



**KENNESAW STATE
UNIVERSITY**

COLLEGE OF COMPUTING AND
SOFTWARE ENGINEERING
Department of Computer Science

CS 3503/08- Computer Organization and Architecture

SYLLABUS

FACULTY AND COURSE INFORMATION

Dan C. Lo, Ph.D.

Professor

Dan.Lo@kennesaw.edu, 470-5478-5487, J-389

Class Location and Meeting Times:

T/R 3:30-4:45PM at J-251

Official Course Web in D2L

Course Communication and Office Hours-

Office Hours: T/R 12:00-2:00PM

Electronic Communications -

“Send emails only to dlo2@kennesaw.view.usg.edu (**students must use their D2L email accounts to send to this address**)”

Email Answering Policy

- Email messages received by 5:00 PM in weekdays will be replied in the same day (by 11:59 PM).
- Other messages will NOT be guaranteed to be responded in the same day.
- Only email in D2L will be replied.

Required Texts or Technology Resources -

Required: N/A

Recommended:

Dan C. Lo, "Digital Computer Design - A Hands-On Approach," in the OpenStax CNX, Rice University,
<https://legacy.cnx.org/content/col29954/latest/>, Aug. 2019.

Dan Lo and Kai Qian, Fundamentals of Computer Systems, 4th edition, 2012 Linus Publications, Inc., ISBN-10: 1-60797-254-9, ISBN-13: 978-1-60797-590-8

Tanenbaum, Andrew S. *Structured Computer Organization, Fifth or Fourth Edition*. Pearson / Prentice-Hall, 2006; ISBN: 0-13-148521-0. ISBN-13: 9780131485211

Teaching/Lab Assistant – N/A

[Additional Resources]

COURSE DESCRIPTION, CREDIT HOURS, AND PREREQUISITES

CS 3503: Computer Organization and Architecture

3 Class Hours 0 Laboratory Hours 3 Credit Hours

Prerequisite: CSE 1322 and CSE 1322L Concurrent: CS 3503L

Introduction and overview of basic computer organization. Computer arithmetic: binary, hexadecimal and decimal number conversions, binary number arithmetic and IEEE binary floating point number standard. Basic computer logic: gates, combinational circuits, sequential circuits, adders, ALU, SRAM and DRAM. Basic assembly language programming, basic Instruction Set Architecture (ISA), and the design of single cycle CPU. Hardware security will be introduced.

COURSE LEARNING OUTCOMES

Students will be able to:

- 1 Apply different formats of data representation and number systems.
- 2 Use Boolean algebra as related to designing computer logic, including solving Karnaugh maps
- 3 Design and evaluate combinatorial and sequential logic circuits with multiple inputs and outputs.
- 4 Design simple combinatorial and sequential logic circuits, using a small number of logic gates.
- 5 Assemble a simple computer with hardware design including data format, instruction format, instruction set, addressing modes, bus structure, input/output, memory, Arithmetic/Logic unit, control unit, and data, instruction and address flow.
- 6 Design simple assembly language programs that make appropriate use of a registers and memory.
- 7 Describe hardware/firmware security vulnerabilities and techniques to mitigate these vulnerabilities

TEACHING PHILOSOPHY AND INSTRUCTION METHODS

My primary teaching goal is to offer a series of courses imparting a broad perspective on the discipline and a firm foundation in the theory and practice of computer science through a rich set of educational experiences. Recent advances in computer systems including open source software, embedded systems, mobile computing, and parallel processing, have allowed applications to be implemented much more easily and less costly. The challenge I would like to bring into the classroom is: how can we exploit current technology to facilitate the demanding applications with a degree of rigor in information security and reliability. In learning theory, I advocate authentic learning and metacognition. Moreover, integrating the technology and application trends into computer science courses should be extended from the classroom into the laboratory and emphasized through larger term projects. This has led to my teaching activities in revising existing courses by bringing in the latest developments in the discipline.

COURSE CONTENT AND REQUIREMENTS/GRADING SCALE

Course Topics and Outline

	Topic
1	Introduction, History, Data Representation, Arithmetic & Numeral Systems, Conversions
2	Signed Numbers, Computer Arithmetic, Binary Multiplication/Division, Booth's Algorithm
3	Boolean Algebra, Gates, Combinational Logic Design
4	Half/Full Adders, Simplification of Boolean Expressions, Karnaugh Maps
5	Schematic Design and Simulation

6	State Machines, Sequential Logic Design, Registers, Hardware Description Languages
7	ALU and CPU
8	Assembly Programming, Addressing, Low Power Computing
9	Instruction Set Architecture
10	Processor, Memory, I/O, Interrupts
11	Memory Systems, Memory Hierarchy, Cache Organizations, Virtual Memory
12	Parallel Computing, Multiprocessors, Multicomputers
13	Hardware/Firmware Security: Root of Trusts, Firmware Worms, BIOS/UEFI, and Chipsec.

Disclaimer: This syllabus represents my current plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunity. Such changes, communicated clearly, are not unusual and should be expected.

Grading Scale and Course Policies

Grading Scale:


Homework Assignments: 30%

Test 1&2: 30%


Test 3: 20%


Attendance & Quizzes: 20%


Each homework is due at the start of class on the due date. Late homework will receive penalty based on the formula, $penalty = (number\ of\ days\ late)^3$, and must be submitted via the late submission dropbox in D2L. No make-up exams will be given except for university-sanctioned absences. All lab works are due in labs. The students are expected to attend all classes. All quizzes are online and due by hard deadlines.


 Points to grade ratio (I reserve the right to make adjustments for borderline cases.)

 A: [90, 100]

 B: [80, 90)

 C: [70, 80)

 D: [60, 70)

 F: [0, 60)

Course Policies:

Feedback in a Timely Manner:

All submitted work graded and returned within a week.

Attendance Policy:

“Attendance at all classes is highly encouraged. Concepts and ideas discussed in one class are used as building blocks for more concepts and ideas in the next class. In being successful in this subject matter, a good rule-of-thumb is to study at least 3 hours per one hour of lecture. *Any class sessions missed by the student are the student's responsibility to make up, not the Professor's.* Makeup exams will NOT be given; instead, the final

exam will count in place of the missed exam; if the final exam is missed, an average of the other exams will be used. No finals will be given outside of the University finals schedule. Project assignments **MUST** be turned in on time to receive full credit. Students will not be allowed to makeup missed project assignments or labs. Students are expected to read the text and any other supporting documentation the Professor distributes. If the student requires additional materials to read or additional problems to solve in better understanding the topics and concepts, the Professor expects the student to take the initiative in locating additional materials or problems. The Professor expects students to take advantage of office hours when needing clarification or help. The Professor greatly supports students sending emails at any time – it will be the goal of the Professor to reply to emails within a 24-hour time span.”

Quiz/Test/Project/Assignment Policy: Quizzes will be online in D2L and exams will be in class proctored.

Quizzes

There will be 8+ quizzes (covering from all modules) to assess learning after completing several topics. All quizzes are online with hard deadlines and no extension will be given. The lowest quiz mark will be dropped automatically.

Tests

There will be 3 tests from each of the modules assessing learning based on covered topics. **Test 1 on 9/17, Test 2 on 10/22, and Test 3 on 12/5.**

Tests are closed book and strictly timed in classroom unless otherwise mentioned. Failure to show at test time will mean no credit for the test. No make-up exams will be given except for university sanctioned absences.

Projects

There will be a course project that will be needed to be done in a group of 3 students. The project topics need to be approved by the instructor. Some topics will be suggested. The project has two parts for marking: implementation and demo (the last 2 weeks reserved for demo), and report writing. The instructor will make provide feedback on proposal and progress with tentative timeline to complete project.

Assignments

Assignments will be handed over throughout the term and students will be given sufficient amount of time to complete it with resources. Assignments are intended for completing on individual basis. Students are highly encouraged to submit assignment by due date to avoid penalties in marks. Late assignments will receive penalty based on the formula, $\text{penalty} = (\text{number of days late})^3$, and must be submitted via the late submission dropbox in D2L.

Make-up Policy:

Proctored Exams:

If you have been granted a make-up, you must use The Testing Center for proctored exam services. Please note, some of these services have a charge affiliated you and you are responsible for the cost.
<http://testing.kennesaw.edu/faculty/request-services.php>

Course Technology: Typical laptop computers are enough.

Electronic Devices and Classroom Behavior Policy:

“In order to minimize the level of distraction, all beepers and cellular phones must be on quiet mode during class meeting times. Students who wish to use a computer/PDA for note taking need prior approval of the instructor since key clicks and other noises can distract other students. Recording of lectures by any method requires prior approval of the instructor. Students using a laptop in class should not check their email, browse the web, or in other way detract from the focus of the class.”

Tutoring:

N/A

COURSE WITHDRAWAL

Last day to drop/add: August 23rd

Last Day to Withdraw Without Academic Penalty: October 9th

See below for commentary on withdrawals from the 2018-2019 Undergraduate Catalog:

Students may withdraw from one or more courses up to one week prior to the last day of class. Summer withdrawal dates vary according to the part of term in which the student is enrolled. As of fall 2004, students will be allowed a maximum of eight total withdrawals if they enter KSU as a freshman. Transfer students will be allowed one withdrawal per fifteen credit hours attempted, for a maximum of eight. Students who choose to pursue a second degree at KSU will be allowed two additional withdrawals and consult with the Registrar's Office. Students who entered KSU before fall 2004 will be allowed one withdrawal per fifteen credit hours attempted for a maximum of eight after the institution of this policy. As part of the consolidation process between Kennesaw State University and Southern Polytechnic State University, SPSU students will have eight withdrawals available beginning Fall Semester 2015.

Students who exceed the maximum number of withdrawals will receive a grade of "WF" for any subsequent withdrawals. To completely or partially withdraw from classes at KSU, a student must withdraw online through Owl Express.

Students who officially withdraw from courses before the last day to withdraw without academic penalty will receive a grade of "W" and receive no credit. Students who officially withdraw after the last day to withdraw without academic penalty and before the last week of classes during the semester or who have exceeded the maximum number of withdrawals will receive a grade of "WF," which will be counted as an "F" in the calculation of their grade point average.

For attendance verification, faculty may assign "non-attendance" or submit a grade of W or WF for students who stop attending class and do not officially withdraw along with the last day of known attendance.

The only exceptions to these withdrawal regulations will be for instances involving unusual circumstances, which must be fully documented. Students may appeal to the Academic Standing Committee for consideration of unusual circumstances. Exact withdrawal dates are published in the official academic calendar. Students will receive refunds only when they withdraw from ALL their classes and only by the schedule outlined in the University System refund policy.

ACADEMIC INTEGRITY

Every KSU student is responsible for upholding all provisions of the Student Code of Conduct, as published in the Undergraduate and Graduate Catalogs. The Code of Conduct includes the following:

- Section II of the Student Code of Conduct addresses the University's policy on academic honesty, including provisions regarding plagiarism and cheating, unauthorized access to University materials, misrepresentation/falsification of University records or academic work, malicious removal, retention, or destruction of library materials, malicious/intentional misuse of computer facilities and/or services, and misuse of student identification cards. Incidents of alleged academic misconduct will be handled through the established procedures of the University Judiciary Program, which includes either an "informal" resolution by a faculty member, resulting in a grade adjustment, or a formal hearing procedure, which may subject a student to the Code of Conduct's minimum one semester suspension requirement.
- Students involved in off-campus activities shall not act in a disorderly or disruptive fashion, nor shall they conduct any dangerous activity.
- Students involved in off-campus activities shall not take, damage or destroy or attempt to take, damage or destroy property of another.

If a student is instructed to provide citations for sources, proper use of citation support is expected.

Additional information can be found at the following locations:

- <http://www.apa.org/journals/webref.html>
 - <http://bailiwick.lib.uiowa.edu/journalism/cite.html>
 - <http://www.indiana.edu/~wts/wts/plagiarism.html>
 - <http://www.virtualsalt.com/antiplag.htm>
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CAMPUS POLICIES

Confidentiality and Privacy Statement (FERPA):

Kennesaw State University adheres to the Family Educational Rights & Privacy Act of 1974 - FERPA. See the following link for more information:

http://usg.edu/information_technology_handbook/section9/tech/9.5_privacy_and_security

University - Student Rights & Responsibilities:

Students of Kennesaw State University are entitled to an environment that is conducive to learning and individual growth. To this end, students enrolling at Kennesaw State University assume a responsibility to abide by the policies and regulations expressed in this section. By doing so, students may fulfill their responsibilities and enjoy the exercise of their own rights while also respecting the rights of others.

<http://catalog.kennesaw.edu/content.php?catoid=27&navoid=2263>

Ethics Statement:

All students are responsible for knowing the information, policies and procedures outlined in the Kennesaw State University Codes of Conduct. The KSU Codes of Conduct include: the general Student Code of Conduct, the Residential Code of Conduct, and the Code of Academic Integrity. Kennesaw State University reserves the right to make changes to this code as necessary and once those changes are posted online, they are in effect. Students are encouraged to check online for the updated versions of all policies.

<http://scai.kennesaw.edu/codes.php>

Sexual Misconduct Policy:

Kennesaw State University is committed to providing programs, activities, and educational environment free from all forms of sex discrimination. For more information click here. KSU issues this statement of policy to inform the community of the University's comprehensive plan addressing sexual misconduct, educational programs, and procedures that address sexual assault, domestic violence, dating violence, and stalking, whether the incident occurs on or off campus. This policy generally covers faculty, students, and staff of the University, as well as third parties. Third parties include but are not limited to guests, vendors, contractors, retirees, and alumni.

<http://scai.kennesaw.edu/procedures/sexual-misconduct.php>

Course Accessibility Statement (ADA Statement):

<http://catalog.kennesaw.edu/content.php?catoid=27&navoid=2263&hl=FERPA&returnto=search#ADA>

ADDITIONAL STUDENT RESOURCES

For CCSE Student resources:

<http://ccse.kennesaw.edu/student-resources.php>

KSU Service Desk:

The KSU Service Desk is your portal to getting assistance or access to University IT Services. Students call: 470-578-3555 or email studenthelpdesk@kennesaw.edu

For Academic Advising information and to schedule appointments:

<http://ccse.kennesaw.edu/advising/index.php>

Links to frequently used and helpful services:

<http://www.kennesaw.edu/myksu/>

Department of Career Planning & Development
<https://careers.kennesaw.edu>

Counseling and Psychological Services
<https://counseling.kennesaw.edu>

Center for Health Promotion and Wellness
<https://wellness.kennesaw.edu>

Student Health Services
<https://studenthealth.kennesaw.edu>