

Akita International University
INF260 Information Science (3 credits)

Fall '2009

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Semesters: Fall

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Meeting times: M, W 15:30-16:45

DESCRIPTION: The course introduces students into the concepts and methods of information study, analysis, and management, and acquaints them with a wide range of information related issues in a variety of contexts, including the cultural and social role of information. The introduction into the concepts and methods of information science will provide a solid foundation for the more advanced future study in many possible areas of applications. The skills developed in the course together with the acquired conceptual framework will allow students to comprehend the literature of the disciplines in which information plays the central role (e.g. artificial intelligence, complexity, neuro-psychology, genetics, etc.) Classroom activities and discussions will give students an opportunity to test their competency in information analysis and to deepen their understanding of the subject. The course emphasizes an integrative role of information science in the study of various manifestations of information across a wide range of disciplines.

OBJECTIVES: The objectives of this course can be viewed from the two perspectives. Since it is a course about information, one of its objectives is to introduce students into the new discipline of information science. This means, upon successful completion of the course, students will acquire the conceptual framework of information studies including the concept of information with its diverse meanings, the concepts of information processing, communication, computation, measures of information, etc. They will learn the rudiments of the methods used in studying phenomena and processes involving information in the disciplines such as theoretical computer science, artificial intelligence, psychology or cognitive science, sociology of information, economics of information, etc.

The course has also objectives going beyond the subject matter. Since information has multiple manifestations in practically all domains of human intellectual or practical activities, the course presents the unified view of the central concept of information in the multiple contexts of its applications. Thus, in the second perspective, crucial for the Liberal Arts education, the course is intended as a demonstration of the unity of intellectual inquiry across the physical sciences, social

sciences, psychology, and humanities. Students should acquire this view of intellectual inquiry, and should be able to search for this unified perspective in their studies of other themes.

STUDY MATERIALS:

<**Textbook**> Information Science is a new discipline in the process of consolidation from the interdisciplinary studies with diverse methods and interests. There is no textbook which could meet the demands of the course. Instructor will prepare materials for classes either in the form of handouts, or in the form of information regarding appropriate sites on the internet.

<**Reference books, sources of readings and other information**> For each topic studied in this course, there are extensive literature resources with different levels of difficulty and different levels of necessary preparation. In the following there is a short list of readings which are easily comprehensible without any specific prior preparation and which are related to the content of classes. The mandatory readings will be announced and/or distributed in the classroom. Please ask the instructor about more advanced texts regarding topics of special interest for you, if you want to expand your knowledge beyond the requirements of the course. The following is a sample of books which develop the themes of the course.

Tom Siegfried “*The Bit and the Pendulum.*” Wiley, New York, 2000.

John R. Pierce “*An Introduction to Information Theory: Symbols, Signals and Noise.*” 2nd rev. ed. Dover, New York, 1980.

Simon Singh “*The Cracking Codebook.*” Harper Collins, London, 2004.

Arne Dietrich “*Introduction to Consciousness.*” Pallgrave Macmillan, New York, 2007.

Gary Marcus “*The Birth of the Mind.*” Basic Books, New York, 2004.

Roger Penrose “*The Emperor’s New Mind.*” Penguin, New York, 1991.

Roger Penrose “*Shadows of the Mind.*” Oxford University Press, Oxford, 1994.

Wolfgang Hofkirchner (Ed.) “*The Quest for a Unified Theory of Information.*” Gordon and Breach, Amsterdam, 1999.

Roger R. Flynn “*An Introduction to Information Science.*” Marcel Dekker, New York, 2000.

ASSESSMENT: Student achievement of the course objectives is being measured in terms of student performance on the midterm test (25%), through the evaluation of homework assignments (25%) a major written assignment (25%) and its presentation in the class (25%). Active participation in the class discussions will provide an opportunity to earn extra credit points (up to 10%) which can compensate the loss of points in assignments or the test.

ACADEMIC PREPARATION: There is no expected academic work at the college level preparing for the course. Although there will be frequent reference to the basic knowledge of several disciplines such as biology, history, psychology, computer science, physics, each time instructor will make an introduction reviewing the high school knowledge necessary for understanding. Genuine interest in the matters related to information and willingness to participate in the discussion of these matters will be of higher importance than the prior academic preparation.

POLICIES: Acts of cheating or other forms academic dishonesty will be dealt with harshly. Students may work together on their assignments or preparation for classes, but every student must prepare individually and without help of others his/her assignments. Attendance in all classes is mandatory, whether it is being checked by instructor, or not.

It is student's responsibility to submit all assignments by the announced deadlines.

COURSE FORMAT AND ACTIVITIES:

Generally, class sessions have format of lectures with frequent interactions between the instructor and students in form of questions and answers, with some regularly scheduled time for discussion in which all students are expected to participate. Students will have an opportunity to influence the proportion of time allocated for the topics considered in the course by asking questions regarding the issues of special interest for them.

In the second part of the course, each student will select a topic for his or her own study going beyond what was done in the class (with approval and advice of the instructor). Based on this study, he or she will write a paper and will make a short presentation of this paper in the class. Instructor will explain his expectations regarding the size, format, and style of the paper. The general rule is that the volume of the paper is of secondary importance. Even short, but informative and interestingly written paper can get high evaluation, while a long paper inflated by multiple quotations, but without student's own analysis or other significant contributions may get lower grade.

After each class, students are asked to write a conspectus summarizing the content of the class with the focus on the definitions or descriptions of the concepts introduced, main questions asked and answers given to these questions. Although these entries to the journal will not be evaluated by the instructor, they will be of great value for students in their preparation for the next class.

SCHEDULE: The weekly schedule may be modified according to specific interests of students. The initial design of the course themes is as follows.

Week 1: Introduction

- Explanation of the expectations from the side of the instructor and from the side of students.
- Review and modification of the course plan based on the interests of students.
- What is information? Why is it so difficult to answer this question?
- Search for diverse manifestations of information across the academic disciplines and in everyday experience.
- The relationship of the concept of information to other concepts such as knowledge, communication, etc.

Week 2:

- The beginnings of information/communication studies: From Morse to Shannon.
- How to measure transfer of information?
- From the telegraph to the limits of human perception.
- The Magical Number Seven (Plus Minus Two).

Week 3: Other Origins: Cryptography

- Codes and ciphers.
- Deciphering forgotten scripts.
- How to hide a message?
- How to send a message?
- The telegraphic message which involved the US in a world war.
- Enigma
- The case of Phil Zimmermann. What is more important: privacy of citizens or effective control of criminal activities?

Week 4: Language and Logic

- Signs and symbols.
- What is logic?
- Semiotics and its subdisciplines.
- Boolean algebras and logic as calculation.

Week 5: Computers and Computer Information Processing

- What is actually computer doing?
- History of computation from the abacus to Microsoft.
- Analog and digital information.
- Turing machines.
- Computer architecture and design.

Week 6: Biological Information Systems – Genetics

- DNA, double helix, and the inherited information
- Evolution

- From “monkey trial” to “Kitzmiller vs. Dover”
- Emergence

Week 7: Biological Information Systems – Information networks in a living organism

- Neural and hormonal transmission of information
- Neurons, synapses, microtubules
- Human brain
- The mechanisms of sensory perception

Week 8: Review and Midterm

Week 9: Consciousness and AI

- What does it mean “thinking”?
- Can machine think?
- Models of cognitive processes.
- Artificial neural networks

Week 10: Information is physical

- The Second Law of Thermodynamics
- Entropy
- Maxwell’s Demon.
- Humans as “informavores.”
- Solar battery for the eco-system.
- Can computer work without a source of energy?
- Quantum computer.

Week 11: Culture and Information

- Cultural differences in information processing.
- Information society.
- Marshall McLuhan’s “global village”.
- Social information networks.
- The Internet.

Week 12: Information perspective on Art and Music

- Alternative view of information.
- Integration of information.
- Information and aesthetics.
- “Random” music.

Week 13: Search for connections between different forms of information

Week 14: Presentations

Week 15: Final version of the major written assignment.