ECE 356: Computer Systems Architecture

Policy Manual

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Spring 2020 Course Description

Architecture and design of microcomputer systems with microprocessors or microcontrollers. Instruction set architectures, software interfaces, processor structures, memory hierarchy, and interfacing. Includes laboratory work.

(RE) Prerequisite(s): ECE256 or 336 or COSC360 or 367.

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I. General Information

1.1. Purpose. This manual describes the course, policies, and procedures. This manual is mandatory for all students enrolled in this course.

1.2. Scope. This manual applies to all students enrolled in the course at the Min H. Kao Department of Electrical Engineering and Computer Science (http://www.eecs.utk.edu) of the Tickle College of Engineering (http://tickle.utk.edu) of the University of Tennessee (http://www.utk.edu).

1.3. Amendments. Amendments may be made to this manual with or without notification; therefore, do NOT save this manual. Instead, retrieve it from Canvas every time in case it happens to update. Use the date at the lower-right corner of the manual to determine if you're reading the most up-to-date version. A summary of changes will be provided on the manual.

1.4. Current Version. The most current version of this manual may be downloaded at: http://tiny.utk.edu/ece356.

1.5. Key Words.

1.5.1. "Will", "must", and "shall" indicate a mandatory requirement.

1.5.2. "Should" is used to indicate a preferred, but not mandatory, method.

1.5.3. "May" indicates an acceptable or suggested means.

1.5.4.“UTK” is short for the “University of Tennessee at Knoxville”.

1.5.5. “TBD” is short for “To Be Determined”.

1.5.6. “IAW” is short for “In Accordance With”.

1.6. Learning Management System. All students will be required to use Canvas as the learning management system. Canvas for the semester is at: https://tiny.utk.edu/canvas_ece356.

1.6.1. Calendar. The Canvas calendar will be used to notify any class cancellations for any purpose, including holidays. Students will be required to frequently check their Canvas calendar for due dates and class dates.

1.7. Times and Dates. All times and dates, including due dates, will use the Eastern Time Zone and will observe spring and fall time changes (EST and EDT). Furthermore, all times will use a 24-hour clock (e.g., 1100 = 11:00am, 1200 = 12:00pm, 1500 = 3:00pm, 1800 = 6:00pm, 2200 = 10:00pm, etc.).

1.8. Student Information and Accommodations. All student information will be kept confidential in accordance with the Family Educational Rights and Privacy Act of 1974 (FERPA). More information may be found at: https://ferpa.utk.edu.

1.8.1. FERPA Waiver. Students may waive some or all their FERPA rights, typically in cases such as letters of recommendations. Students must complete and sign a FERPA form before any FERPA-related information is released.

1.8.2. Disclosure. All student information is covered under FERPA and will not be disclosed to anyone, including students' parents. FERPA information necessary for this course is

retrievable by the professors, undergraduate teaching assistants, and graduate teaching assistants.

1.8.3. Disability. Any students who have disabilities may register with the Office of Student Disability Services (SDS) for a range of accommodations. No accommodations will be made without prior approval from SDS.

1.8.3.1. SDS Website. More information about SDS may be found at: https://sds.utk.edu.

1.9. Deviations.

1.9.1. While compliance with this manual is mandatory, the following exceptions to policy may be made given:

1.9.1.1. All exception to policy rules must be in writing (unless otherwise noted), or

1.9.1.2. Exceptions to policy rules must be made at the department head level, or

1.9.1.3. Any illness, injury, death in the family, and so forth requires an "absence request" from the Dean of Students (https://dos.utk.edu).

1.9.2. For unusual circumstances, the professor or instructor may deviate from this manual on a case-by-case basis.

1.9.2.1. TAs and other representatives of this course may suggest deviations, but they are not permitted to approve deviations and must comply with 1.9.1 above.

1.10. Teaching Assistants (TA). Teaching assistants are representatives of the professors. They have full access to all student information, including grades. Teaching assistants may be undergraduate (UTA) or graduate students (GTA), or both.

1.11. Supplemental Instructors (SI). Supplemental instructors from the student success center are not official representatives of the course.

1.11.1. Students will not consider any instruction or suggestion to be official from any supplemental instructor.

1.11.2. Supplemental instructors will not make any deviations per section 1.9 of this manual.

1.11.3. Information about the SI program is available at: https://studentsuccess.utk.edu/supplemental-instruction/what-is-supplemental-instruction/

1.12. Contacts. Electronic communications will be made to the professor and teaching assistants through Piazza. A link is provided on Canvas to connect to Piazza.

1.12.1. **Email Correspondence.** For most purposes, students will NOT email a teaching assistant of professor directly. These emails are likely to be ignored.

1.13. Letters of Recommendations. Generally, students may request letters of recommendation.

1.13.1. FERPA Requirements. Any letter of recommendation written must have a FERPA waiver on file with the professor writing the letter. http://tiny.utk.edu/marz_ferpa

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II. Office Hours

1.1. Office Hours. The teaching assistants will hold regular office hours to assist students with the course material and with their lab assignments.

1.1.1. Information. Information regarding office hours, including times and locations, will be posted to Canvas.

1.1.2. Rules for Help. The teaching assistants have been instructed NOT to give answers but try to lead you to answers or show you where the information can be found. The teaching assistants may point you to a place to read information rather than tell you the information outright.

1.2. Office Hours Conduct. Students will conduct themselves with respect towards those holding the office hours. The programming clinic tends to get very busy, and the teaching assistants will try to give time to each student requesting help.

1.2.1.1. Availability. Students will not congregate. Instead, students will enter the room, ask their question(s), and then leave. The room is too small to allow students to stay. The teaching assistants may ask that any student who is in the programming clinic leave until they have a question, regardless of the number of students in the room.

1.2.1.2. Behavior Penalties. Students who do not follow the rules laid out above may sanctioned in accordance with UT HillTopics Student Code of Conduct: https://hilltopics.utk.edu/student-code-of-conduct.

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III. Prerequisites

1.1. **Knowledge**. Students should have the following prerequisite knowledge:

- 1.1.1. Basic digital logic and design
- 1.1.2. Basic knowledge of central processing unit datapaths (pipelining and caches).
- 1.1.3. Simple pipelining operations
- 1.1.4. C or C++ pointer knowledge (pointer arithmetic, typecasting pointers)
- 1.1.5. Basic assembly-level programming
- 1.1.6. Basic virtual memory operations
- 1.1.7. Basic memory mapped and port IO systems.

1.2. **Skills**. Students should have a firm background in C++ programming and be able to understand low-level programming in C++. Students should have an introductory skillset regarding assembly-level programming.

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IV. Course Work

1.1. **Textbooks.** No textbook has been assigned for this course.

1.2. Assignments. Students will be assigned and graded based on a variety of assignments. Students must check Canvas under Assignments for weighting, rules, and due dates for all assignments. Students may check Canvas under Syllabus for all future and past due dates.

1.2.1. Submissions. All assignments will be submitted to Canvas. Submissions sent via Piazza or email to a professor or teaching assistant will be ***ignored***.

1.2.2. Homework. Homework may be assigned on Canvas. Students must check the policies for the given homework. The policy will be on Canvas before you the assignment is accessed. Some assignments may allow multiple attempts with a compulsory timeout between attempts.

1.2.3. Labs. Labs will be assigned on Canvas. All submissions must be made through Canvas (see Figure 1).

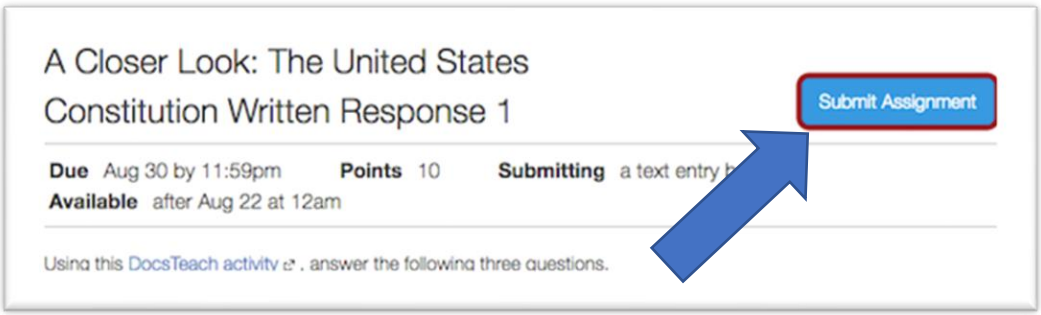

Figure 1: Submitting Lab Assignments

1.2.3.1. Lab Submission. Students must submit their labs using Canvas.

1.2.3.1.1. Diligence. Students must check their submission to ensure it is the correct submission and that it properly submitted. NO EXCEPTIONS will be made for incorrect submissions.

1.2.3.1.2. Recency. Only your latest submission will be graded. If you previously submitted your lab prior to the due date and subsequently submitted past the due date, the lab submitted past the due date will be graded and subject to late penalties.

1.2.3.1.3. Grading Comments. Students may make comments on their submission; however, these have no bearing on the students' grading. Graders are NOT given notification when a student makes a comment. Therefore, students will not make comments after the assignment has been graded.

1.2.4. Exams. Students may complete hardcopy or online exams during class time. (See Canvas calendar for if/when an exam would be given).

1.2.4.1. Laptop. You will be notified of the exam's format. If it is an online, Canvas format, you must make sure your laptop is in good working condition and fully charged before arriving to your testing location. You MUST notify the instructor as soon as possible if your laptop is unserviceable.

1.2.4.2. Missing Exams. Students must notify their professor in writing that they will miss an exam at least one (1) week prior to the exam. Approved missed exams must be taken as soon as possible. Note that make-up exams may or may not be taken in the same place as the original exam. Students who do not give a week's notice must submit an absence request through the dean of students (see section I.1.9.1.3).

1.2.4.3. Disability Services. Students who need extra time for an exam must take the exam at the Student Disability Services Testing Center (SDS) (see: https://sds.utk.edu/testing-center). Disability services will be provided a hard-copy version of the exam and will email the completed exam to the professor.

1.2.4.4. Make-up Exams. Make-up exams will only be offered to those who are excused from the original time or place. To avoid potential cheating, make-up exams may or may not be the original exam.

1.2.4.5. Partial Credit. Partial credit may or may not be offered for exams, regardless of the points offered for a question. Students are not permitted to negotiate partial credit, and all students will be held to the same standard.

1.3. Due Dates. All due dates will be listed on Canvas.

1.4. Grading.

1.4.1. Weights. The weight of each grading category is listed on Canvas under "Manual".

1.4.2. Canvas. Students must make sure that the checkbox shown in Figure 2 is ***unchecked***. Otherwise, assignments not submitted will not count against the student's grade.

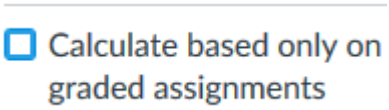

Figure 2: Canvas Grading Checkbox

1.4.3. Late Penalty. Late labs will not be accepted.

1.4.4. Homework. Homework is automatically graded by Canvas.

1.4.5. Attendance. Attendance will be taken in the class using a "clicker". Students may use a physical clicker device or use their mobile phone with the clicker app.

1.4.6. Labs. Teaching assistants will typically grade lab submissions.

1.4.6.1. Comments and Formatting. All student lab submissions must be properly formatted and commented, including a commented header which includes the student's name, date, and a summary of the lab.

1.4.6.1.1. Example.

```
// lab2.cpp
```

```
// This lab calculates things.
// Joe Student
// 11-Jun-2019
// Professor: Dr. Marz
// TAs worked with: Ms. Assistant
// Students worked with:
// Jane Student (section 1), Donald Sutherland (section 2)

int main() {

}
```

1.4.6.2. Compiling Requirement. Unless otherwise noted, all labs that do not compile on the EECS-IT lab machines (i.e., Tesla, Hydra, and Arc lab machines) using the given compiling commands will be graded 0.

1.4.6.3. Rubrics. A rubric may be attached to all Canvas assignments to normalize grading among the teaching assistants. The rubrics are based on a completed assignment. For example, incomplete assignments may not receive full credit for formatting and/or comments or other rubric items.

1.4.7. Regrades. Students may request a regrade to challenge the grade they received on any assignment. Students must use Piazza and put in writing their intention to appeal a grade. The Piazza message must be sent to all "Instructors".

1.4.7.1. Timeliness. Regrade requests must be made within **seven (7)** days of receiving the grade.

1.4.7.2. Regrading. A TA may regrade a student's work without regard to their previous grade. Therefore, the student may receive a lower grade after an appeal.

1.5. Grade Curving. Grades will not be curved or rounded. Grades will not be "bumped" to another grade level no matter how close it is. Instead, extra credit may be offered, including a survey, to effectively round or bump grades.

1.6. Extra Credit. Opportunities may be given to earn extra credit.

1.6.1. End of Course Survey. An end of course survey will be offered. This course survey will permit a student to earn extra points towards their final grade. This is used in lieu of curving and rounding grades.

1.6.1.1. Survey Credit. The amount of extra credit given for the end of course survey will be indicated on Canvas.

1.7. Official University Appeal. A student may appeal their final grade with the University of Tennessee. The procedures for doing so are outlined in the undergraduate course catalog under "Academic Policies and Procedures" > "Grade Appeal Procedures": http://catalog.utk.edu.

1.8. Course Auditors. Students who sign up for this course as an auditor must remain as an auditor regardless of their success in the course. No auditors will be allowed to petition for a recorded letter grade.

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V. Code of Conduct

1.1. **Honor Statement.** Students will conduct themselves according to the University of Tennessee Hilltopics Honor Statement, which may be viewed at: http://catalog.utk.edu/content.php?catoid=24&navoid=3078#hono_stat.

1.2. **Behavior.** Any student who exhibits inappropriate behavior may be admonished immediately and/or referred to student conduct (see section 1.3.3.5 below). Continued inappropriate behavior may involve the University of Tennessee Police Department (UTPD).

1.3. **Plagiarism and Cheating.** Any student who is suspected of plagiarism and/or cheating will receive a penalty for doing so. The student will not be notified in advanced at the penalty or that they were suspected of violating the plagiarism and/or cheating policy. Instead, it is the student's responsibility for contacting their professor.

1.3.1. **Examples of Cheating.** Plagiarism and cheating may result from a student copying an assignment or sections of an assignment from another student, from an online source, or from the student's own previous assignment (from a previous attempt at the course).

1.3.1.1. **From SECTION 10.4 PLAGIARISM:** Plagiarism is using the intellectual property or product of someone else without giving proper credit. The undocumented use of someone else's words or ideas in any medium of communication (unless such information is recognized as common knowledge) is a serious offense, subject to disciplinary action that may include failure in a course and/or dismissal from the University. Specific examples of plagiarism include, but are not limited to: (1) using without proper documentation (quotation marks and citation) written or spoken words, phrases, or sentences from any source; (2) summarizing without proper documentation (usually a citation) ideas from another source (unless such information is recognized as common knowledge); (3) borrowing facts, statistics, graphs, pictorial representations, or phrases without acknowledging the source (unless such information is recognized as common knowledge); (4) collaborating on a graded assignment without the instructor's approval; and (5) submitting work, either in whole or partially created by a professional service or used without attribution (e.g., paper, speech, bibliography, or photograph).

1.3.1.2. **From SECTION 10.5 EXAMPLES OF OTHER TYPES OF ACADEMIC DISHONESTY:** Specific examples of other types of academic dishonesty include, but are not limited to: (1) providing or receiving unauthorized information during an examination or academic assignment, or the possession and/or use of unauthorized materials during an examination or academic assignment; (2) providing or receiving unauthorized assistance in connection with laboratory work, field work, scholarship, or another academic assignment; (3) falsifying, fabricating, or misrepresenting data, laboratory results, research results, citations, or other information in connection with an academic assignment; (4) serving as, or enlisting the assistance of, a substitute for a student in the taking of an examination or the performance of an academic assignment; (5) altering grades, answers, or marks in an effort to change the earned grade or credit; (6) submitting without authorization the same assignment for credit in more than one course; (7) forging the signature of another or allowing forgery by

another on any class or University-related document such as a class roll or drop/add sheet; (8) gaining an objectively unfair academic advantage by failing to observe the expressed procedures or instructions relating to an exam or academic assignment; and (9) engaging in an activity that unfairly places another student at a disadvantage, such as taking, hiding, or altering resource material, or manipulating a grading system.

1.3.2. **Working Together.** Students are encouraged to work together, however this increases the risk of plagiarism and/or cheating. Students are cautioned to make sure that when they work together that their code cannot be seen by another student. We recommend that students work together by placing their laptops back to back. With this method, students may discuss topics, but the code they write is purely their own.

1.3.2.1. **Citation.** Always cite any professor, teaching assistant, or another student with whom you discussed the work with. Even if you cannot see another student's code, the chances of parallel thinking are increased. When you cite whom you worked with, we can understand where your lab may look like another.

1.3.2.1.1. **Parallel Thinking.** Citations do NOT preclude you from abiding by the plagiarism/cheating policy. Even if you cite your source, you may still not copy code in portions or entirety.

1.3.3. **Penalties.** The professors and teaching assistants are not investigation units. Therefore, anyone found in violation of the plagiarism policy will receive the same penalty regardless of who originated the content.

1.3.3.1. **Labs/Homework.** Students will receive a 0 for the lab or homework and a ten (10) point drop on their final grade. This will appear as a "Plagiarism" column on Canvas. Essentially, it removes exam points to achieve a 10-point drop on the student's final grade.

1.3.3.1.1. **Repeated Violations**. Repeated violations of the plagiarism or cheating policy will result in a 0 for the course.

1.3.3.2. **Exams.** Any suspected plagiarism and/or cheating on an exam will result in a 0 for the course.

1.3.3.3. **Stolen Work.** If an allegation of theft is made, the theft will immediately be reported to student conduct for an investigation.

1.3.3.4. **Extended Scrutiny.** After a student has been flagged for potential plagiarism, all other works will be more closely scrutinized for plagiarism, past and present. Students will note that if they have not been caught for plagiarism, it doesn't mean it's not plagiarism. Therefore, if a previous work was plagiarized, the student or students responsible will be held to account for multiple violations of the plagiarism policy.

1.3.3.5. **Referrals.** The professors and teaching assistants reserve the right to refer any student behavior to student conduct regardless of previous incidents, or lack thereof. More information about referrals and student conduct may be found at: https://studentconduct.utk.edu.

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VI. Transcript Grades

1.1. Letter Grades. Numeric grades will follow Table 1 to translate to the final letter grade.

1.2. Failing scores. Students who receive a combined grade of 65% for any category will not earn more than a B letter grade. Students who fail an exam by scoring a 60% or below (excluding the exam that drops) will not earn more than a B letter grade.

Letter	Floor (%)
A	94
A-	90
B+	87
B	84
B-	80
C+	77
C	75
C-	73
D+	70
D	68
D-	66
F	0

Table 1: Letter Grade Conversion

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VII. Learning Objectives

After successfully completing this course, students should be able to perform/understand the following.

Software Layer

1. Understand what an instruction set architecture means and what it details.
2. Understand how an assembler converts instructions into machine code.
3. Understand how programmers deal with asynchronous programming.
4. Understand how virtual systems and dynamic translation is performed.
5. Understand how memory is allocated and used.
6. Understand how an operating system handles interrupts or exceptions.

Hardware Layer

1. Understand how instructions are executed in the CPU.
2. Understand how information is written to or read from memory.
3. Understand how cache can improve performance.
4. Understand how the operating system communicates with hardware.
5. Understand how instruction-level parallelism can improve performance.

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VIII. Summary of Changes

8-Jan-2020: Initial release.