Advanced Operating Systems COSC 6352
Department of Computing Sciences
Fall 2019

A. COURSE INFORMATION

Course number/section: COSC-6352.001
Class meeting time: MW 3:30 - 4:45 PM
Class location: IH-156
Course Website: Blackboard

B. INSTRUCTOR INFORMATION

Instructor: Dr. Mohammed Yassine Belkhouche
Office location: CI 305
Office hours: TR 01:30 PM – 03:00 PM
MW 02:00 PM – 03:00 PM
Telephone: 361-825-3492
e-mail: mohammed.belkhouche@tamucc.edu
Appointments: By e-mail

C. COURSE DESCRIPTION

Catalog Course Description
An introduction to advanced concepts in operating systems and distributed systems. Topics include distributed system architectures, inter-process communication, distributed mutual exclusion, distributed synchronization and deadlock, agreement protocols, distributed scheduling and process management, distributed shared memory, and distributed file systems, multiprocessor system architectures and operating systems, recovery and fault tolerance.

Extended Course Description
None.

D. PREREQUISITES AND COREQUISITES

Prerequisites
COSC 5331 (Survey of Computer System Software), or an equivalent undergraduate course in operating systems.

Corequisites
None.

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook(s)

Optional Textbook(s) or Other References
None.
Supplies

None.

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1. Define what a distributed computing system is and analyze various distributed computing system models.
2. Comprehend and evaluate the basic fundamentals and design issues of distributed operating systems.
3. Recognize and evaluate various types of computer networks, communication protocols, and internetworking technologies.
4. Comprehend various methods and design issues for inter-process communication using message passing and remote procedure calls in a distributed system.
5. Explain the design and implementation issues for distributed shared memory, consistency models, replacement strategies, and thrashing.
6. Explain and analyze distributed operating system principles of clock synchronization (physical, logical, and vector), event ordering.
7. Explain and analyze various algorithms for distributed mutual exclusion.
8. Explain and analyze various algorithms for distributed deadlock.
9. Comprehend distributed system design issues for database systems and atomic transactions.
10. Explain and analyze concurrency control, scheduling, process migration, and load distribution in distributed operating systems.
11. Research specialized design issues in real-time operating systems, clusters, high availability systems, and disaster recovery methods.

Assessment of objectives will be conducted through exams, laboratory exercises, and programming assignments.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

This is a graduate-level core course. Students are expected to attend all classes. Regular completions of all homework/project assignments on time are essential for success in this course. Please note that this course has a heavy programming workload.
H. MAJOR COURSE REQUIREMENTS AND GRADING

Your course grade will be decided on your performance in the homework assignments, quizzes, and exams. The distribution of points is as follows:

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
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<tbody>
<tr>
<td>Exam I</td>
<td>15</td>
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<tr>
<td>Exam II</td>
<td>15</td>
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<tr>
<td>Final Exam</td>
<td>15</td>
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<tr>
<td>Home work</td>
<td>5</td>
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<tr>
<td>Programming assignments</td>
<td>40</td>
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<tr>
<td>Quizzes</td>
<td>10</td>
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Grading scale: A: 100-90, B: 89-80, C: 79-70, D: 69-60, and F: 59-0.

Homework/Programming Assignments: Approximately 6-8 assignments will be given. No late homework assignments will be accepted. Partial credit will be given for incomplete assignments.

Quizzes: Approximately 3-5 pop-up quizzes (dropping one or two). Each quiz is about 10 minutes long.

Exams: The first exam will be given on October 02, 2019, the second exam will be given on November 04, 2019 during the scheduled class time, and the final exam will be given on December 09, 2019 from 01:45 PM – 04:15 PM.

I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>CHAPTER(S)</th>
<th>ASSIGNMENTS</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Review of operation systems concepts</td>
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<tr>
<td>Week 2</td>
<td>Characterization of Distributed Systems</td>
<td>Chapter 1</td>
<td>HW1</td>
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<tr>
<td>Week 3</td>
<td>Inter-process Communication</td>
<td>Chapter 3</td>
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<td>Week 4</td>
<td>MPI Programming</td>
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<td>HW2</td>
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<tr>
<td>Week 5</td>
<td>MPI Programming</td>
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<td>Week 6</td>
<td>Distributed Objects and Remote Invocation</td>
<td>Chapter 5</td>
<td>Project 1</td>
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<td><strong>Exam 1:</strong> Wednesday, October 02, 2019</td>
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<tr>
<td>Week 7</td>
<td>Time and Global States</td>
<td>Chapter 6</td>
<td></td>
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<tr>
<td>Week 8</td>
<td>Time and Global States</td>
<td>Chapter 6</td>
<td>Project 2</td>
</tr>
<tr>
<td>Week 9</td>
<td>Coordination and Agreement</td>
<td>Chapter 7</td>
<td>Project 3</td>
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<tr>
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<td><strong>Exam 2:</strong> Monday, November 04, 2019</td>
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<tr>
<td>Week 10</td>
<td>Transactions and Concurrency Control</td>
<td>Chapter 8</td>
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### Week 11
- Distributed Transactions
- Chapter 9
- Project 4

### Week 12
- Distributed Shared Memory
- Chapter 10

### Week 13
- Distributed File Systems
- Chapter 11
- Project 5

### Week 14
- Mobile and Ubiquitous Computing
- Chapter 12

### Week 15
- Mobile and Ubiquitous Computing
- Chapter 12

### Final Exam:
- Monday, December 09, 2019 from 01:45 PM - 04:15 PM

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

### J. COURSE POLICIES

#### Attendance/Tardiness
Students are responsible for all materials covered in class and assigned. Should a student be absent from class, it is his/her responsibility to get the notes, etc. for that missed class. More important, should there be assignments, it is the student responsibility to obtain such assignments. No excuse will be accepted for assignments not turned in because the student was absent when it was due.

#### Late Work and Make-up Exams
There is a penalty for late submissions. Late assignments will be counted 20% off for each day after the due time. 100% penalty (i.e. no credit) if submitted after 5 days. If you have not completed your assignment by the due date, you should submit the work you have done for partial credit. No work will be accepted once the graded work has been returned or the solution has been disclosed to the class, except for unusual circumstances which the instructor feels reasonable. If you cannot attend the class to take the exam due to some emergency or some unavoidable situation (such as serious illness, death in the family, participation in university sports, religious observations, and so on) you must notify me as soon as possible before the exam and also you must validate your absence by providing me a document (e.g., with a letter from your doctor). Once your cause is validated a make-up exam will be given.

#### Cell Phone Use
Please refrain from using electronic devices during class, as it is distracting to not only you, but also to your instructor and peers. Silence your phones and put them away so you are not tempted to stray off task.

#### Laptop Use
Laptops, Tablets cannot be used in the class.

#### Food in Class
No food in the classrooms or labs.

#### Missed Exam
In the event, if you cannot attend the class to take the exam due to some emergency or some unavoidable situation (such as serious illness, death in the family, participation in university sports, religious observations, and so on) you must notify me as soon as possible before the exam and also you must validate your absence by providing me a document (e.g., with a letter from your doctor). Once your cause is validated a make-up exam will be given.

K. COLLEGE AND UNIVERSITY POLICIES

- **Academic Integrity (University)**
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- **Classroom/Professional Behavior**
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- **Deadline for Dropping a Course with a Grade of W (University)**
  I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT
automatically result in your being dropped from the class. Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

  If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

  http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.
L. OTHER INFORMATION

- Academic Advising
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

GENERAL DISCLAIMER

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.