



PURDUE
UNIVERSITY

CS18000: Problem Solving And Object-Oriented Programming

Course Overview
10 January 2011
Prof. Chris Clifton



COMPUTER SCIENCES



Course Objective

- Scaling up Programming
 - Larger systems
 - Larger inputs/outputs
 - Multicore Processors

Ability to build significant software systems
- These demands new ways of thinking
 - Functional abstraction
 - Data abstraction
 - Concurrent Execution

1/14/2011 CS18000 2



Assumptions



You have little or no expertise in computer programming using Java.

You are hard working.

You will not sleep during classes, and if you do, you will not snore!

You will not use phones during class and turn them off when you enter the class and leave them off until the class is adjourned.

You will not disturb others by talking to your neighbors.

You will try to participate in the class by asking questions and responding to questions asked by the instructor.

You will use iClickers in the class when requested.

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3



Impact of Assumptions



Some of you may get bored during the first four weeks of classes,

but others may find appealing the slow pace.

For those with some Java experience, we recommend participating in the programming competition. Refer to the course web site for details.

Please buy an iClicker.

You should skip the class if you need to discuss important matters with your friends. **But skipping a class is not a good idea!** So maybe you might consider rescheduling the important matters with your friend.

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4



What you Already Know



- Primitive Data Types
 - Numbers, strings, ...
- Expressions on Primitive Types
- Conditionals
- Loops
- Some structured types
 - Arrays
- Functions (methods)

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5



What you'll Learn



- Functional Abstraction
 - Recursion
- Data Abstraction
 - Classes as data types
 - Polymorphism, Inheritance
 - I/O as Abstract Data
- Concurrent Execution
 - Threads
 - Exception Handling
 - Synchronization
- Putting it all together: Projects involving
 - Visualization
 - Interfaces
 - Networking
 - ...

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6



Administrivia



- Who am I?
 - Prof. Chris Clifton
LWSN 2142F, x4-6005
clifton@cs.purdue.edu
- Course Coordinator
 - Dr. Lorenzo Martino
HAAS 144, x6-7345
lmartino@purdue.edu
- Recitation Instructors
 - Nguyen Duc Cao
 - Alvin Jon-Hong Law
 - Jiayi Ren
 - Julian James Stephen
- Lab instructors
 - TBD

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7



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- Course format:
 - Lectures (MW 4:30-5:20, SMTH 108):
Introduce new concepts
 - Lab (various times): Practice what you've learned (previous week / Monday)
 - Recitation (Fridays):
 - Repeat material that caused trouble in labs
 - Cover detailed material needed for labs and projects

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8



Please note....



Classes will begin at 4:30pm and end at 5:20pm. Please try to be in your seat a few minutes before the class begins and leave after the class ends.

All students are encouraged to ask questions. You may interrupt the instructor at any time.

The instructor is here to help you learn. Make full use of the instructor. Make full use of the instructor's office hours

I want you to succeed in this class and in your major. I will do all I can to help you succeed; this is my primary responsibility as a professor at Purdue.

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9



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- Course Workload
 - Weekly labs (15%): Graded short assignments covering specific lecture material
 - Projects (40%): Six larger-scale assignments synthesizing multiple parts of the course
 - Quizzes (5%): In-class questions using [CPS pads](#)
 - Exams: Two midterms (10% each), Final (20%)

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10



Expectations: Academic Honesty



Unless specified otherwise, all labs, projects, and exams are to be completed by you without assistance from anyone else other than the course instructor and the graders.

Read the Policies page on the course web site.

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13



Expectations: Attendance



You will attend all lectures, labs, and recitations.


Attendance is not mandatory but highly recommended.

If you miss a lecture, lab or recitation then it is your responsibility to (a) learn on your own the material covered (b) find out if there were any announcements that might affect your course grade.

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14




Administrivia: Textbook

- A Gentle Introduction to Concurrent Programming. Third (or Fourth) edition
 - Barry Wittman, Aditya Mathur, Tim Korb
- Boiler CopyMaker Room 157
Purdue Memorial Union


A Gentle Introduction To
CONCURRENT PROGRAMMING
Text for a Freshman Course using Java
The **Raw** Edition

Barry Wittman
Aditya Mathur
Tim Korb



Educating The
Multicore Generation

1/14/2011 CS18000 17



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- Java compiler / runtime environment
 - DR-Java recommended
 - Key requirement: Must compile/run under Standard java environment
- ***Projects must compile to be graded***
- [JavaDocs](#)
- [LWSN B146](#)
 - Consultant schedule will vary depending on project due dates
- Watch <http://www.cs.purdue.edu/cs180>

1/14/2011 CS18000 18



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- Academic Integrity Policy
 - <http://portals.cs.purdue.edu>
 - Read and sign policy
 - Obtain a Purdue CS department account
 - Work to be done individually unless otherwise specified
- Four credit hour course
 - Expect seven hours outside of course/labs
 - Don't try to do a two-week project the last night...
- Watch <http://www.cs.purdue.edu/homes/cs180>

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19



Computer Science...



...is a discipline just as any other discipline like Mechanical Engineering, Electrical Engineering, Biomedical Engineering,...

...educates and trains students to work as software engineers, information security specialists, systems engineers,....

...deals with software that drives a large number of devices and systems that we use in our day to day lives,...

...consists of subfields such as algorithms, artificial intelligence, computational science and engineering, databases, graphics and visualization, information retrieval, information security, machine learning, modeling and simulation, networking, programming languages and compilers, software engineering,...

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20



Computer Scientists...

...develop software that drives consumer devices such as smart phones, TVs, stereo systems,...



...develop software systems that control and manage aircrafts, automobiles, health care networks, power grids, intelligent transportation systems,...

...develop systems software such as compilers, operating systems, databases, and search engines on which are built a myriad of other user applications,....

...work alongside engineers to develop software that drives devices such as smart phones or more complex systems such as aircrafts,...

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21

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Course Overview

12 January 2011

Prof. Chris Clifton





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- Boilercast may not yet be available
 - Server error when I made the request
- Course email
 - You should have received an email
 - If not, send me a note *from your @purdue.edu address*
- Web site not yet up to date
- “Real” labs start next week
 - But if you haven’t done this week’s, don’t expect to complete next week’s

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23



Review of Programming Concepts: Primitive Data Types



Numeric

1. byte
2. short
3. int
4. long
5. float
6. double
7. boolean
8. char
9. String

Which of the above is not really a primitive data type?

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34



Review of Programming Concepts: Operators



- Assignment
=
 - Binary
+ - * / %
 - Unary
+ - ++ -- !
 - Relational
== != > >= < <=
 - Conditional
&& ||
 - *And over 20 others...*
- Which of the following is NOT a java operator?*
1. &
 2. ?=
 3. instanceof
 4. >>=

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35



Review of Programming Concepts: Expressions and Statements



- Expression: Generates a value
 - a+3
 - “Now is the time” + “ for all good”
 - c = 4
- Statement: Unit of execution
 - int a = 3;
 - System.out.println(“Hello World!”);
 - c = 4;

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36



Review of Programming Concepts: Conditionals



- If – then – else
if (expression) { statement } else { statement }
- Switch
switch (expression) {
 case 1: statement; break;
 case 2: statement; break;
 default: statement ; break;
}

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37



Review of Programming Concepts: Looping



- While
while (expression) { statement }
- Do-While
do { statement } while (expression)
- For
for (initialization ; termination ; increment) {
 statement
}

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38



Review of Programming Concepts: Methods



```
public int sum(int a, int b) { return a+b };
```

- Modifiers
 - public, protected, private, abstract, static, final, synchronized, native, strictfp
- Return type
 - Methods are expressions (when called)
- Parameters
- Exception list
 - throws *exception_type*
- Body

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39



What is “problem solving?”



“Problem solving” refers to a set of activities performed in order to solve a given problem. This is a generic term and applies to all disciplines, not only to Computer Science.

The following sequence of steps for solving a problem was proposed by George Polya in the 1950's :

- Understand the problem
- Devise a plan
- Execute the plan
- Review the solution

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40



What is OO programming?



OO, or **O**bject **O**riented, programming refers to a set of activities that lead to a computer program, written in an object-oriented language, that when executed on a computer will solve a problem.

Java is an OO language used in CS 180.

Other OO languages include C++, C#, Delphi, Modula, Oberon, Objective C, Simula, Smalltalk, and many more!

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41



Classes



```
class Bool {  
    boolean value;  
    public Bool(boolean initial) { value = initial;  
    };  
    public IsTrue() { return value; } ;  
}
```

- Defines a new “type”
- *We’ll learn a lot more about these*

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42



What is Problem solving and OO programming?



Problem solving and OO programming refers to a set of activities that allow the mapping of a problem to a computer program, written in an object-oriented language, that when executed on a computer will solves the problem.

Here is a simplistic summary of activities that aid in solving a problem using OO programming:

- Understand the problem
- Design a solution using objects
- Implement the design as a well documented program in an OO language
- Test, debug, and correct the program

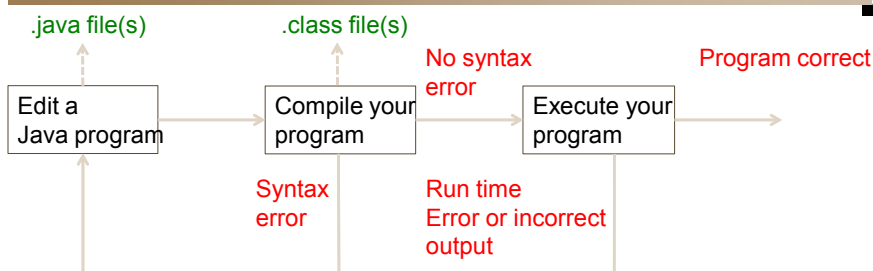
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43



The edit, compile, execute cycle



In CS 180 we shall use DrJava for editing, compiling and execution. DrJava is an Integrated Development Environment also known as an IDE. Eclipse, JBuilder, and IntelliJ IDEA are a few other Java IDEs. For programming the RidgeSoft robot we shall use RoboJDE.

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44



What is a multi-core microprocessor?



A multi-core microprocessor is a microprocessor chip that contains two or more **cores**. Each core is capable of executing its own sequence of instructions.

A dual-core microprocessor contains 2-cores. A quad-core microprocessor contains 4-cores, and so on.

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45



What is a parallel computer?



A computer capable of executing two or more programs in parallel is often referred to as a parallel computer.

A computer containing a multi-core microprocessor is a parallel computer.

A computer containing two or more single-core microprocessors is also a parallel computer.

Nearly every desktop and laptop today is a parallel computer containing a multi-core microprocessor.

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46



What is a sequential program?



A sequential program is one that is executed by a computer in a strict sequence, one instruction at a time. Thus, every instruction in the program is executed strictly in the specified sequence.

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47



What is a concurrent program?



A concurrent program is one that contains instructions that may be executed in parallel, or concurrently, by a parallel computer.

A concurrent program written in Java contains two or more **threads**. Each thread may be executed concurrently on a parallel computer.

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48