

MSCS3070: Survey of Systems and Programming Languages

Course.CRN.22761

Semester/Year: Fall.2023

DRAFT 08.28.23.bh

Welcome!

Welcome, welcome! In our digitized world, a deep understanding of computing systems offers a distinct advantage in numerous fields. By enrolling in this course, you're developing hardware and software computer skills highly valued by peers, researchers, academics, and businesses.

Patt and Patel's Introduction to Computing Systems provides a comprehensive overview, from fundamental components such as bits, data types, and operations to the complexities of C/C++ programming. Starting with digital logic structures and the von Neumann Model, the course lays a strong foundation for subsequent advanced topics. Upon delving into assembly language, data structures, and I/O, you'll understand the nuanced interplay between hardware and software. Transitioning to C/C++ introduces modern computing paradigms encompassing procedural and object-oriented methodologies. The final segments critically examine programming languages, sharpening your analytical prowess to assess and contrast them based on design. Completing this master's course ensures an understanding of computing systems and their capability to innovate.

This course's skills and insights are directly relevant to today's computational landscape to excel in coding, system design, and computational analysis. Whether streamlining data processes for research, crafting efficient algorithms for businesses, or assessing the suitability of new programming languages, this curriculum provides a tested foundation based on 20 years of academic delivery. It aims to foster an adaptive mindset that helps you discern deeper issues when surveying systems. In short, this intellectual journey is a strategic investment providing a baseline toward a sustainable career in computing.

~instructor.hogan, 08.28.23

Faculty Name: Instructor Brian Hogan

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Office Hours: Usually same day as requested by appointment

GitHub: <https://github.com/bbe2/instructor.brian/tree/mscs.3070.survey.of.systems.and.programming.languages>

Course Overview

Summary

This course will be an exploration, through lecture and problem solving, to hardware, operating systems and programming language design. Students will study the interaction between hardware and the operating system, and the connections to programming languages. A basic understanding of machine and assembly language, processor organization, and operating system concepts, along with working knowledge of multiple programming languages is assumed.

Course Schedule

Week	Topic	Materials	Assignments
1	Bits, Data Types, and Operations	Ch. 1, 2 Lectures Slides	Discussion 1 Assignment 1 Quiz 1
2	Digital Logic Structures	Ch. 3, Lectures Slides	Discussion 2 Assignment 2 Quiz 2
3	The von Neumann Model LC-3	Ch. 4, 5 External Source Lectures Slides, LC-3 instructions	Discussion 3 Assignment 3 Quiz 3
4	Programming	Ch. 6 Lectures Slides	Discussion 4 Assignment 4 Quiz 4
5	Assembly Language	Ch. 7 Lectures Slides	Discussion 5 Assignment 5 Quiz 5
6	Data Structures	Ch. 8 Lectures Slides	Discussion 6 Assignment 6 Quiz 6
7	I/O A Calculator	Ch. 9, 10 Lectures Slides	Discussion 7 Assignment 7 Quiz 7
8	Midterm	tbd	
9	Introduction to C/C++ Programming Variables and Operators	Ch. 11, Ch. 12, Lectures Slides	Discussion 8 Assignment 8 Quiz 8
10	Control Structures Functions Testing and Debugging	Ch. 13, 14, 15 Lectures Slides	Discussion 9 Assignment 9 Quiz 9
11	Pointers and Arrays Recursion I/O in C	Ch. 16, 17, 18 Lectures Slides	Discussion 10 Assignment 10 Quiz 10
12	Dynamic Data Structures in C Introduction to C++ and Object oriented Languages	Ch. 19, 20 Lectures Slides	Discussion 11, Assignment 11, Quiz 11
13	Review programming languages + Compare from design aspect Part 1	External source Lectures Slides	Discussion 12, Assignment 12, Quiz 12
14	Review programming languages + Compare from design aspect Part 2	External source Lectures Slides	Discussion 13, Assignment 13, Quiz 13
15	Final Exam		

Student Learning Outcomes

After having completed this course, each student will have demonstrated:

- Demonstrate ability to describe and analyze a variety of systems from a low-level perspective.
- Understand and evaluate various performance tradeoffs and use this understanding to make platform and language choices.
- Learn to examine published research, code, and other design documents to understand the problems being described and solved.

Course Resources

Required Materials

- Introduction to Computing Systems: From Bits & Gates to C/C++ & Beyond 3rd Ed
- Authors: #=> Yale Patt and Sanjay Patel
- [ISBN10:1260150534](#) #=> <[github.7th.edition\(use to get started\)](#)><[abebooks](#)><[amazon](#)>
- ISBN13:9781260150537

Course Format

The course is an online course. The time of the class is on Thursday between 6:30-9:30 PM. It is a robust course with significant engagement requirements. Students are expected to participate regularly every week in canvas across all activities (reading, reviewing, writing, discussing). Missing some or all of a week's activities will most likely reduce your grade due to the loss of participation. There will be no makeup or extra credit assignments. Student are expected to participate and complete assignments on time as outlined specifically by the course instructor.

Grading

The table below summarizes the way the final grade is calculated.

Assignment Category	% of Course
<i>Discussions</i>	<i>15</i>
<i>Quizzes</i>	<i>15</i>
<i>Assignments</i>	<i>35</i>
<i>Midterm</i>	<i>15</i>
<i>Final</i>	<i>20</i>
Total	100

Grading / Engaged Academic Time

Engaged academic time determines the credit hours a course is worth; 1 Unit=180hrs. Use the following as an approximation of how the 180 hrs hours are distributed.

Activity	Estimated hours
<i>Readings</i>	40
<i>Discussions</i>	20
<i>Practice / Programming</i>	25
<i>Quizzes</i>	20
<i>Assignments</i>	40
<i>Midterm</i>	15
<i>Final</i>	20
Total	180

Clark Graduate Grading Scale

Scale for converting letter to numeric grades.

Grade	Number to letter	Letter to number
A	95-100	100
A-	90-94	94
B+	87-89	88
B	83-86	85
B-	80-82	82
C+	77-79	78
C	73-76	75
Fail	below 73	72
IN	Incomplete	(Associate Dean approval)

Assignments and Exams Descriptions

Assignments and class preparation

The attached course schedule shows the material (textbook Ch.s and slides) to be covered in the course. Assignments, discussion and quizzes are every week.

Tests and quizzes

There will be 13 short quizzes (the lowest quiz grade will be dropped), all quizzes are open book and cover the same week materials. Midterm (Week 8) and Final Exam (Week 15). Exams information will be posted on Moodle ahead of time. There are no make-ups for missed exams. Exceptions to this policy will be made only in case of serious illness, injury or other emergencies.

Due Dates, and Late Work

Late submissions will be accepted within 10 days of the due date with a slight penalty as specified in the project rubric. After that, it will be my discretion whether to accept any assignment after that time. If they are accepted, they will be given a lower grade. In addition, plagiarism will result in a grade of "F" for this course. Students are expected to be familiar with what constitutes plagiarism. If you are uncertain, please ask!

How to be a Good Classmate

These guidelines are presented so that we can agree that during the course of this class, we will all interact with each other in a positive, professional, cooperative, and supportive manner.

- Prepare for discussions prior to engaging in them. This includes reviewing all assigned materials and reading any posts already in the forum.
- All writing should be professional, consisting of complete sentences and free of grammatical and spelling errors. "Texting" or "chat" language is not appropriate. Also consider that slang can be misunderstood or misinterpreted.
 - Be careful when using sarcasm and humor. Without social cues, such as facial expressions and body language, a remark meant as humorous could come across harmful or offensive. Emoticons aren't enough to convey your tone or intent.
- Use a short, meaningful description in the subject line in an email or discussion post. Your subject line should summarize your main point in 10-words or less.
 - Capitalizing whole words is generally seen as SHOUTING. Avoid ALL CAPS, and repeated punctuation!!!
- Be courteous about what you say to or about others. The golden rule is "Remember the Human"; there is a real person with real feelings on the 'other side' of the computer.
 - Be respectful and open to opinions and ideas that differ from yours. The exchange of diverse thoughts, ideas and opinions are an important part of the scholarly environment. Be sensitive to the fact that there will be cultural and linguistic backgrounds different to your own and different political and religious beliefs.
- The posting of messages that are deliberately hostile and insulting is not appropriate under any circumstances. While everyone (learners and instructors alike) is encouraged to share ideas and opinions openly, you should never use insults or resort to name-calling even if you disagree strongly with what someone else has written.
 - Allow for misunderstandings. Keep in mind that writing often conveys the incorrect tone or intention in the absence of nonverbal communication. You should make allowances. What you may perceive as rudeness may be unintended.

Campus Resources

Library Access and Resources

The Clark University Libraries subscribe to many academic resources and offer research assistance for anyone in the Clark community, including students at a distance. The library team offers short tutorials on how to use library resources and the basics of academic research in a Moodle course called "Library Research Tutorials". The Goddard Library Homepage contains links to databases, course research guides, and descriptions of services. For assistance with conducting research or help with a database, use the Goddard Library Online Help to connect with the library team by phone, email, text, or chat.

Clark faculty, staff, and students with domain accounts may access all Clark databases remotely with their Clark University credentials. These are the same way you sign into Moodle and your Clark email. Here you can access over 100 databases and multiple resources to complete your research needs. The library hours are 8am to midnight Monday through Thursday, 8 am to 10 pm on Friday, 10am to 10pm on Saturday, and noon to midnight on Sunday (all times U.S. Eastern Time). Online access is available 24 hours per day. For more information follow this link:

<http://www.clarku.edu/research/goddard/>

When you are off-campus and accessing library resources (such as journal articles or online books in the holdings) you may be prompted for your Clark credentials (username/password). **Technology Requirements**

To be successful in this course, you will access materials and submit assignments in Moodle regularly. It your responsibility to ensure that you can do so. At a minimum to access Moodle, you will need access to the Internet and a supported Web browser (Chrome, Internet Explorer, Firefox, Safari). In general, you will be expected to submit assignments in MS Word, Excel, PowerPoint, or PDF format (Clark provides MS Office at no extra cost if you need it). Unless the assignment specifically requires an alternate format, please be sure to submit in one of the above formats or I reserve the right not to grade the assignment. If students need assistance with converting or formatting documents, they should contact the ITS Help Desk.

If you need technical assistance with Moodle, using your Clark accounts or with software used for completing course assignments, contact the ITS Help Desk. You may visit the Help Desk in person at the Academic Commons in Goddard Library, email them at HelpDesk@clarku.edu or phone them at 508- 793-7745. Their hours are available at <http://www.clarku.edu/offices/its/support.cfm>

Policies

Accommodations for Individuals with Disabilities

Clark University is committed to providing students with documented disabilities equal access to all university programs and facilities. If you have or think you have a disability and require academic accommodations, you must register with Student Accessibility Services (SAS), by contacting the office directly at accessibilityservices@clarku.edu or (508)798-4368. If you are registered with SAS and qualify for accommodations that you would like to utilize in this course, please let SAS know immediately.

The Family Educational Rights and Privacy Act (FERPA)

Students at Clark University are protected by the Family Educational and Privacy Act of 1974 (FERPA). A description of the Act and Clark's FERPA policy can be obtained online at www.clarku.edu/offices/src/ferpag.shtml.

Faculty Members are Responsible Employees: "It's On Us" too

Faculty members are required by the Office of Civil Rights to report all alleged sexual offenses to the university's Title IX Coordinator

Exceptions: The only exceptions to this reporting responsibility are the faculty members who have been designated and trained as Confidential Sources. The professional staff in Clark's Center for Counseling and Personal Growth and the medical providers at the Health Center are also confidential spaces.

This reporting is necessary to track patterns of offenses so that we can successfully combat all forms of sexual harassment and sexual violence on campus. We believe in providing all students with an educational environment that is free from discrimination. The sexual harassment of students, including sexual violence, interferes with students' right to receive an education free from discrimination and, in the case of sexual violence, is a crime. The Clark faculty is committed to making Clark University a safe and inclusive environment for all.

Statement on Inclusion, Equity, and Diversity

The programs of Clark University aspire to be a collaborative, inclusive and caring community that strives for equity and equal opportunity in everything we do; that creates a welcoming environment and enables success for people from all walks of life; and that shares common, fundamental values grounded in justice, civility and respect while looking to our diversity as a source of enrichment and strength. We will work to remain steadfast in our pursuit of equity, inclusion, and diversity.

Principles

An inclusive university community is achieved and sustained by seeking a diversity of people and perspectives, valuing our differences, and ensuring equitable opportunities. We are guided by the interdependent principles of inclusion, equity, and diversity.

Policies <continued>

We define inclusion as working together to create a welcoming environment through interpersonal interactions that respect and affirm the inherent dignity, value, and uniqueness of all individuals and communities. Inclusion is an active process of creating a community in which people have full access to relationships and resources that enable their personal and intellectual growth and success.

Inclusive practices reflect awareness and understanding of the complexity of identity and the increasing interconnectedness of our world.

We define equity as ensuring equality of opportunity in all that we do. Equity requires fairness of standards, norms, and practices for all community members. An equitable learning and working community provide equal access to all rights, privileges, and resources.

We define diversity as seeking and realizing the richness of human difference. Diversity is a dynamic phenomenon, life enriching and foundational to excellence. We strive to create and nurture an environment where a diversity of people, ideas, and perspectives flourish and inspire creativity and achievement.

University Policy on Academic Integrity

Academic integrity is highly valued at Clark. Research, scholarship, and teaching are possible only in an environment characterized by honesty and mutual trust. Academic integrity requires that your work be your own. Because of the damage that violations of academic integrity due to the intellectual climate of the University, they must be treated with the utmost seriousness and appropriate sanctions must be imposed. The maintenance of high standards of academic integrity is the concern of every member of the University community.

Every student is responsible for knowing the Academic Policies as outlined in the Acalog: [Academic Policies - Clark University - Acalog ACMS™](#). Several ways in which academic integrity may be violated are outlined below.

Cheating

Cheating has three principal forms:

- Unauthorized use of notes, text, or other aids during an examination or in performance of course assignments.
- Copying the work of another.
- Handing in the same paper for more than one course unless the faculty members involved give their explicit permission to do so.

Plagiarism refers to the presentation of someone else's work as one's own, without proper citation of references and sources, whether or not the work has been previously published. Submitting work obtained from a professional term paper writer or company is plagiarism. Claims of ignorance about the rules of attribution, or of unintentional error are not a defense against a finding of plagiarism.

Policies <continued>

Unauthorized collaboration refers to work that students submit as their own but which was arrived at through a process of collaboration without the approval of the professor. Since standards on appropriate or inappropriate collaboration may vary widely among individual faculty, students should make certain they understand a professor's expectations before collaborating on any class work.

Alteration or fabrication of data includes the submission or changing of data obtained by someone else or not actually obtained in the performance of an experiment or study, except where allowed by the professor. It also includes the changing of data obtained in the performance of one's research.

Participating in or facilitating dishonest activities includes, but is not limited to:

- Stealing examinations
- Forging grade reports or grade change forms, or altering academic records
- Sabotaging the work of another student
- Selling, lending, or otherwise distributing materials for the purpose of cheating
- Forging or altering Graduation Clearance forms
- Forging letters of recommendation
- Forging signatures on any official university documents
- **Generative pretrained transformers (GPT) such as ChatGPT**
 - **Training AI programs to generate work for other students for the purpose of cheating**

Academic Dishonesty Sanctions

In determining the appropriate sanction, the Graduate Dean Board will take into consideration the student's prior history of academic integrity, and the seriousness of the violation. Sanctions may include but are not limited to one or a combination of the following responses:

- Letter of warning to the student
- Grade of zero for the particular assignment
- Grade of F for the course
- Academic probation, the length of which will be determined by the Board
- Notation of sanction on student's academic record
- Suspension: student may be suspended for one semester or one year; the Board may suspend the student without opportunity for transferable credit
- Expulsion from the University

Policies <continued>

Appropriate Use of Clark's Informational Technology System (ITS)

The ITS policy sets forth standards for responsible and acceptable use of Clark University's Information Technology Systems (ITS) resources. These resources include computer systems, computer labs, applications, networks, software, electronic communications and information sources, web pages, and related services. It is the responsibility of both the instructor and the student to be in compliance with the University Policy.

End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is very important to Clark University. Your comments will make a difference in the future planning and presentation of our curriculum. At the end of this class, please take the time to complete the online evaluation survey when it is distributed.

Disclaimer: The instructor reserves the right to make changes to any information contained in this syllabus at any time during the semester. Changes will be announced, and an updated version of the syllabus will be posted on Moodle and/or distributed to students.