Introduction to Informatics I101 is an exciting class that enables the student to learn about and utilize problem solving techniques and technology. There is a computer laboratory that supplements the lecture materials.

Informatics is about problem solving with technology. We investigate what “problem solving” means as a process. We learn how to become better problem solvers by learning and applying different techniques. Students will also learn about IT from the bit to the internet. The laboratory works in concert with the lecture. The laboratory culminates with the creation of a web-based portfolio from which all future work can be posted. The lecture outline and laboratory outline are presented next.

The Lecture Outline

Introduction to Informatics

- motivation
- definition
  - solving problems with technology
  - adding “structure”
    - verify
    - reproduce
    - atoms + rules for building
    - syntax—properly built
    - semantics—what the structure means
- compare & contrast with other disciplines
- challenge is to capture reality digitally—many times faced with capturing analog information with digital
- Analog vs. Digital

Problem Solving

- motivation
- definition
  - change in state of affairs from current to possible
  - solution is the path
- problem solving sins
- process of problem solving
- application

Problem Solving—the “Problem Statement”

- motivation
- definition
  - the “problem statement” delineates the set of solutions pursued from those that aren’t
  - significance
- techniques to create or discover the correct problem statement
- application

Problem Solving—Algorithms vs. Heuristics

- motivation
- definition
  - desirability of algorithm, likelihood of heuristics
  - resources used in problem solving
    - money, people, space, time, ...
  - “Brute force” as a first example of algorithm
  - “Russian Peasant” multiplication as a second example of algorithm
  - Introduction of flow chart elements—another example of structured reasoning
    - var <= expression; PRINT var; GET var;
    - operation; branch; I/O

Capturing Reality Digitally

- motivation
- definition
  - (digital) numbers as a working example
  - examine what is a number
    - tally
    - different bases
• convert from base $x$ to base 10—algorithm
• convert from base 10 to base $y$—algorithm
• draw attention to binary, octal, hex
• can “build” larger algorithm from two smaller algorithms
  o to convert from base $x$ to base $y$ use two algorithms learned previously
  o using flow chart show how to convert from base 10 to base $x$

Problem Solving—Making Language Precise: Propositional Logic (PL)
• motivation
  o natural language vs. artificial (mathematical)
• definition
  o structure + reasoning = logic
  o syntax and semantics
• operators $\land$, $\lor$, $\neg$, $\rightarrow$, $\oplus$, $\leftrightarrow$
• meaning
• truth tables
  o exhaustive listing of input values with output
  o related to digital (count in binary for all possible inputs)
• tautology, contradiction
• translation from English to PL and PL to English

Technology—HTML
• motivation
• definition
• XHTML
  o Syntax and semantics
  o Browsers
  o File vs. image
• TAGS
• File formats

Problem Solving: Algorithm Weighted Ranking
• motivation
• definition
  o means of ordering best solutions by uniformly applying most important criteria
• application

Problem Solving & Technology—Gates
• motivation
• definition
• a different formalization of PL
  o syntax and semantics
• Translate from PL to gates and gates to PL
• Translate from English to gates and gates to English
• means of capturing reality digitally
• example of problems
  o majority vote of three people
  o bit adders
• Introduction to computer architecture
  o CPU
  o Bus
  o Memory (captured with gates)
  o Video

Utility Analysis
• motivation
• definition
• Sets
  o syntax and semantics
  o operators $\cap$, $\cup$, $\epsilon$, $\neg$, powerset
  o predicates $\exists$
• Models
  o Deterministic
  o Random
• Probability
  o Sample space
Introduction to Informatics

I101 General Syllabus Outline 2003 Dalkilic

- Events (subsets)
- Measure on subsets
- Build sets using operators
  - Actually PL
  - Every set operator has equivalent PL operator
- Utility function
- Bringing the parts together for Utility analysis

Problem Solving—More Models
- Motivation
- Definition
- “Database”
  - purpose
  - relational model
    - structure
    - queries
- Linear Model (least squares)
- Shannon’s Model of Communication
  - Concept of “interestingness” (no mathematics)
  - Sender, Encoder, Channel, Decoder, Receiver
  - Bit as a unit of currency (tie into previous work)
  - Entropy
  - Speed vs. Correctness

Technology
- motivation
- Computer
  - Architecture
- OS
- Networks
  - motivation
  - definition
  - physical vs. logical
  - Model: OSI
  - architecture
- Internet
  - General architecture

Bringing It Altogether
- Problem solving with technology
  - Bioinformatics
  - HCI
  - New Media
  - Health Informatics
- New Frontiers
  - RF tags
  - “smart paper”
- Social Impacts of IT
  - Ethics
  - Law
The Laboratory Outline

Getting Connected at IU: Mail and MS Outlook

Getting Connected at IU: Accounts
- SSH, SFTP
- Security
- OS
  - UNIX (Solaris)
  - Windows XP
- CFS

Resources: Word Processing
- Notepad, MS Word
- format
- Creating, Editing, Saving, Printing
- Page numbers, Images, Tables

Technology: Steel Account (Solaris)
- UNIX
- Picking a shell
- Commands
  - Word processing with Emacs
    - .emacs
    - directories
    - files

Technology: Web pages on Steel
- HTML
- Creation
- chmod
- mypage

Technology: Web pages on Windows
- HTML
- Creating
- Uploading to Steel
- Downloading from Steel

Technology: Web pages
- Tables
- Colors
- Fonts
- Dynamic Web pages
  - javascript
  - Images
- Event driven programming
- Flow charts
  - Algorithms

Technology: Web pages
- Java
- Applets

Resources: Spreadsheets
- Excel
- Utility Analysis

Technology: Web pages
- Frames
- Maps
- Resource management

Technology: Web pages
- Portfolio design
- Portfolio implementation