COS 220: Introduction to C++ Programming

Sudarshan S. Chawathe

University of Maine

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THIS COURSE IS AN INTRODUCTION TO COMPUTER PROGRAMMING USING THE C++ LANGUAGE. Its catalog description states:

> Topics include programming techniques with a brief introduction to hardware concepts as they apply to software development. Students are assigned programs emphasizing numerical algorithms for implementation in the C++ language. Assumes knowledge of the Windows operating system, basic word processing, and file and folder management. Some prior experience in programming logic, macros, or scripting is recommended.

This course introduces both programming and the C++ language without assuming any prior knowledge of either. In the programming aspects, the primary emphasis is on fundamental topics, such as logic, control flow, and the static and dynamic scope of objects, that span programming languages, using C++ for concreteness. In the C++ aspects, the primary emphasis is on the simpler features of the language that are readily accessible while concurrently learning programming. Another important aspect relates to the formal and informal standards, tools, and practices (e.g., standard input and output streams, build systems and Makefiles, and integrated development environments) that form the environment in which typical programming work is performed. We adopt an active learning approach that emphasizes exploration.

News and Reminders:
- Some sections below point to material in separate documents that are found on the class Web site, linked from the online version of this document.
- The most recent version of this document may be found at `http://chaw.eip10.org/cos220/`.
- Please use the PDF version of this document for printing and reference: `cos220.pdf`
- Brightspace site (access limited): `https://courses.maine.edu/d2l/home/275368`.

Contact Information

Class meetings:

> **Time:** Mondays, Wednesdays, and Fridays, 11:00–11:50 a.m.
> **Location:** Williams Hall 211.

Instructor: Sudarshan S. Chawathe

> **Office:** Boardman Hall, Room 329.
> **Office hours:** *Please check for changes.*
>> No appointment is *necessary*, but advance email notification is *useful*.
>> - Mondays, Wednesdays, and Fridays: 11:55 a.m.–12:30 p.m.;
>> - Tuesdays and Thursdays: 11:00–11:30 a.m.;
>> - *or* by appointment (email).
>
> **Phone:** +1-207-581-3930.
>> *Please avoid calling* except for truly urgent matters.

Email: `sudarshan.chawathe@maine.edu`

Use email only for messages unsuitable for the discussion forum. (See below.) Please use only this email address and **put the string _COS220_ near the beginning of the Subject header** of the message. _Responses to all other messages may be very significantly delayed._

Web: `http://chaw.eip10.org/`.

Online Resources

Class Web site:
`http://chaw.eip10.org/cos220/`
We will use the class Web site for posting assignments, readings, notes, and other material. Please monitor it.

Class discussion forum: We will use the university's _Brightspace_ installation for class discussions outside class meeting times. This forum is a very important part of this course and participation is important and incentivized in the grading scheme.

Class mailing list: _Please make sure you are on the class mailing list._ The mailing list will use the email address for each student as recorded in the official university records (_MaineStreet_ system). We will use this mailing list only for urgent messages because all other messages will go on the class discussion forum. I anticipate fewer than a dozen messages on this list over the semester.

Grading Scheme

Grade components: _Students are expected to complete and submit all assigned coursework in good faith; those who fail to do so will earn a **failing grade, regardless of overall numerical score**._ Cut-offs for final letter grades D, C, B, A are, respectively, 35, 55, 70, and 85. In case of class-wide unexpectedly low scores the above may be adjusted, but only in a manner that everyone's grade is at least as good as the above indicate.

component	% of grade
in-class participation	5
discussion forum contributions	5
online work and tests	20
homeworks (including programming)	20
two quizzes	10
two midterm exams	20
final exam	20

Students are expected to be responsible in tracking their own performance and to ask for clarifications or assistance in case of difficulties.

In-class participation: Students are expected to contribute to learning by asking questions and making relevant comments in class and participating in the specified online components of the class. Quality is more important than quantity. Disruptive activity contributes negatively. See policies below. Attendance is an important aspect.

Discussion forum activities Discussions on the class discussion forum are an important mode of learning. To encourage everyone to participate actively in these discussions, there is a portion of the grade assigned to how well, and how often, students contribute there.

Homeworks: Homeworks include programming and non-programming ones, often mixed. No collaboration is permitted. Everyone is encouraged to discuss the problems and solution strategies _at a high level_, but the final solution and details must be individual work. **If the boundary between permissible and non-permissible interactions is unclear, please ask for clarifications.**

Exams and quizzes: Unless otherwise noted, all exams and quizzes are by default *open book, open notes*. They are held during regular class meeting times, with the important exception of the final exam, which follows the usual university schedule. You are free to bring with you any resources that you find useful (within reason). However, no communications are permitted other than between students and me. The use of computers during exams is strongly discouraged, but brief use may be permitted provided it does not cause a disturbance, at the discretion of the proctor. You may use the Internet, but only as a library to look up material you may find useful. Ask for clarifications in case of any doubt. The exams are designed to require no equipment other than a pen and paper, along with the textbook and assigned readings.

Policies

Spring 2023 COVID-19 issues: Everyone is expected to follow the University policies related to the COVID-19 pandemic. See `https://umaine.edu/return`.

Due dates: All due dates and times, as announced in class, are strict, to the second. If you believe your work was delayed by truly exceptional circumstances, let me know as soon as those circumstances are known to you and I will try to make a fair allowance. However, *the default is that you get a zero if you don't turn in the work on time*, and fail the class if you don't turn it in at all (cf. Grade Components above). A *very limited* late-submission option may be announced in class later.

Attendance: It is very important to attend all class meetings, for many reasons, but the grade component provides additional motivation to those who may need it. If you have a valid reason for missing a class, let me know early and I will try to help you make up the class. There will be no make-up exams or quizzes. A missed test earns zero credit. If you have a valid reason for missing a test, let me know as early as that reason is known to you and I will make a fair allowance but there will be no make-up tests in any case.

Classroom activities: This course is based on an active learning format, so effective classroom activities are critical to its success. Students are expected to contribute to their own learning and that of their classmates, and to devote 100% of their attention to these activities while in class. On a similar note, all electronic and other distractions (computers, phones, assorted gizmos, etc.) must be completely silenced and put away for the entire duration of the class. (Students who need any such devices for disability accommodations should follow the guidelines outlined below. Others who need any accommodation in this regard due to special circumstances should make advance arrangements with the instructor.) No food or drink is allowed in class, other than water, tea, coffee, and similar, in a spill-proof container. (As a general guideline, we will follow "library rules" in this regard.) Students who violate these rules or otherwise cause distractions in class will be asked to leave with *no warning*; habitual violators will face disciplinary action.

Office hours: All students are encouraged to make use of office hours to further their learning, obtain assistance on homework assignments, obtain feedback on their class performance, etc. However, office hours are not to be used as a substitute for attending and participating in class meetings (see above). Similarly, assistance with homework assignments will be limited to what is appropriate based on fairness to all; students are expected to demonstrate substantial effort on the assignment before seeking assistance.

Make-up classes: I may have to reschedule a few classes due to my other professional commitments. I will make every attempt to minimize the number of such occurrences and to reschedule for a time that works for most students. Further, I will make sure no student is penalized by such occurrences.

University of Maine administrative policy statements: [Verbatim, standard wording from `https://umaine.edu/citl/teaching-resources-2/required-syllabus-information/`. Please refer to that site for further details.]

Academic Honesty Statement Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

Students Accessibility Services Statement If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services, 121 East Annex, 581.2319, as early as possible in the term. Students who have already been approved for accommodations by SAS and have a current accommodation letter should meet with me (the instructor of the course) privately as soon as possible.

Course Schedule Disclaimer (Disruption Clause) In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

Observance of Religious Holidays/Events The University of Maine recognizes that when students are observing significant religious holidays, some may be unable to attend classes or labs, study, take tests, or work on other assignments. If they provide adequate notice (at least one week and longer if at all possible), these students are allowed to make up course requirements as long as this effort does not create an unreasonable burden upon the instructor, department or University. At the discretion of the instructor, such coursework could be due before or after the examination or assignment. No adverse or prejudicial effects shall result to a student's grade for the examination, study, or course requirement on the day of religious observance. The student shall not be marked absent from the class due to observing a significant religious holiday. In the case of an internship or clinical, students should refer to the applicable policy in place by the employer or site.

Sexual Violence Policy Sexual Discrimination Reporting

The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or any form of gender discrimination involving members of the campus, your teacher is required to report this information to the campus Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity.

If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

For confidential resources on campus: Counseling Center: 207-581-1392 or Cutler Health Center: at 207-581-4000.

For confidential resources off campus: Rape Response Services: 1-800-310-0000 or Partners for Peace: 1-800-863-9909.

Other resources: The resources listed below can offer support but may have to report the incident to others who can help:

For support services on campus: Office of Sexual Assault & Violence Prevention: 207-581-1406, Office of Community Standards: 207-581-1409, University of Maine Police: 207-581-4040 or 911. Or see the OSAVP website for a complete list of services at http://www.umaine.edu/osavp/

Programming

Submissions will be in the form of packaged, well documented *source* files. *Proper documentation and packaging of source code and other material is a crucial component of assigned work and submissions failing in this regard will receive no credit.*

Literate Programming: All submitted work must use a *literate programming style*: Your programs must be designed with *a human as the intended reader*, although they must also compile and run correctly. *Programs that do not meet this requirement are likely to receive a zero score with no further consideration.* Details will be discussed in class.

Class accounts: Shell accounts will be generated on the host `aturing.umcs.maine.edu` based on registration records. These accounts are important for successful completion of homeworks and other assignments. You should be able to access your accounts from anywhere on the Internet by using *ssh*. On most Unix-like hosts (GNU/Linux, Mac OS), the command `ssh -l ` *username* `aturing.umcs.maine.edu` should suffice. For Windows hosts, the freely available *Putty* program works well.

Schedule

A rigid schedule is not conducive to effective learning, since it would limit our flexibility in exploring ideas as they arise in class. A partial and *approximate* schedule, to serve as a baseline, appears in Figure 1; it

will be updated as we progress. Please use it only as a rough guide to plan your studies. *Do not use it to schedule travel or other events.* If you need a definite answer on when something will or will not occur, you should check with me.

At the beginning and end of each class, I typically announce the topics and textbook sections covered in that class and those due at the next class. It is important that students read the material *before* the class in which it is discussed and, in general, keep up with readings and studies.

Textbook and Readings

Textbook: Tony Gaddis, Judy Walters, and Godfrey Muganda. *Starting Out with C++: Early Objects.* Pearson, 10th edition, March25 2019. *Please note the edition and year and also the "early objects" in the title.* (There is another version of the book without early objects.) It is a *required textbook* for this course. Copies should be available at the university bookstore and elsewhere.

There are some resources on the Web for this textbook and more generally for this material. You are welcome, and encouraged, to use these resources (unless specifically directed otherwise), and to share and discuss them with classmates on the discussion forum. However, *you must prominently attribute any help from such or other resources in all your work.* Failure to do so is a serious offense (see policies). And, regardless of what resources you use or do not, it is never permissible to simply include someone else's work unless it is specifically permitted as an exception.

Readings: A few supplemental readings will be added here based on class preferences.

Exercises, Homeworks, Tests, and Notes

Additional material will appear here as we move along the semester.

- Homework assignments:

  - Homework 1: `hwq/hw01.pdf`.
  - Homework 2: `hwq/hw02.pdf`.

- Practice tests:

  - Midterm Practice 1: `hwq/mp01.pdf`; sample solutions: `hwq/mp01s.pdf`.
  - Final Exam Practice: `hwq/fp01.pdf`; sample solutions: `hwq/fp01s.pdf`.

- Quizzes and Exams:

  - Quiz 1: `hwq/q01.pdf`; sample solutions: `hwq/q01s.pdf`.
  - Midterm Exam 1: `hwq/mt01.pdf`; sample solutions: `hwq/mt01s.pdf`.
  - Quiz 2: `hwq/q02.pdf`; sample solutions: `hwq/q02s.pdf`.
  - Midterm Exam 2: `hwq/mt02.pdf`; sample solutions (with many thanks to the students who allowed their work be used): `hwq/mt02s.pdf`; `hwq/mt02s2.pdf`.

Homework and Project Submissions

All electronic submissions must be made using the procedure that will be outlined in class and here later. Electronic submissions in **all other forms**, such as email or physical media, will be **discarded and receive no credit.**

Illegible, hard to read, or otherwise messy submissions, whether handwritten on typed, are likely to be returned without grading, for zero credit.

Monday	Wednesday	Friday
January 16th ✕ *No class.* MLK Jr. Day.	18th C1 Introduction.	20th C2 §§ 1.*.
23rd C3 §§2.0–2.9.	25th C4 §§2.10–2.17.	27th C5 §§2.*.
30th C6 3.0–3.7.	**February** 1st C7 3.8–3.12.	3rd C8 §§3.*.
6th C9 ★ **Quiz 1**, regular class time & place.	8th C10 §§4.0–4.9.	10th C11 §§4.*.
13th C12 §§5.*. Homework HW01 assigned.	15th C13 §§6.*.	17th C14 §§7.0-7.9.
20th ✕ *No class.* Presidents' Day.	22nd C15 §§7.*.	24th C16 **Homework HW01 due.** Catch-up and review.
27th C17 ★ **Midterm Exam 1**, regular class time & place.	**March** 1st C18	3rd C19
6th C20	8th C21	10th C22
13th ✕ *No class.* Spring break Mar. 13–19.	15th ✕ *No class.* Spring break Mar. 13–19.	17th ✕ *No class.* Spring break Mar. 13–19.
20th C23	22nd C24	24th C25
27th C26 ★ **Quiz 2**, regular class time & place.	29th C27	31st C28
April 3rd C29	5th C30	7th C31
10th C32 ★ **Midterm Exam 2**, regular class time & place.	12th C33	14th C34
17th C35	19th C36	21st C37
24th C38	26th C39	28th C40
May 1st ✕ *No class.* **Finals week.**	3rd ✕ *No class.* ★ **Final exam: 8:00 a.m.–10:00 a.m. WH 211**	5th ✕ *No class.* **Check Univ. schedule.**

Figure 1: **Approximate** schedule, likely to change. **Notation: §§ $x.y$** $\Rightarrow$ textbook chapter x, section y.

Fallback procedure   If (and only if) there are unexpected problems and you are unable to submit your work as above, then you should save your file on your own computer (with some backups), compute its MD5 checksum using the `md5sum` utility on Unix-like systems (or other similar tools), and submit the file name, time stamp, and MD5 checksum (only, not the file itself) by email with a suitable Subject header.

Keys to Success

1. Don't lose sight of the fun parts. If you cannot find them then ask for help.

2. Take responsibility for your own learning. At the first sign of trouble, no matter how minor, seek help. I am here to help but you must take the first step.

3. Read *every day*! The textbook, code, your own notes, discussion forum, and more.

4. Write *every day*! The textbook (mark it up!), notes (in and out of the classroom), code, discussion forum, more.