

# CSC 373: Computer Systems I

## Spring 2015

Tuesdays and Thursdays: 11:50 – 1:20 pm CDM 226  
Professor Robin Burke  
Office hours: Tuesdays and Thursdays 10:00 – 11:30 am and by appointment.  
Contact: (Phone) 312-362-5910  
(Email - better) [rburke@cs.depaul.edu](mailto:rburke@cs.depaul.edu)  
(Piazza – best) [piazza.com/depaul/spring2015/csc373/home](https://piazza.com/depaul/spring2015/csc373/home)

Supplemental Instruction Leader: Jon Pitzen

### Description

A course on computer systems topics, focusing on machine-level programming and architecture and their relevance for application programming. Information representations, assembly language, C programming, and debuggers, processor architecture.

### Prerequisites

Data structures: CSC 300, CSC 383, or CSC 393  
Discrete math: MAT 140

### Readings

Randal E. Bryant and David R. O'Hallaron, *Computer Systems: A Programmer's Perspective* (2nd Edition), Addison-Wesley, 2010. ISBN-13: 978-0136108047. (CSAPP below)

Other documentation and resources available online.

### Advice

To succeed in the class you must engage the material actively. You will need to master new tools and new languages.

My advice:

- start early,
- be methodical,
- be proactive in finding solutions, and
- ask questions about issues you cannot quickly resolve on your own.

Time is of the essence! You need to work early and ask questions early. If you delay, you will be lost in an incomprehensible morass!

### Supplemental Instruction

This section of CSC 373 was selected to participate in DePaul's Supplemental Instruction (SI) Program. Supplemental Instruction is a series of weekly review sessions designed to help students succeed in their academic pursuits. SI is provided for ALL students who want to improve their understanding of course material and improve their grades.

The sessions offer a chance to meet with people in your class to compare notes, discuss important concepts, develop strategies for studying technical material, and test yourselves before quizzes and exams. At each session you will be guided through the material by your SI leader, a student who has previously taken the course and done well.

Each week, the SI leader will conduct two one-hour study sessions. You may attend any of the sessions that fit into your schedule. Session times and locations can be found on the Supplemental Instruction website, [www.depaul.edu/~si](http://www.depaul.edu/~si)

## Tools

### Linux server

All of the assignments in this course will be performed on a CDM Linux (Ubuntu) server: `burke373.cdm.depaul.edu` for which all students will be issued accounts. You will need to become familiar with a number of Linux-based tools including `nano` (text editor), `bash` (command shell), `gdb` (debugger) and `gcc` (compiler). There will be two lab days in which students will gain experience using the Linux tools.

### Piazza

We will be using Piazza for class discussion. The system is designed to get you help quickly and efficiently from your classmates and the instructor. Rather than emailing questions, I encourage you to post your questions on Piazza. Find our class page at: [piazza.com/depaul/spring2015/csc373/home](http://piazza.com/depaul/spring2015/csc373/home).

### Socrative

We will use the Socrative app for in-class interactive question answering. This app is available for Android, iPhone, Chrome and PC operating systems. The room name is “BurkeDePaul”

## Grading

Grading will be based on weekly quizzes, lab assignments, a midterm and a final.

- Online quizzes / participation (15 of 19, lowest 4 discarded) – 15%
- In-class labs (2) – 10%
- Individual homeworks (3) – 30%
- Midterm – 20%
- Final – 25%

### Late Assignments

All assignments must be turned in on time usually 11:59 pm on a Tuesday. Late assignments are not accepted.

## Schedule

(Lab classes - **in bold** - meet in Daley 505)

3/31: Introduction / Overview

Course structure and expectations. Course tools. Overview of course material.

Reading: CSAPP, Ch. 1

### 4/2: Linux / C lab

The Linux environment. Using the command shell, compiling and executing programs.

Reading: Sections 1 – 3 of “An introduction to C”. Tutorials 1-- 3 in “Unix Tutorial for Beginners”. (Both available online. See links in D2L.)

4/7: Binary representations

Bit level representation of data. Hexadecimal notation. Data types and sizes. Byte ordering.

Reading: CSAPP, Ch. 2.1 – 2.1.6

Due: Linux / C in-class lab

4/9: Logic

Boolean algebra. Bit-level Boolean operators. Shift operators.

Reading: CSAPP, Ch. 2.1.7 – 2.1.10

4/14: Integer representations I

Representations for unsigned and two's complement integers.

Reading: CSAPP, Ch. 2.2 – 2.2.3

4/16: Integer representations II

Type conversions. Extension and truncation. C data types and operations.

Reading: CSAPP, Ch. 2.2.4 – 2.2.8

4/21: Integer arithmetic

Basic arithmetic operations on signed and unsigned types.

Reading: CSAPP, Ch. 2.3

4/23: Floating point

Floating point representations. Normalized and denormalized numbers. Rounding. Floating point operations.

Reading: CSAPP, Ch. 2.4 – 2.5

4/28: Midterm

4/30: Assembly I

Machine level representation of code. Registers. Addressing modes. Data movement instructions.

Reading: CSAPP, Ch. 3.1 – 3.4

Due: Data lab

5/5: Assembly II

Arithmetic instructions. Shift operations and division.

Reading: CSAPP, Ch. 3.5

**5/7: GDB lab**

Using the GDB debugger. Setting breakpoints. Inspecting registers and stack frames.

Reading: Sections 1 – 3 of “Using GNU’s GDB Debugger”; CSAPP, Ch. 3.11

5/12: Assembly III

Compare instructions and condition codes. Jump instructions. Implementing conditional constructs and loops. Conditional move instructions. Jump tables and switch statements.

Reading: CSAPP, Ch. 3.6

Due: GDB in-class lab

5/14: Assembly IV

The call stack. Frame and stack pointers. Calling conventions. Recursive functions.

Reading: CSAPP, Ch. 3.7

5/19: Assembly V

Arrays and other data structures. Data alignment. Pointers.

Reading: CSAPP, Ch. 3.8 – 3.10

Due: Bomb lab

5/21: Buffer overflow

Buffer overflow and stack corruption.

Reading: CSAPP, Ch. 3.12

5/26: Memory hierarchy

RAM memory. Disk and other I/O devices. Access latencies. Locality of reference and the memory hierarchy.

Reading: CSAPP, Ch. 6.1 – 6.3

5/28: Cache

L1 (and L2/L3) caches. Cache types and operation. Cache-friendly code and optimization.

Reading: CSAPP, Ch. 6.4 – 6.7

6/2: 64-bit

64-bit architecture. x86-64 conventions and instructions. Floating point instructions.

Reading: CSAPP, Ch. 3.13-3.15

6/4: Review

Due: Buffer lab

6/9: Final exam (11:45 am to 2:00 pm)

## **Course Policies**

### **Attendance**

Students are expected to attend each class and to remain for the duration. Coming 15 minutes late or leaving 15 minutes early constitutes an absence for the student. Students are individually responsible for material they may have missed due to absence or tardiness. In-class students will not get credit for their quizzes without class attendance.

### **Assignment Submission**

All assignments will be submitted to the online autograder or to D2L. Do not submit assignments by email.

### **Attitude**

A professional and academic attitude is expected throughout this course. Measurable examples of non-academic or unprofessional attitude include but are not limited to: talking to others when the instructor is speaking, mocking another's opinion, cell phones ringing, emailing, texting or using the Internet whether on a phone or computer. If any issues arise a student may be asked to leave the classroom. The professor will work with the Dean of Students Office to navigate such student issues.

### **Civil Discourse**

DePaul University is a community that thrives on open discourse that challenges students, both intellectually and personally, to be socially responsible leaders. It is the expectation that all dialogue in this course is civil and respectful of the dignity of each student. Any instances of disrespect or hostility can jeopardize a student's ability to be successful in the course. The professor will partner with the Dean of Students Office to assist in managing such issues.

### **Cell Phones/On Call**

If you bring a cell phone to class, it must be off or set to a silent mode. Should you need to answer a call during class, students must leave the room in an undistruptive manner. Out of respect to fellow students and the professor, texting is never allowable in class. If you are required to be on call as part of your job, please advise me at the start of the course.

## **University Policies**

### **Changes to Syllabus**

This syllabus is subject to change as necessary during the quarter. If a change occurs, it will be thoroughly addressed during class, posted under Announcements in D2L and sent via email.

### **Online Course Evaluations**

Instructor and course evaluations provide valuable feedback that can improve teaching and learning. The greater the level of participation, the more useful the results. As students, you are in the unique position to view the instructor over time. Your comments about what works and what doesn't can help faculty build on the elements of the course that are strong and improve those that are weak. Isolated comments from students and instructors' peers may also be helpful, but evaluation results based on high response rates may

be statistically reliable (believable). As you experience this course and material, think about how your learning is impacted. Your honest opinions about your experience in and commitment to the course and your learning may help improve some components of the course for the next group of students. Positive comments also show the department chairs and college deans the commitment of instructors to the university and teaching evaluation results are one component used in annual performance reviews (including salary raises and promotion/tenure). The evaluation of the instructor and course provides you an opportunity to make your voice heard on an important issue – the quality of teaching at DePaul. Don't miss this opportunity to provide feedback!

### **Academic Integrity and Plagiarism**

This course will be subject to the academic integrity policy passed by faculty. More information can be found at <http://academicintegrity.depaul.edu/>.

The university and school policy on plagiarism can be summarized as follows: Students in this course should be aware of the strong sanctions that can be imposed against someone guilty of plagiarism. If proven, a charge of plagiarism could result in an automatic F in the course and possible expulsion. The strongest of sanctions will be imposed on anyone who submits as his/her own work any assignment which has been prepared by someone else. If you have any questions or doubts about what plagiarism entails be sure to consult the instructor. While students are permitted to discuss assignments at the conceptual level, under no circumstances should students share specific answers (electronically or otherwise).

### **Withdrawal**

Students who withdraw from the course do so by using the Campus Connection system (<http://campusconnect.depaul.edu>). Withdrawals processed via this system are effective the day on which they are made. Simply ceasing to attend, or notifying the instructor, or nonpayment of tuition, does not constitute an official withdrawal from class and will result in academic as well as financial penalty.

### **Retroactive Withdrawal**

This policy exists to assist students for whom extenuating circumstances prevented them from meeting the withdrawal deadline. During their college career students may be allowed one medical/personal administrative withdrawal and one college office administrative withdrawal, each for one or more courses in a single term. Repeated requests will not be considered. Submitting an appeal for retroactive withdrawal does not guarantee approval. College office appeals for CDM students must be submitted online via MyCDM. The deadlines for submitting appeals for this quarter is the last day of the last final exam of Winter Quarter 2014.

### **Excused Absence**

In order to petition for an excused absence, students who miss class due to illness or significant personal circumstances should complete the Absence Notification process through the Dean of Students office. The form can be accessed at <http://studentaffairs.depaul.edu/dos/forms.html>. Students must submit supporting documentation alongside the form. The professor reserves the sole right whether to offer an excused absence and/or academic accommodations for an excused absence.

Exceptions to the late assignment policy and requests for makeup exams will only be permitted if the Absence Notification protocol is followed.

### **Incomplete**

An incomplete grade is a special, temporary grade that may be assigned by an instructor when unforeseeable circumstances prevent a student from completing course requirements by the end of the term and when otherwise the student had a record of satisfactory progress in the course. CDM policy requires the student to initiate the request for incomplete grade before the end of the term in which the course is taken. Prior to submitting the incomplete request, the student must discuss the circumstances with the instructor. Students may initiate the incomplete request process in MyCDM.

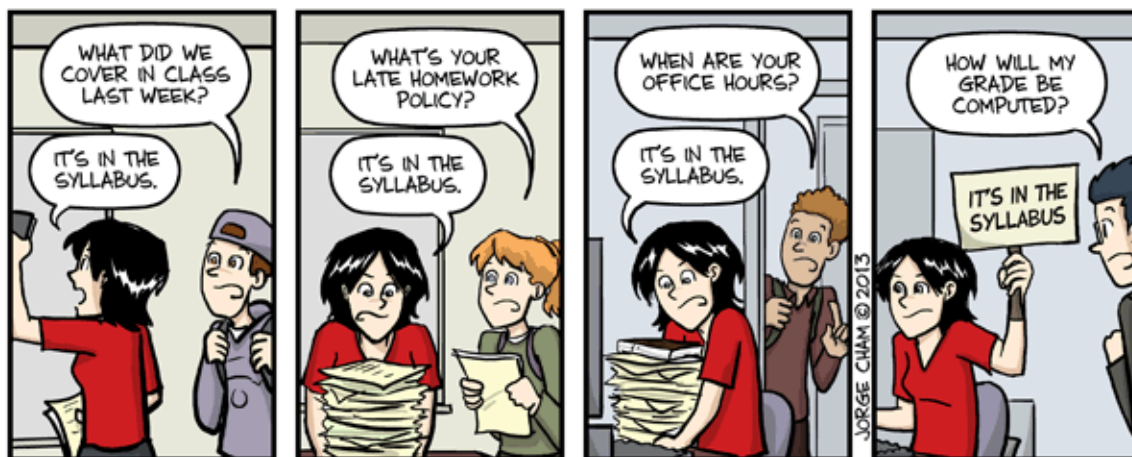
- All incomplete requests must be approved by the instructor of the course and a CDM Associate Dean. Only exceptional cases will receive such approval.
- If approved, students are required to complete all remaining course requirement independently in consultation with the instructor by the deadline indicated on the incomplete request form.

- By default, an incomplete grade will automatically change to a grade of F after two quarters have elapsed (excluding summer) unless another grade is recorded by the instructor.
- An incomplete grade does NOT grant the student permission to attend the same course in a future quarter.

### Students with Disabilities

Students who feel they may need an accommodation based on the impact of a disability should contact the instructor privately to discuss their specific needs. All discussions will remain confidential.

To ensure that you receive the most appropriate accommodation based on your needs, contact the instructor as early as possible in the quarter (preferably within the first week of class), and make sure that you have contacted the Center for Students with Disabilities (CSD) at: Student Center, LPC, Suite #370 Phone number: (773)325.1677 Fax: (773)325.3720 TTY: (773)325.7296



# IT'S IN THE SYLLABUS

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## Quarter at a Glance

Lecture	Lab
CDM 226	CDM 801

Date	Topic	Assignments	Reading (CSAPP, unless specified)
3/31	Introduction		Ch. 1
4/2	Linux / C Lab		C tutorial, Unix tutorial
4/7	Binary representations		Ch. 2 – 2.1.6
4/9	Logic		Ch. 2.1.7 – 2.1.10
4/14	Integer representations I		Ch. 2.2 – 2.2.3
4/16	Integer representations II		Ch. 2.2.4 – 2.2.8
4/21	Integer arithmetic		Ch. 2.3
4/23	Floating point		Ch. 2.4 – 2.5
4/28	Assembly I	Data lab due	Ch. 3.1 – 3.4
4/30	Midterm		
5/5	Assembly II		Ch. 3.5
5/7	GDB Lab		GDB tutorial, Ch. 3.11
5/12	Assembly III		Ch. 3.6
5/14	Assembly IV		Ch. 3.7
5/19	Assembly V	Bomb lab due	Ch. 3.8 – 3.10
5/21	Buffer overflow		Ch. 3.12
5/26	Memory hierarchy		Ch. 6.1 – 6.3
5/28	Cache		Ch. 6.4 – 6.7
6/2	64-bit		Ch. 3.13 – 3.15
6/4	Review	Buffer lab due	
6/9	Final exam 11:45 – 2:00 pm		