

Carleton University
Department of Systems and Computer Engineering
SYSC 2004 - Object-Oriented Software Development - Winter 2012
Course Outline

Instructors

Section B: Don Bailey, MC 3042, 520-2600 ext. 5748, bailey@sce.carleton.ca.

Office hours: posted on the course Web site.

Section C: Babak Esfandiari, ME 4478, 520-2600 ext. 2479, babak@sce.carleton.ca.

Office hours: posted on the course Web site.

Undergraduate Calendar Course Description

SYSC 2004 [0.5 credit]

OO Software Development

Designing and implementing small-scale programs as communities of collaborating objects, using a dynamically-typed or statically-typed programming language. Fundamental concepts: classes, objects, encapsulation, information hiding, inheritance, polymorphism. Iterative, incremental development and test-driven development.

Precludes additional credit for SYSC 1101.

Prerequisite: SYSC 2002 or SYSC 2006 (SYSC 2006 can be taken concurrently).

Lectures three hours a week, laboratory two hours a week.

Course Objectives

- To learn the fundamental concepts of object-oriented programming (classes, objects, encapsulation, information hiding, inheritance, polymorphism).
- To gain experience applying these concepts by implementing small-scale programs as communities of interacting (collaborating) objects.
- To learn and apply some lightweight, modern techniques commonly used during object-oriented software development (iterative, incremental development; test-driven development).
- To develop the ability to build software experiments as an aid to learning.

Prerequisite

SYSC 2002 or SYSC 2006 are the prerequisites for SYSC 2004 (SYSC 2006 may be taken concurrently). Prerequisite waivers will not normally be granted. Students who have not received credit for SYSC 2002 or who are not concurrently enrolled in SYSC 2006 must withdraw from SYSC 2004 by the last date for registration in Winter term courses; otherwise, they will be deregistered before the end of term. Students who received DEF in the Fall 2011 offering of SYSC 2006 are eligible to register in SYSC 2004, provided that they write the deferred exam in February 2012. These students can remain in SYSC 2004 if the DEF is changed to a passing grade; otherwise, they must withdraw from SYSC 2004.

Textbook

Objects First with Java: A Practical Introduction Using BlueJ, Fifth Edition, David J. Barnes, and Michael Kölling, Pearson/Prentice Hall, 2012, ISBN-13: 9780132492669.

Printed copies can be purchased at the university bookstore. An online version of the eTextbook can be rented for 180 days from CourseSmart (www.coursesmart.com) for roughly 40% of the list price of a printed copy.

The Third or Fourth Editions of this book are also acceptable. Used copies of these editions may be available from Software Engineering students who took SYSC 1101 in Winter 2010 or earlier.

Java Resources: Online Programming Exercises

CodingBat (<http://codingbat.com/>)

The Java coding problems at this site don't cover all of the topics taught in this course, but are a great way to verify that you have the prerequisite knowledge required for this course (Boolean logic, loops, arrays and strings). All students should be able to complete the "AP CS medium" problems (see section AP-1) after the first few lectures that introduce fundamental Java constructs. Experience has shown that students who are unable to complete these problems, on their own, do not have an adequate understanding of fundamental programming concepts, and will likely have difficulty with the advanced object-oriented concepts covered in SYSC 2004.

Course Web Site

- Section B: <http://www.sce.carleton.ca/moodle/>
- Section C: WebCT will be used to distribute course materials, and for assignment and lab submissions.

Policy on Laptop and Tablet Computers

During scheduled labs, students who prefer to use their own laptop computers instead of the lab computers are permitted to do so; however, all laptop and tablet computers must be turned off during lectures.

Attendance

Students are expected to attend all lectures and lab periods. The University requires students to have a conflict-free timetable. For more information, see the current Undergraduate Calendar, *Academic Regulations of the University*, Section 1.2, Course Selection and Registration and Section 1.5, Deregistration.

Requests to accommodate a missed midterm exam, lab periods, due dates, etc., because of conflicts with jobs or vacation plans will not be considered.

Health and Safety

Every student should have a copy of our Health and Safety Manual. A PDF copy of this manual is available online: <http://www.sce.carleton.ca/courses/health-and-safety.pdf>.

Evaluation and Grading Scheme

Students will be evaluated by means of laboratory work, assignments, a midterm exam and a final exam.

To pass the course, students must pass the final examination (50% or better). For students who pass the final exam, a numeric mark out of 100 will be calculated by weighting the course components as shown here:

Lab work	5%
Assignments	15%
Midterm exam	25%
Final Exam	55%

This mark will be converted to your final letter grade, using the table of percentage equivalents shown in Section 2.3 of the *Academic Regulations of the University*.

Lab Periods

Attendance at the scheduled laboratory periods is mandatory, and attendance will be taken. During the labs you will work on short programming exercises that are intended to help you understand particular concepts that have been introduced in the lectures. You will normally be required to demonstrate and/or submit your lab work by the end of the lab period (or other specified deadline), as indicated in that week's lab "handout".

Your work in each lab period will be graded *satisfactory*, *marginal*, or *unsatisfactory*.

- *Satisfactory* means that you were present at the lab and made reasonable progress towards completing the lab exercises. Note that you do not have to finish all the exercises to receive a *satisfactory* grade.
- *Marginal* means that you made some progress towards completing the exercises, but your solutions were not sufficiently complete to warrant a *satisfactory* grade. This grade indicates that you may be falling behind, and should take steps to remedy this situation.
- *Unsatisfactory* means that you were absent from the lab period, or you attended but attempted few of the exercises or did not demonstrate or submit your work, or many of your solutions to the exercises had significant problems. This grade indicates that you are likely having difficulty with an important topic, and should seek help from your instructor as soon as possible.

For each *satisfactory* or *marginal* grade, you will receive 1/1 towards the lab component of the course. Each *unsatisfactory* grade will receive 0/1.

Your lowest two lab marks will not be counted when calculating your final grade. This means you can have up to two unsatisfactory lab marks and still earn full marks (100%) for the lab component of the course.

If you are absent from a lab period for any reason, you will receive 0/1 for that lab. If you are unable to attend a lab because of illness, you are not required to provide a medical certificate to explain your absence. It is up to you to do the missed lab work on your own time; however, you cannot submit your completed lab work late to receive credit for the missed lab. Please do not

ask for exemptions and/or extensions because of illness and so on. You can miss up to two lab periods and still receive full credit for the lab component, but it's up to you to use your "excused absences" wisely. Serious long-term illness will be dealt with on an individual basis; in these circumstances, please contact your instructor to discuss appropriate arrangements.

Assignments

There will be four or five programming assignments. Your lowest assignment mark will not be counted when calculating your final grade. This means you can miss an assignment and still earn full marks (100%) for the assignment component of the course. Late assignments will normally not be accepted. Please do not ask for exemptions and/or exceptions because of illness and so on - you have, in effect, one "sick day" to play with, and it is up to you to use it wisely. Serious long-term illness will be dealt with on an individual basis; in these circumstances, please contact your instructor to discuss appropriate arrangements.

Portions of the designs and code from any lab/assignment may be reused and refined in subsequent labs/assignments, and doing these components is the best way to learn the course material and prepare for the exams, so students are encouraged not to "write off" any particular lab/assignment just because of its relatively low weight in the overall grading scheme.

Students can use the Systems and Computer Engineering undergraduate computer labs whenever the Mackenzie Building and Minto CASE are open, except for those times when labs are reserved for specific courses.

Exams

There will be one closed-book midterm exam, which will be held approximately one-half of the way through the term. The date of the exam will be announced in class and posted on the course Web site.

Students who are unable to write the midterm exam because of illness or other circumstances beyond their control must provide in cases of illness a medical certificate dated no later than one working day after the exam, or appropriate documents in other cases. Medical documents must specify the date of the onset of the illness, the (expected) date of recovery, and the extent to which the student was/is incapacitated during the time of the exam. If this information is provided to the instructor no later than five working days after the exam, the weight of the final exam will be increased to cover the missed midterm; otherwise, the mark for the missed midterm exam will be 0.

Requests for accommodation because of poor performance on the midterm exam will not be considered. There will be no "make-up" midterm exam. So, if you are ill on the day of the exam, don't write the exam and later claim that your performance was impaired because you were unwell. You are better off to miss the exam and request that the weight of your final exam be increased, by following the procedure outlined earlier.

A closed-book final exam will be held during the University's April examination period. The *Academic Regulations of the University* permit instructors to specify requirements that must be satisfied for students to be eligible to write the final examination or, where circumstances warrant, the deferred final examination.

- All students are eligible to write the final examination, regardless of the marks they received during the term.
- Students who miss the final exam, but earned at least 60% overall on the lab and assignment component and wrote the midterm exam (or provided acceptable documentation to explain their absence from the exam), will receive the grade ABS. These students will be deemed to have performed satisfactorily during the term when their applications for a deferral of the final examination are considered. For more information, see the current Undergraduate Calendar, *Academic Regulations of the University*, Section 2.2, The Course Outline; Section 2.3, Standing in Courses/Grading System; and Section 2.5, Deferred Final Examinations.
- Students who miss the final exam but have not satisfied the conditions for receiving ABS, as listed above, will receive the grade FND. These students are ineligible to write the deferred final exam.

The final examination is for evaluation purposes only and will not be returned to students. You will be able to make arrangements with your instructor to see your marked final examination before June 30, 2012 (the last day for receipt of applications for review of final grades in Winter-term courses). Your exam will not be remarked during this meeting and solutions to the exam questions will not be provided.

Early Feedback

See Section 2.2.1 of the *Academic Regulations of the University*.

The weekly lab exercises will normally be graded during the lab period. Outside of the scheduled labs, you can obtain feedback during office hours or by making an appointment to see your instructor.

One assignment will be marked and returned prior to the 25th teaching day of the term.

Pop Quizzes

Short pop quizzes may be held during some of the lectures. These quizzes are for diagnostic purposes only and will not count towards your final grade.

Academic Accommodations

You may need special arrangements to meet your academic obligations during the term. To request academic accommodation, the processes are as follows:

Religious Obligations

Email me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more information, refer to the *Guide to Academic Accommodation for Students*, which can be found at:

<http://www2.carleton.ca/equity/accommodation/academic>

Pregnancy

Email me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more information, refer to the *Guide to Academic Accommodation for Students*, which can be found at:

<http://www2.carleton.ca/equity/accommodation/academic>

Students with Disabilities

Students with disabilities who require academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities include but are not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC, 613-520-6608, early in the term to ensure that I am sent a copy of your Letter of Accommodation no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you require accommodations only for the formally scheduled final exam, you must submit your request for accommodations to the PMC by March 7, 2012.

For more information, refer to the *Students* section of the Paul Menton Centre Web site::

<http://www1.carleton.ca/pmc/students>

Week-by-week Outline

The order in which topics are presented may be changed as the course progresses.

Week 0: Introduction to object-oriented concepts. Using Java classes and objects; introduction to the BlueJ Integrated Development Environment. (Chapter 1)

Week 1: Java class definitions: fields (instance variables), constructors, instance methods. Accessor and mutator methods. (Chapter 2). UML representation of classes and objects.

Week 2: Classes as types. The `new` operator. References to objects. Interacting objects. (Chapter 3)

Week 3: Grouping objects: array objects. (Chapter 4) Generic collections: class `ArrayList` (Chapter 4) and `HashMap`. (Chapter 5).

Week 4: Using classes from Java's library (class `String`, wrapper classes), packages, reading and writing documentation (javadoc) comments. (Chapter 5) Unit testing (JUnit) and debugging. (Chapter 7) Class variables and methods (the `static` reserved word). (Chapter 5)

Week 5: Inheritance: fundamental concepts, UML notation; support for inheritance in Java: the `extends` reserved word, constructor chaining, visibility of inherited variables. (Chapter 8).

Week 6: Inheritance, continued: subclasses and subtypes, polymorphic variables, up/downcasting, class `Object`. (Chapter 8)

Week 7: Inheritance, continued: method overriding, dynamic method lookup, method polymorphism, the `super` call. Overriding methods inherited from `Object` (`equals`, `toString`). (Chapter 9) Handling errors with exceptions, the exception class hierarchy (Chapter 12).

Week 8: Inheritance, continued: abstract classes, interfaces (Chapter 10). Comparison of inheritance and composition as techniques for object-oriented design.

Week 9: Introduction to design patterns. The observer pattern and event handling. (Chapter 13)

Weeks 10, 11, 12: Graphical user interface programming: the Swing framework, GUI components and event handling. (Chapter 11)

Last revised: January 2, 2012.