COSC 5352.001 Advanced Operating Systems
School of Engineering and Computer Science
Fall 2015

A. COURSE INFORMATION

Course number/section: COSC 5352.001
Class meeting time: MW 5:30 - 6:45 PM
Class location: CS-101
Course Website: http://faculty.tamucc.edu/~akatangur/fa15/COSC5352

B. INSTRUCTOR INFORMATION

Instructor: Dr. Ajay K Katangur
Office location: CI 340
Office hours: MW 3:30 PM - 5:15 PM
Telephone: 361-825-2478
e-mail: ajay dot katangur at tamucc dot 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). A strong knowledge of C/C++ programming will help you succeed in the programming projects. If you do not have the prerequisites (or equivalents from another university) shown on your TAMUCC records, you may be dropped from class at any time.

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 high-level core course. This is a difficult course that demands all students attend all classes! Regular completion of all reading, homework, and other outside assignments, are absolutely essential for success in this course.

H. MAJOR COURSE REQUIREMENTS AND GRADING

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

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams</td>
<td>45</td>
</tr>
<tr>
<td>Quizzes</td>
<td>5</td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>5</td>
</tr>
<tr>
<td>Projects</td>
<td>45</td>
</tr>
</tbody>
</table>

Grading scale: A: 100-90, B: 89-80, C: 79-70, D: 69-60, and F: 59-0.

Homework Assignments and Quizzes: Approximately 2-3 homework assignments will be given. No late homework assignments will be accepted. Partial credit will be given for incomplete assignments. In addition, there may be a pop quiz from time-to-time.

Projects: Approximately 4-5 programming projects will be given. Partial credit will be given for incomplete assignments.

Exams: The first exam will be given on September 28, 2015, the second exam will be given on October 28, 2015 during the scheduled class time, and the final exam will be given on December 7, 2015 from 4:30 – 7:00 pm.

I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>Week 1:</th>
<th>Review of Operating Systems Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 2:</td>
<td>Chapter 1: Characterization of Distributed Systems</td>
</tr>
<tr>
<td>Week 3:</td>
<td>Chapter 2: System Models</td>
</tr>
<tr>
<td>Week 4:</td>
<td>Chapter 3: Networking and Internetworking</td>
</tr>
<tr>
<td>Week 5:</td>
<td>Chapter 4: Interprocess Communication</td>
</tr>
<tr>
<td>Week 6:</td>
<td>MPI Programming, Exam 1</td>
</tr>
<tr>
<td>Week 7:</td>
<td>MPI Programming</td>
</tr>
<tr>
<td>Week 8:</td>
<td>Chapter 5: Distributed Objects and Remote Invocation</td>
</tr>
<tr>
<td>Week 9:</td>
<td>Chapter 6: Time and Global States</td>
</tr>
<tr>
<td>Week 10:</td>
<td>Chapter 7: Coordination and Agreement</td>
</tr>
</tbody>
</table>
Week 11: Chapter 8: Transactions and Concurrency Control, Exam 2
Week 12: Chapter 9: Distributed Transactions
Week 13: Chapter 10: Distributed Shared Memory
Week 14: Chapter 11: Distributed File Systems
Week 15: Chapter 12: Mobile and Ubiquitous Computing

Final Exam on Monday, December 7, 2015 from 4:30 - 7:00 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

Course Syllabus: We will meet for lecture on Mondays and Wednesdays, when new material will be presented. We will follow the text generally, but non-text material may also be included in the lectures. The assignments and exams will be given during the class hours. You are responsible for all the material presented during the lecture.

Exams: Exams will cover all lecture and reading material discussed in the class. Exams must be taken on the hour they are scheduled.

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.

Homework Assignments & Projects: They will significantly be based on the material from the lectures and other material considered essential for the successful completion of this course. They will be posted on the course web page or hard copies are handed out in the class during the lecture sessions. The submission details will be provided to you along with the assignment. All the homework assignments and projects are due at the beginning of the class on the due date. If the student is absent on the due date, it is the student's responsibility to see to it that the assignment is submitted on the designated date. No late homework assignments will be accepted. Late projects will be accepted. There is a penalty for late submissions. A project that is turned in after the class on the due date is considered one day late. There is a penalty for late submissions. 25% penalty for 1-2 days late. 50% penalty for 3-4 days late. 75% penalty for 5 days late. 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. Note that any kind of hardware or software failure or machine
unavailability in the lab does not merit an extension on the assignment. Diskettes upon which major examinations, assignments, projects or papers submitted may be retained by the instructor as a permanent record of the student's work.

**Grading Error:** All questions concerning a test score or grading of a returned test or assignment must be resolved within one week. It is always a good idea to keep all of your work until the end of the semester. In case of any recording errors or doubts, you may produce them for correction or verification.

**Academic Honesty Policy:** You are expected to avoid all forms of academic dishonesty as defined in Catalog. In addition, students are expected to behave in an ethical manner in all class activities. If you feel uncertain about a particular activity, please speak to me BEFORE problems arise. Ethical behavior is a requirement for passing this course. All work submitted for grading must be the student's own work. Plagiarism will result in a score of 0 (zero) for the work or dismissal from the course and the Dean of Students office will be notified. No copying from another student's work, of any class, is allowed. It is the student's duty to allow no one to copy his or her work. Anyone found cheating and/or copying, in the exams or assignments, in the instructor's opinion, will receive an automatic F for the course.

**Collaboration:** If two or more people collaborate on an assignment assigned it should be notified on the assignment and each student should submit his or her solutions for grading. The grade obtained on such an assignment is the total points obtained for the assignment divided by the square of the number of people who collaborated on the assignment (e.g., if 3 people collaborate on an assignment and the grade for that assignment is 90 out of 100, then each student receives a grade of $90/3^2 = 10$). If you do not notify me of such collaboration it will be treated as copied and action will be taken as discussed under the academic honesty policy.

**Attendance:** You must attend all classes and labs. While in class or lab attendance will not directly affect the grade, you are responsible for any materials covered or handed out or announcements made for the tests and assignments in your absence. Records of your attendance will be maintained and reported to the university. Students found missing classes without the instructor's permission will be automatically withdrawn from the course.

**Absence from class:** 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.

**Cell Phone Use:** Cell phones and pagers must be turned off during class. First violation receives a warning. All succeeding violations result in a ten point deduction on the last exam. Any violation during a quiz or exam results in a ten percent deduction off the corresponding paper. No warnings for quizzes or exams.
Laptop Use
Laptops, Tablets cannot be used in the class.

Food in Class
No food in the class or labs.

Student Security Statement: Please read the Student Security Statement.

K. COLLEGE AND UNIVERSITIY POLICIES

• Academic Integrity (University)
  It is expected that university students will demonstrate a high level of maturity, self-
direction, and ability to manage their own affairs. Students are viewed as individuals
who possess the qualities of worth, dignity, and the capacity for self-direction in
personal behavior.
  See Full University Policy at
  http://catalog.tamucc.edu/content.php?catoid=10&navoid=313#Academic_Integrity

• Classroom/Professional Behavior
  You are expected to behave professionally in the classroom, labs and during office
visits. Unprofessional behavior will be reported to the dean of students.

• Deadline for Dropping a Course with a Grade of W (University)
  The grade of W will be assigned to any student officially dropping a course by
  Friday, November 6, 2015. No student is eligible to receive a W without completing
  the official drop process by this deadline. Visit the Office of the University
  Registrar for the Course Drop Form that must be submitted. After November 6,
  2015 a student will not be allowed 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
• **Disability Services**
Disability Services (DS) is the hub for coordinating services and accommodations to ensure accessibility and utilization of all programs for all Texas A&M University-Corpus Christi students with disabilities. Our services are designed to meet the unique educational needs of enrolled students with documented permanent or temporary disabilities. DS provides intake and consultation services to students seeking to register with our office. DS reviews an individual’s documentation of disability and assesses eligibility for services and the determination of reasonable accommodations. For more information visit the Disability Services Office at 116 Corpus Christi Hall or go to [http://disabilityservices.tamucc.edu/](http://disabilityservices.tamucc.edu/)

• **Academic Advising**
The College of Science and Technology 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. The College's Academic Advising Center is located in CI 366, and can be reached at 825-3721.

**L. OTHER INFORMATION**
None

**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.