COSC361
Operating Systems
SYLLABUS

Spring 2019 Course Description
Threads, operating system structure, process management, scheduling, synchronization, deadlock, memory management, virtual memory and demand paging, file system management and implementation, mass storage structure, protection, security, and distributed systems.

(RE) Prerequisite(s): 130 and 302
# COSC361 Operating Systems

## SYLLABUS

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I. General Information

1.1. Purpose. This syllabus describes the COSC361 course, policies, and procedures. This syllabus is mandatory for all students enrolled in COSC361.

1.2. Scope. This syllabus applies to all students enrolled in the COSC361 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 syllabus with or without notification; therefore, do NOT save this syllabus. Instead, retrieve it from Canvas every time it happens to update. Use the date at the lower-right corner of the syllabus to determine if you’re reading the most up-to-date version. A summary of changes will be provided on the syllabus.

1.4. Current Version. The most current version of this syllabus may be downloaded at: http://tiny.utk.edu/cosc361.

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. COSC361 for the Spring 2019 semester is at: https://tiny.utk.edu/canvas_cosc361.

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 syllabus 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 syllabus 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 COSC361 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 COSC361 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 syllabus.

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.
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1.13.1. **FERPA Requirements.** Any letter of recommendation written must have a FERPA waiver on file with the professor writing the letter.
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 be sanctioned in accordance with UT HillTopics Student Code of Conduct: https://hilltopics.utk.edu/student-code-of-conduct.
III. Course Work

1.1. **Textbooks.** The textbook “Operating Systems” is provided as an inclusive access ZyBook (ISBN-13: 978-1-5418-6082-7). A link will be provided on Canvas to access this textbook.

1.2. **Assignments.** Students will be assigned and graded based on a variety of assignments.

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 will be assigned through the ZyBook (see Figure 1). Students must use the link provided through Canvas and click the “Submit to Canvas” button on the ZyBook itself. Otherwise, a grade will not be recorded.

![Figure 1: Zybook Submission Button](image)

1.2.3. **Labs.** Labs will be assigned on Canvas. All submissions must be made through Canvas (see Figure 2).

![Figure 2: Submitting Lab Assignments](image)

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. **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.

1.2.3.2. **Lab Solutions.** Lab solutions will not be distributed. See your teaching assistant for questions about any of your lab submissions.

1.2.4. **Exams.** Students will complete hardcopy, paper exams during class time.

1.2.4.1. **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.

1.2.4.2. **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](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.

1.2.4.3. **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.

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

1.3.1. **Diligence.** Students are responsible to check Canvas regularly for any due dates.

1.3.2. **Late Policy.** Students may submit assignments up to three (3) days late.

1.4. **Grading.**

1.4.1. **Weights.** The weight of each grading category is listed on Canvas under “Syllabus”.

1.4.2. **Canvas.** Students must make sure that the checkbox shown in Figure 3 is **unchecked.** Otherwise, assignments not submitted will not count against the student’s grade.

![Calculate based only on graded assignments](image)

*Figure 3: Canvas Grading Checkbox*
1.4.3. **Late Penalty.** Late submissions will receive a 3% per hour penalty.

1.4.4. **Homework.** Homework is automatically graded by Canvas and/or ZyBooks.

    1.4.4.1. **Zybooks.** Zybooks does NOT automatically send your score to Canvas. You must click on the "Submit to Canvas" button as shown in section **III.1.2.2.**

1.4.5. **Labs.** Teaching assistants will typically grade lab submissions.

    1.4.5.1. **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.

    1.4.5.2. **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.

    1.4.5.2.1. **Appeals.** Students will not appeal a 0-grade due to compiling problems.

1.4.6. **Appeals.** Students may appeal the grade they received. Students must send a Piazza message to all "Instructors" with the assignment whose grade they wish to appeal.

    1.4.6.1. **Timeliness.** Appeals must be made within ten (10) days of receiving the grade.

    1.4.6.2. **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.

1.6. **Extra Credit.** Several 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 at: [http://catalog.utk.edu/content.php?catoid=24&navoid=3078#grad_appe_proc](http://catalog.utk.edu/content.php?catoid=24&navoid=3078#grad_appe_proc).
IV. 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 advance of 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).

1.3.2. **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](https://studentconduct.utk.edu).
V. Transcript Grades

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

<table>
<thead>
<tr>
<th>Letter</th>
<th>Floor (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>94</td>
</tr>
<tr>
<td>A-</td>
<td>90</td>
</tr>
<tr>
<td>B+</td>
<td>87</td>
</tr>
<tr>
<td>B</td>
<td>84</td>
</tr>
<tr>
<td>B-</td>
<td>80</td>
</tr>
<tr>
<td>C+</td>
<td>77</td>
</tr>
<tr>
<td>C</td>
<td>75</td>
</tr>
<tr>
<td>C-</td>
<td>70</td>
</tr>
<tr>
<td>D+</td>
<td>67</td>
</tr>
<tr>
<td>D</td>
<td>64</td>
</tr>
<tr>
<td>D-</td>
<td>61</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table 1: Letter Grade Conversion*
VI. Schedule

1.1. Dates. All key dates and times will be listed on the course's calendar on Canvas.

1.2. Attendance. Attending all lectures is mandatory.

1.3. Lecture. Lectures will be held on Monday, Wednesdays, and Fridays in Min Kao Room 524 and are 50 minutes. Lecture begins at 1010 and ends at 1100.

1.3.1. Instructor. A teaching assistant or another professor may substitute for a class, or a class may be canceled if the primary instructor is unable to teach for any reason, such as due to an illness.
VII. Weekly Topics

1.1. Spring 2019. The weekly course schedule, Table 2, describes the topics that will be covered during the spring 2019 semester.

1.1.1. Date. The date refers to the first day of the week that the topics will be covered.

1.2. Changes. Changes to the schedule may be made with or without notice.

<table>
<thead>
<tr>
<th>Week</th>
<th>Begins</th>
<th>Topics</th>
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<tbody>
<tr>
<td>01</td>
<td>01/09</td>
<td>Introduction, syllabus</td>
</tr>
<tr>
<td>02</td>
<td>01/14</td>
<td>Role of OS, definitions, booting</td>
</tr>
<tr>
<td>03</td>
<td>01/21</td>
<td>Drivers and hardware</td>
</tr>
<tr>
<td>04</td>
<td>01/28</td>
<td>System calls</td>
</tr>
<tr>
<td>05</td>
<td>02/04</td>
<td>Processes and scheduling</td>
</tr>
<tr>
<td>06</td>
<td>02/11</td>
<td>Concurrency</td>
</tr>
<tr>
<td>07</td>
<td>02/18</td>
<td>Deadlocks</td>
</tr>
<tr>
<td>08</td>
<td>02/25</td>
<td>Memory management</td>
</tr>
<tr>
<td>09</td>
<td>03/04</td>
<td>Kernel paging</td>
</tr>
<tr>
<td>10</td>
<td>03/11</td>
<td>Paging algorithms</td>
</tr>
<tr>
<td>11</td>
<td>03/18</td>
<td>Spring break (NO CLASS)</td>
</tr>
<tr>
<td>12</td>
<td>03/25</td>
<td>File system</td>
</tr>
<tr>
<td>13</td>
<td>04/01</td>
<td>Virtual file system</td>
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<tr>
<td>14</td>
<td>04/08</td>
<td>Input and output</td>
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<td>15</td>
<td>04/15</td>
<td>Distributed operating systems</td>
</tr>
<tr>
<td>16</td>
<td>04/22</td>
<td>Protection and security</td>
</tr>
</tbody>
</table>

*Table 2: Weekly Topics*
VIII. Learning Objectives
After successfully completing this course, students should be able to perform/understand the following.

Hardware/Software Layer
1. Understand how computers boot.
2. Understand how control is transferred to a bootloader.
3. Understand how an operating system controls hardware.
4. Understand the different input/output systems: PIO and MMIO.
5. Understand how hardware changes can be detected through interrupts and/or polling.

Operating System Protection
1. Understand the differences between user space and kernel space.
2. Understand how user space enters kernel space.

Memory Management
1. Understand how an operating system kernel can allocate memory.
2. Understand how the operating system programs the memory management unit (MMU).
3. Understand how virtual addresses translate into physical addresses.

Mass Storage / File Systems
1. Understand the goals of different file systems.
2. Understand how a set of file systems link together through a virtual file system (VFS).
3. Understand how operating systems efficiently write/read from I/O.

Operating System Design
1. Understand the choices made with operating system design.
2. Understand the pros/cons of monolithic, micro, and hybrid kernels.
3. Understand how the components of an operating system perform a task together.
4. Understand how tasks are accomplished using various scheduling techniques.
IX. Summary of Changes