

College is a journey. You have a short time to pick the rides, the places you want to see. I invite you to spend a semester with me and Informatics!

Introduction to Informatics I101 is an exciting class that gives students a hands-on approach to understanding and using technology.

Lecture and laboratory work together in providing answers to basic questions like

- What is a CPU? Is the new Intel Dual Core really twice as good?
- How can I make a webpage? How can the web help me find a job?
- Should students be penalized for downloading music?
- What is Internet Law? Should Google give information to the government?
- How do use Adobe Photoshop to edit my images?
- What exactly is a word processor? When I use Unix, is there an editor like MS Word?
- Are students today really that much different from students 20 years ago?
- How can technology at IU help me with my college career?
- What is music informatics? sports informatics? bioinformatics?

We'll spend the semester exploring these and other wonderful questions. This syllabus provides some of the sites you and I will see. I invite you to look through it. Please feel free to contact me if you have any questions.

Sincerely,

Prof. M.M. Dalkilic

LECTURE

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.



I101 is Informatics' gateway course and provides some foundations for core classes. Below is a collection of topics that either are currently being included or have been included. Core topics, topics that are required, are signified by a ☑.

0 ☑ Introduction to Informatics

- motivation
- definition

1 ☑ Science vs. Technology

- motivation

- definition
- 2 Problem Solving
- motivation
 - definition
 - problem solving sins
 - process of problem solving
 - application
- 3 Problem Solving—Algorithms vs. Heuristics
- motivation
 - definition
 - resources used in problem solving
 - EXAMPLE “Brute force” as a first example of algorithm
 - EXAMPLE “Russian Peasant” multiplication as a second example of algorithm
- 4 Problem Solving Formalism---Flow Charts
- motivation
 - definition
 - Introduction of flow chart elements—another example of structured reasoning
- 5 Analog to Digital—Data Representation
- motivation
 - definition
- 6 Analog to Digital---Number Systems
- motivation
 - definition
 - 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
 - to convert from base x to base y use two algorithms learned previously
 - using flow chart show how to convert from base 10 to base x
- 7 Problem Solving—Making Language Precise: Propositional Logic (PL)
- motivation
 - natural language vs. artificial (mathematical)
 - definition
 - structure + reasoning = logic
 - syntax and semantics
 - operators $\wedge, \vee, \neg, \rightarrow, \oplus, \leftrightarrow$
 - truth tables
 - exhaustive listing of input values with output
 - related to digital (count in binary for all possible inputs)
 - tautology, contradiction
 - translation from English to PL and PL to English
- 8 Technology—HTML
- motivation

- definition
- XHTML
 - Syntax and semantics
 - Browsers
 - File vs. image
- TAGS
- File formats

9 Technology—XML

- motivation
- definition

10 Problem Solving: Algorithm Weighted Ranking

- motivation
- definition

11 Problem Solving & Technology—Gates

- motivation
- definition
- a different formalization of PL
 - 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
 - majority vote of three people
 - bit adders
- Introduction to computer architecture
 - CPU
 - Bus
 - Memory (captured with gates)
 - Video

12 Problem Solving—Sets, Graphs, Trees

- motivation
- definition
- Sets
 - syntax and semantics
 - operators: \cap , \cup , ϵ , $-$, powerset
 - predicates: \supseteq
- EXAMPLE: ontology (Graphs)
- EXAMPLE: HTML, Unix directories, grammar (Trees)

13 Problem Solving—Models

- motivation
- definition
 - Deterministic
 - Random
- Probability
 - Sample space
 - Events (subsets)

- o Measure on subsets
 - o Build sets using operators
 - Actually PL
 - Every set operator has equivalent PL operator
 - Utility function
 - Bringing the parts together for Utility analysis
- 14 Problem Solving--Utility Analysis
- motivation
 - definition
- 15 Problem Solving—More Models
- motivation
 - definition
 - Linear Model (least squares)
- 16 Problem Solving—More Models
- motivation
 - definition
 - Shannon's Model of Communication
 - o Concept of "interestingness" (no mathematics)
 - o Sender, Encoder, Channel, Decoder, Receiver
 - o Bit as a unit of currency (tie into previous work)
 - o Entropy
 - o Speed vs. Noise
- 17 Problem Solving—More Models (Relational)
- motivation
 - definition
 - UML and Chen notation
 - ER modeling to relational model to physical model
 - Conceptual \Rightarrow Logical \Rightarrow Physical
 - query languages—SQL (simple, not nested) joins
 - keys, candidate, primary, Functional Dependencies
- 18 Problem Solving—Knowledge Discovery in Databases (KDD)
- motivation
 - definition
 - cleansing, transformation
 - association rules, clustering, classification
- 19 Technology—Networks and Security
- motivation
 - definition
 - o Model: OSI
 - logical vs. physical
 - o Hub, Switch, Router, Brouter,...
 - o protocols
 - o Entropy
 - o Speed vs. Noise
 - Internet

- 20 Social—Ethics
 - motivation
 - definition
 - privacy, gender

- 21 Bringing It Altogether
 - Problem solving with technology
 - Bioinformatics
 - HCI
 - New Media
 - Health Informatics
 - Security
 - Sports
 - New Frontiers
 - RF tags
 - “smart paper”

LABORATORY

The Informatics Laboratory, unlike the lecture topics, crucially rely on their sequence. Since technology changes quickly, each semester the laboratory must be revisited and revised to reflect these changes. Some elements have been added while others removed.

A Getting Connected at IU: Mail and MS Outlook

B Getting Connected at IU: Accounts

- SSH, SFTP
- Security
- OS'
 - UNIX (Solaris)
 - Windows XP
- CFS

C Resources: Word Processing

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

D Technology: Steel Account (Solaris)

- UNIX
- Picking a shell
- Commands
- Word processing with Pico
- directories
- files

E Technology: Web pages on Steel

- HTML

- Creation
- chmod
- mypage

F Technology: Web pages on Windows

- HTML
- Creating
- Uploading to Steel
- Downloading from Steel

G Technology: Web pages

- Tables
- Colors
- Fonts
- Dynamic Web pages
 - Javascript
 - Images
- Event driven programming
- Flow charts
 - Algorithms

H Technology: Web pages

- Java
- Applets

I Resources: Spreadsheets

- Excel
- Utility Analysis

J Technology: Web pages

- Frames
- Maps
- Resource management

K Technology: Database

- Conceptual ⇒ Logical ⇒ Physical
- ER modeling
- MS Access
 - keys, candidate keys, primary keys
 - SQL (simple) single join
 - creation of tables

Typically the class has this breakdown of grades:

Homework	20%
Laboratory	15%
Attendance and Participation	10%

Exam One	15%
Exam Two or Group Project	15%
Final	25%