Dr. Joshua B. Gross joshua.gross@blackburn.edu Last Updated: January 18, 2016

Syllabus for CS120: Paradigms (Spring 2016)

Office: Hudson 130G, 217-854-5759 (email better than voicemail)
Office Hours: By appointment (email, suggest *multiple* times) and:
M 3:00-4:00pm, T 11:00am-1:00pm, W 3:00-4:30pm in P-Lab (left of common lab), R 1:00-2:00pm

Tutoring Hours (in PLab):

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Monday    4 - 6pm Tim
Tuesday   7 - 9pm  Lucas
Wednesday 3 - 4:30pm Dr. Gross, 7 - 9pm Tim and Lucas
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Class Meeting Times (4 contact hours total):

Monday, Wednesday, Friday 9:00-9:50AM in Hudson 109
Thursday 10:00-10:50am (Lab B) or 2:00-2:50pm (Lab C), in the PLab - there is no Lab A

Introduction

This course is about understanding the different ways that you as computer scientists can think about problems and how to translate them to code. We will pick up where CS211 left off, building knowledge of object-oriented (OO) software design and OO programming in Java. We will continue adding OO features like abstraction, data hiding, message passing, inheritance, and polymorphism, which we will use when we build data structures and graphical user interfaces.

We will conclude the course by looking at an entirely different paradigm: functional programming., which has different rules and tools, and is useful for dealing with problems that object-oriented programming is bad at.

Course Learning Objectives

At the end of the course, students should be able to:

- Design a program with multiple classes and packages
- Apply abstraction, data hiding, message passing, inheritance, and polymorphism
- Express that design using UML class diagrams
- Implement that design in Java
- Implement and use basic data structures, including linked lists, stacks, and queues
- Choose the appropriate data structure for a given problem
- Use the contents of an API based on its documentation
- Build user interfaces in JavaFX using a scene builder
- Implement code to make the user interface function
- Write software in a functional programming language
- Use recursion effectively in functional programming to explore nonlinear data

- Decide whether a problem is better solved with a functional or OO program

From the Catalog

Continuation of CS 211 with emphasis on nonnumerical applications and programming language paradigms. Fundamental data structures. At least two programming languages from different language paradigms will be covered. Prerequisite: CS 211.

Readings and Resources

- **Required Text:** Liang. *Introdution to Java Programming, Comprehensive 10th Edition*
- Additional articles or other resources as assigned
- Moodle (https://elearning.blackburn.edu)

Grades

Grade	**Quality of Work Rubric**
A	Exceptional work, complete, showing mastery of the material, creativity (as appropriate), obvious hard work, and free from errors
B	Good work, mostly complete, showing competence, understanding of the material, and significant effort, with minimal errors
C	Acceptable work, largely complete, showing some knowledge of the material, and some effort, with no errors undermining the whole work
D	Essentially failing material, but with some special quality deserving special consideration, such as exceptional effort & hard work; rarely used
F	Work that is largely incomplete, shows minimal knowledge, insufficient effort, or has overarching errors
Partial Credit: Live It, Learn It, Love It	

Graded Work	**Percent**
Quizzes	10%
Maintained or improved performance	10%
Labs	15%
Projects	10% each * 2 projects = 20%
Exams	10% each * 3 exams = 30%
Comprehensive Exam	15%
Total	100

Schedule

Date	Topic	Readings
01. M 01/11	Review: Variables to Functions	Ch. 2-8
02. W 01/13	Classes, Methods, Attributes	Ch. 9
A. R 01/14	Lab 00 Due, Lab 01 (Basic Objects) Assigned	
03. F 01/15	The Object Model: Concept and Foundations	Ch. 10
04. M 01/18	Packages and Visibility	
05. W 01/20	Design Using Class Diagrams	
B. R 01/21	Lab 01 Due, Lab 02 (Class Designs & Version Control) Assigned	
06. F 01/22	Version Control	
07. M 01/25	Set Theory	Ch. 11
08. W 01/27	Inheritance in Practice and Concept	
C. R 01/28	Lab 02 Due, Lab 03 (Simple Inheritance) Assigned	
09. F 01/29	Abstraction, Generalization, and Specialization	
10. M 02/01	Abstract Classes & Interfaces	Ch. 13
11. W 02/03	Polymorphism 1: Principles	Ch. 12
D. R 02/04	Lab 03 Due, Lab 04 (Polymorphic Inheritance) Assigned	
12. F 02/05	Polymorphism 2: APIs and Designing Interface Abstraction	
13. M 02/08	Exception Handling & I/O	
14. W 02/10	Exam 1 Prep	
E. R 02/11	Lab 04 Due, Lab 05 (In-Class Only) Assigned	
15. F 02/12	Exam 1	
16. M 02/15	Project 1 Introduction: Design & Implement	
17. W 02/17	The Java Virtual Machine & Memory Model	
F. R 02/18	Project 1 Design Due	
18. F 02/19	Compilation vs. Interpretation, Bytecode, JIT	

19. M 02/22	Variables, Dynamic vs. Lexical Scoping, Stack vs. Heap, Passing	
20. W 02/24	Programming Just Like Grandma Did	
G. R 02/25	Project 1 Due, Lab 06 (Compilation, Memory, Tracing) Assigned	
21. F 02/26	Garbage Collection and Memory Management	
22. M 02/29	Exam 2 Preparation	
23. W 03/02	Exam 2	
H. R 03/03	Lab 06 Due, No Lab - Dr. Gross at SIGCSE	
24. F 03/04	No Class - Dr. Gross at SIGCSE	
Monday, March 7 to Friday, March 11 - Spring Break - No Class - Boo!		
Unit 3: Structuring, Storing, and Accessing Data		
25. M 03/14	Data Structures and Collections	Ch. 20
26. W 03/16	Lists & Linked Lists	
I. R 03/17	Lab 07 (Linked List Implementation) Assigned	Ch. 24
Friday, March 18 is the last day of Spring Semester 2016 to withdraw with a W		
27. F 03/18	Different Implementation Mechanisms for Lists	
28. M 03/21	Stacks	
29. W 03/23	Queues	
J. R 03/24	Lab 07 Due, Lab 08 (Stack & Queue Implementations) Assigned	
30. F 03/25	Applications of Stacks & Queues & Introduction to Project 2	
Monday, March 28 - Easter Holiday - No Class		
32. W 03/30	Event-Driven Programming	Ch. 15
K. R 03/31	Lab 08 & Project 2 Design Due	
33. F 04/01	JavaFX UI Controls	Ch. 16
34. M 04/04	Multimedia	
35. W 04/06	TBA	
L. R 04/07	Project 2 Due, Lab 09 (GUI Programming) Assigned	
36. F 04/08	Introduction to Functional Programming	

37. M 04/11	Simple Recursion	Ch. 18
38. W 04/13	Nonlinear Data	
M. R 04/14	Lab 09 Due, Lab 10 (Simple Recursion) Assigned	
39. F 04/15	Trees & Traversal	
40. M 04/18	Side Effects and Lambda Functions	
Wednesday, March 20 is the last day of Spring Semester 2016 to withdraw passing		
41. W 04/20	Depth-First and Breadth-First Search	
N. R 04/21	Lab 10 Due, Lab 11 (Traversal) Assigned	
42. F 04/22	Unit Three Exam Review	
43. M 04/25	Unit Three Exam	
44. W 04/27	Comprehensive Exam Prep	
0. R 04/28	Lab 11 Due	
Double Instruction periods begins on Friday, March 29		
45. TBA	Comprehensive Exam	
Double Instruction periods and Fall Semester 2015 end on Monday, May 2		

Issues & Concerns

If you are having issues, please come talk to me, or to someone else. Others to talk to include:

- Dr. Kevin Coogan, Professor of Computer Science
  Hudson 130F kevin.coogan@blackburn.edu
- Dr. Chris Morin, Professor of Math (academic issues or issues with the class; he's my boss)
  Hudson 209B chris.morin@blackburn.edu
- Tim Morenz, College Counselor (& supervises Peer Counselors, personal & academic issues)
  DCC 133 217-854-5759 tim.morenz@blackburn.edu
- Erica Brown, College Chaplain, Pastoral Counselor (personal & spiritual issues)
  Hudson 203 217-854-5644 erica.brown@blackburn.edu

Disabilities

Students with disabilities must get and give me a copy of proper documentation of recommended accommodations from Counseling Services. If you are allowed accommodations and you choose not to use them (for any reason), I cannot adjust your grade or give you a second chance.

Expectations

- All students are expected to attend every session. If you miss class and I'm concerned about your performance, we will talk and institute an accountability program.
- If you need to miss, email me beforehand if possible, or as soon as possible afterward
- *Please arrive on time, ready to work at the start of class.*
- Class participation is required; if you are not comfortable speaking in class, please talk to me
- If you want to meet me outside of posted hours, email me and **please** suggest multiple times
- Here is a link on to my calendar: https://www.google.com/calendar/embed?src=joshua.gross%40blackburn.edu&ctz=America/Chicago
- I use email to contact class and check email regularly
- As part of class, you are expected to **check email every day** except Saturday
- Athletes must email in the first week about away-game absences (not a copy of the schedule)
- Keys to success:
    - Regular work, not cramming, and good time management
    - Form study groups
    - Read everything twice: once before class, and once after class, taking notes
    - Take notes in class, ask questions, and know and love partial credit
- This syllabus may change

Respect

Every person in this course (including me) is expect treat every other person with respect both in and outside the classroom. Disrespectful or harassing behavior is not tolerated and will result in ejection from class. If you experience any such behavior, please report it to me or another authority.

Academic Integrity

I hate academic integrity violations. The BBook clearly explains plagiarism and other kinds of integrity violations, which you are expected to know. Failure to contribute to group work is also a violation of academic integrity, as you are hurting others. A violation will earn a penalty up to and including an immediate F in the course. The penalty will always be worse than not doing the work.