student has plagiarized on an assignment, the possible consequences are: failure on the assignment; failure in the course; course failure with a mark of academic dishonesty, which can not be removed from the transcript; or dismissal from the graduate program. If you fail a class assignment, you can restore some points by working harder in other assignments. However, *once you violate the academic conduct guidelines, there is no way that you can reverse the damage*. Please be alert to the academic integrity guidelines.

**Notes**

1. Please turn off your cell phone before class.
2. Do not expect email response from the instructor during the weekend.
3. No laptops in class.
4. It is your responsibility to check information on the class website.
5. The syllabus is subject to change by the instructor.