

Syllabus**Indiana University****School of Informatics****I101: Introduction to Informatics**

Spring 2003, Section 6899/6903

Lecture: M/W 1:00-2:15/4:00-5:15, BH310 /WH009

Course website: http://informatics.indiana.edu/courses/i101_ekbia**Instructor:** Hamid R. Ekbiae-mail: hekbia@indiana.edu

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Associate Instructors:

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Monday 7:00-9:00 PM, Informatics 304

Required Reading: Course packet (obtainable at Mr. Copy, E. 10th St., west of Indiana Ave.) and other online material listed in the table of contents.**Auxiliary Reading:** The Computer Desktop Encyclopedia by Alan Freedman (could be obtained from IU bookstore)Course Description

This course is designed to introduce information technology (IT) and its art, science, and human dimensions to students who intend to have Informatics either as a major or as a cognate. In addition to a preliminary introduction to this new field, the course covers some of the basic concepts, topics, and technologies that students are going to use, study, or work with in the future. The course does *not* presuppose any prior knowledge of computers on the part of the student, except for basic keyboarding skills. By the end of the semester, the student should have a basic understanding of IT and the way it could be used for problem solving and communication in different contexts. They should also have a basic understanding of the personal, organizational, and social issues brought about by ubiquitous use of IT. The course includes a separate lab/discussion session that takes place once a week. Lab projects involve minor computer assignments that could be typically completed during the lab session.

Grade

The final grade will be based on

- Class participation (100)
- Homework (150)
- Lab (200)
- Two midterms (250)
- Final exam (300)
- Bonus (100)

Students can obtain as much as 100 bonus points based on additional reading/writing work performed as part of their assignments. *Hard work, honesty, helpfulness, and humility* throughout the semester and in relation to others will be rewarded in this course.

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Participation: Students are expected to take active part in class and lab discussions. Since some of the assignments are given on a group basis, teamwork and cooperation among the group members is also important. Taking advantage of instructor and AI's office hours is strongly recommended.

Assignments will be given every other week on Monday, and are due one week later. **Late hand-in** will be penalized by 5% for each day of delay for a maximum of 3 days, after which it will not be accepted except under documented emergency situations. As a bonus, the lowest-grade assignment will not be included in the final grade. The two **midterms** will be taken on Feb. 19 and April 7th.

Schedule

(1st page: up to first midterm)

Wk 1 (Jan 13/15): *Putting Things in Perspective*

(Read: Aspray 2003)

- Why Informatics?
- A brief history of computing and IT
- Common mistakes about technology
 - Technology as magic bullet
 - The Productivity Paradox
 - *Informatics: an answer?*
- We shape technology and technology shapes us

Wk 2 (Jan 20/22): *Numbers*

(Read Hofstadter 1985 & Wakerly 2002)

- Number savvy
 - Order of magnitude & exponential growth
 - KILO, MEGA, GIGA
 - Typical numbers for computer speed, memory, etc.
- Number systems
 - Tally, Binary, Decimal, Octal
- Bits, bytes, words, etc.
- Moore's Law

Wk 3 (Jan 27/29): *Propositional Logic*

(Assignment I due)

- Basic operators (AND, OR, NOT)
- Declarative statements
- Conditional and biconditional
- Truth tables
- Contradiction, tautology

Wk 4 (Feb. 3/5): *Digital Computers*

(Read Prosser & Winkel 1987)

- Analog and Digital
- Logic Circuits
 - Basic operators (AND, OR, NOT)
 - Translation to/from Propositional Logic
- Basic von Neumann computer architecture
 - CPU, memory, storage devices, peripherals

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Wk 5 (Feb. 10/12): Structures

(Assignment II due)

- Flow charts
- Algorithms
 - Brute-force
 - Greedy
 - Recursive

Wk 6 (Feb. 17/19): Models

- Formal vs. informal
- Physical vs. Logical
- Functional vs. object-oriented

Schedule(2nd^t page: second midterm)**Wk 7 (Feb.24/26): Sets and Probability**

(First midterm exam)

- Basic set theory
- Basic probability theory
- Decision trees
 - Deterministic vs. non-deterministic

Wk 8 (March 3/5): Relational Models

(Assignment III due)

- Relational data bases
- Queries
- SQL

Wk 9 (March 10/12): Basics of Information Theory

(Read Touretzky 2002)

- Models of Information
 - Shannon
 - Elements: sender, receiver, encode, decode, channel, noise)
 - Probability and entropy
 - Speed vs. correctness
- Data, Information, Knowledge

WK 10 (March 24/26): Reasoning & Problem-solving

(Assignment IV due)

- Search and problem space
- Algorithm vs. heuristic
- Utility Analysis (simple and multiple)
- Flaws and fixes of reasoning

Wk 11 (March 31/April 2): Networks

(Read Bates & Gregory)

- Topologies (LAN, WAN, MAN)

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- Elements (server, client, router, bridge, gateway)
- Protocols (OSI, TCP/IP, WAP)
- IP addresses (Class A, B, C)

Wk 12 (April 7/9): *The World Wide Web*

(Midterm exam II)

(Read Castells: Lessons from the History of the Internet)

- History
- Operations and governance
- Global issues
- E-commerce

Wk 13 (April 14/16): *IT in Action*

(read Waltz 1996 & Kim 2002)

(Assignment V due)

- Artificial Intelligence
- Bioinformatics
- Computer Art
- Human-computer interaction

Wk 14 (April 21/23): *Security, Privacy, and Ethics*

- Encryption
 - Brute force
 - Formulaic
- Hacking
 - Open Source (the case of LINUX)
- Privacy and liberty
 - Spam
 - Health
 - Finance

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Wk 15 (April 28/30): *IT in Society*

(Assignment VI due)

(Read Kling 1997)

- Social dynamics of IT
- Organizational impacts
- Economic aspects

Readings

Course syllabus and schedule

Aspray, William (2003). "Computer Science and the Computer Revolution", pp. 598-614 in Mary Jo Nye, ed., *The Cambridge History of Science Volume 5: The Modern Physical and Mathematical Sciences*. Cambridge University Press.

Hofstadter, Douglas R (1985). "On Number Numbness." In *Metamagical Themas*. Basic Books. (pp. 115-135)

Wakerly, John F. (2002). "Number Systems and Codes." In *Digital Design: Principles and Practices* (3rd edition). Prentice Hall (pp. 25-34)

Prosser, Frank and David Winkel (1987). "The Art of Digital Design." (Chapter 3)

Touretzky, David S (2002): "Basics of Information Theory."
<http://www-2.cs.cmu.edu/~dst/Tutorials/Info-Theory/>

Bates, R. & Gregory, D (2001). *Voice & Data Communications Handbook*, 4th Edition, 2001

Castells, Manuel (2001). "Lessons from the History of the Internet." In *The Internet Galaxy: Reflections on the Internet, Business, and Society*. Oxford University Press (pp. 9-35)

Waltz, David L. (1996). "Artificial Intelligence: Realizing the Ultimate Promise of Computing." NEC Research Institute and the Computing Research Association.
<http://www.cs.washington.edu/homes/lazowska/cra/ai.html>

Kim, Junhyong (2002). *Computer Are from Mars, Organisms Are from Venus*. In IEEE Journal
<http://www.dlib.computer.org/co/books/co2002/pdf/r7025.pdf>
(Other related articles at: r7034. pdf, r7041.pdf, r7055.pdf)

Kling, Rob (1997). "Computers as Tools and Social Systems: The Car-Computer Analogy". In Kling, Rob (ed.), *Computerization and Controversy: Value Conflicts and Social Choices*. San Diego: CA. Academic Press. (pp.16-21)