CSCE-4600 Operating Systems Design
Spring 2020
Meeting Time: TR 8:30 am - 9:50 am
Classroom: NTDP B185 and K120

Instructors: Armin R. Mikler and Marty O’Neill
Office: NTDP F294
Office Hours: (Mikler) MW 9:30am - 11:00am, or by appointment
(O’Neill) Thu 10:00am – 1:00pm, or by appointment
E-Mail: Please communicate via Canvas messaging
Teaching Assistant: Dominic Carrillo, Michael Nutt, Srishan Bhattarai
TA Office Hours: TBA
Textbook: "Operating System Concepts - Essentials" 2nd Edition (but edition 1 can be used if you have a copy)
by Silberschatz, Galvin, and Gagne
Course Page: UNT CANVAS
Expected background: Systems Programming (or equiv.)

Operating Systems
After a brief overview of the different issues we will encounter during this course, we will review the principles of
Operating Systems in detail. This course will focus specifically on the management of processes and their coordination,
deadlocks, file systems, memory management, process scheduling, and security. Time permitting, we will discuss some
of the important issues in the area of distributed systems. While the course will loosely follow the textbook, however,
we will study material from many other sources, e.g., journals and other textbooks. The course will strike a balance
between the programmers (applied) perspective and a theoretical view of operating systems.

CSCE 4600/5640 Course Outcomes

Students will be able to:
1. use the principles of processes and threads for abstraction of real-world events
2. formulate solutions for mutual exclusion and process synchronization
3. understand the concept of deadlock to develop deadlock free systems of processes
4. understand principles of memory and resource management
5. identify different process scheduling paradigms and utilize them in system development
6. develop fundamental security features to protect systems and data

Useful References:

1. Advanced Concepts in Operating Systems by M. Singhal and N. G. Shivaratri
2. Operating Systems – Advanced Concepts by Maekawa, Oldehoeft, and Oldehoeft
3. Operating Systems by J. Bacon and T. Harris
4. Operating Systems by W. Stallings
5. Advanced Programming in the UNIX Environment by W.R. Stevens
6. Beginning Linux Programming by R. Stones and N. Matthew
Tentative Schedule of Topics:

<table>
<thead>
<tr>
<th>Week of</th>
<th>Topic:</th>
<th>Reading Assignments:</th>
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</thead>
<tbody>
<tr>
<td>1-12</td>
<td>Introduction to OS – an overview</td>
<td>Chapter 1 &amp; 2</td>
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<tr>
<td>1-19</td>
<td>Introduction to OS continued</td>
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<tr>
<td>1-26</td>
<td>Operating System Structures and Introduction to Processes</td>
<td>Chapter 3 &amp; 4</td>
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<tr>
<td>2-2</td>
<td>Processes and Process Coordination – The MUTEX problem</td>
<td>Chapter 5</td>
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<tr>
<td>2-9</td>
<td>Semaphores and Process Synchronization Problems</td>
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<tr>
<td>2-16</td>
<td>Higher-Level Process Synchronization Mechanisms</td>
<td>Chapter 5</td>
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<tr>
<td>2-23</td>
<td>Review of Process synchronization - EXAM #1 (2-27)</td>
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<tr>
<td>3-1</td>
<td>Process Scheduling – Conventional</td>
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<td>3-8</td>
<td>SPRING BREAK</td>
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<tr>
<td>3-15</td>
<td>Real-Time Scheduling, Introduction to Deadlocks</td>
<td>Chapter 6 and Chapter 5</td>
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<tr>
<td>3-22</td>
<td>Deadlock Avoidance and Prevention</td>
<td>Chapter 5, Handouts, References</td>
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<tr>
<td>3-29</td>
<td>Scheduling and Deadlock Review, EXAM #2 (4-2)</td>
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<tr>
<td>4-5</td>
<td>Memory Management</td>
<td>Chapter 7</td>
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<tr>
<td>4-12</td>
<td>Virtual Memory</td>
<td>Chapters 8, 9, 10, 11</td>
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<tr>
<td>4-19</td>
<td>File Systems</td>
<td>Chapters 13 and 14, Handouts</td>
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<td>4-26</td>
<td>Protection and Security – Wrap-up</td>
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<tr>
<td>5-3</td>
<td><strong>Final Exam:</strong> Exam according to UNT Exam Schedule</td>
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Homework:
There will be regular homework assignments for each topic covered. Homework assignments are to be completed **individually** (see policies) unless specified otherwise. Homework will consist of problem sets as well as small programming assignments. It is important to spend the time to experiment with the various program elements, so start your homework promptly. All assignment submissions must be typed. **Handwritten assignments WILL NOT be graded.**

Projects:
There will be several course projects for which you will be expected to work in small groups. The maximum group size will depend on the type of project and will be specified at a later time. **Each project must be accompanied by a detailed project report describing the problem, the implementation, experiments and results as well as their interpretation.**

Reading Assignments:
In addition to regular homework, there is a standing reading assignment of all chapters listed in the table above. Material covered in each of the textbook chapters assigned may form the basis for questions in homework, projects, and exams.

Testing:
There will be three exams, each covering separate parts of the course material. **The Final Exam will NOT be comprehensive!**

Grading:

<table>
<thead>
<tr>
<th>Item</th>
<th>% of final grade</th>
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<tbody>
<tr>
<td>Homework</td>
<td>25%</td>
</tr>
<tr>
<td>Projects (2)</td>
<td>30%</td>
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<tr>
<td>Tests (3)</td>
<td>45%</td>
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Course Policies:

- **Attendance**: Students are expected to attend all lectures. There are aspects of the material that are being discussed in class, which are not found in the textbook or the slides. Further, in-class discussions are an important part of the course and students should actively participate.

- **All homework assignments and projects** must be turned in at the beginning of class on their respective due date. Late assignments will be accepted with a 25% penalty per day. Assignments that are submitted more than two days past their deadline will not be accepted and not graded. All assignment submissions must be typed.

- **Cheating and Plagiarism** will not be tolerated. Anyone found guilty of cheating on a test or assignment will receive zero points for the entire unit of work and will result in a lowering of the grade for the course. Discussions of problems and assignment with your classmates is welcome and encouraged, however, sharing of solutions is not. If you need help, you should ask the TA or the instructor. Cheating includes, but is not limited to, all forms of plagiarism and misrepresentation.

- **There will be NO "make-up" Test or Exams**. In case of verifiable emergencies, arrangements must be made with the instructor.

- **There will be NO early Tests or Exams**.

Disability Policy:

*The Computer Science Department and this instructor cooperate with the Office of Disability Accommodation to make reasonable accommodations for qualified students (cf. Americans with Disabilities Act and Section 504, Rehabilitation Act) with disabilities. If you have not registered with ODA, we encourage you to do so. If you have a disability for which you will require accommodation, please discuss with me after class and present a written accommodation request before the 2nd week of class.*

Please provide the following information and submit this page at the end of the first class.

First Name: ________________________________

Last Name: ________________________________

UNT E-MAIL : ____________________________

*I have read and understood the above course policies!*

Initial: ________