**Instructor:** Dr. Frederick C Harris, Jr.
- E-mail: Fred.Harris@cse.unr.edu
- Phone: (775) 784-6571
- Office: SEM 240A
- Office hours: M,W: 11:00am-11:50am


**Teaching Assistant:** TBA
- E-mail: TBA
- Office: TBA
- Office hours: TBA

**Lectures:**
- Monday, Wednesday: 9:30am-10:45am, SEM 257

**Labs:**
- none

**Important Notes and Dates:**
- **Final Exam:** Friday May 11 2:45-4:45pm
- **Holidays:** M Feb 20(Presidents Day), M Mar 19, W Mar 21 (Spring Break)

**Required Textbooks:**
- *Parallel Programming* (2nd Ed.) by Wilkinson and Allen—Prentice Hall.

**Supplemental Books:**
- *Parallel Programming with MPI* by Peter Pacheco—Morgan Kaufman

**Course Description:**
**Catalog:**

**Prerequisites:**
**Courses:**
- CS 302 (Data Structures).
- Math 182 (Calculus II)
Topics:
- a good working knowledge of data structures. You will need to know how to implement these data structures in C or C++.
- This course will also draw on knowledge of 2D and 3D geometry of vectors and coordinate systems, and on the use of matrix algebra for coordinate transformations.

Requirement or Elective:
- This course is a technical elective for the BS CSE Program.
- It is an elective for the specialization in Software Systems and the specialization in Computer and Network Systems

Course Objective:
Students will demonstrate an understanding of concepts, algorithms, and design principles underlying parallel computing, develop algorithm design and implementation skills, and gain practical experience in programming large scale parallel machines

Student Outcomes and Course Outcomes:
The course outcomes are skills and abilities students should have acquired by the end of the course. These outcomes determine how the general CSE Student Outcomes apply specifically to this course. All CSE Student Outcomes are listed in the next subsection and those relevant to this course are identified in the following Table.

<table>
<thead>
<tr>
<th>CSE Student Outcomes</th>
<th>Course Outcomes</th>
<th>Assessment Methods/Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Students...</td>
<td>Explain...</td>
</tr>
<tr>
<td></td>
<td>can define and apply parallel computing...</td>
<td>...parallel computing and...parallel computing.</td>
</tr>
<tr>
<td>3</td>
<td>Students...</td>
<td>Design...</td>
</tr>
<tr>
<td></td>
<td>to assess a problem presented to them, design a solution, and test their implementation.</td>
<td>...parallel program to solve specific problems.</td>
</tr>
<tr>
<td>5</td>
<td>Students...</td>
<td>Design...</td>
</tr>
<tr>
<td></td>
<td>will be presented with problems and will have to design and implement solutions for those problems.</td>
<td>...parallel program to solve specific problems.</td>
</tr>
<tr>
<td>10</td>
<td>Students...</td>
<td>Quizzes and Tests</td>
</tr>
<tr>
<td></td>
<td>will have an ability to discuss large scale machine design as well as applications and algorithms on those machines.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Students...</td>
<td>Design...</td>
</tr>
<tr>
<td></td>
<td>will learn to use large scale parallel machines to solve problems as well as discuss the issues related to their construction and use.</td>
<td>...parallel program to solve specific problems.</td>
</tr>
</tbody>
</table>
CSE Student Outcomes:
1. an ability to apply knowledge of computing, mathematics, science, and engineering.
2. an ability to design and conduct experiments, as well as to analyze and interpret data.
3. an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints specific to the field.
4. an ability to function effectively on multi-disciplinary teams.
5. an ability to analyze a problem, and identify, formulate and use the appropriate computing and engineering requirements for obtaining its solution.
6. an understanding of professional, ethical, legal, security and social issues and responsibilities.
7. an ability to communicate effectively with a range of audiences.
8. the broad education necessary to analyze the local and global impact of computing and engineering solutions on individuals, organizations, and society.
9. a recognition of the need for, and an ability to engage in continuing professional development and life-long learning.
10. a knowledge of contemporary issues.
11. an ability to use current techniques, skills, and tools necessary for computing and engineering practice.
12. an ability to apply mathematical foundations, algorithmic principles, and computer science and engineering theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
13. an ability to apply design and development principles in the construction of software systems or computer systems of varying complexity.

CSE Program Educational Objectives:
Within 3 to 5 years of graduation our graduates will:
1. be employed as computer science and engineering professionals beyond entry level positions or be making satisfactory progress in graduate programs.
2. have peer-recognized expertise together with the ability to articulate that expertise as computer science and engineering professionals.
3. apply good analytic, design, and implementation skills required to formulate and solve computer science and engineering problems.
4. demonstrate that they can function, communicate, collaborate and continue to learn effectively as ethically and socially responsible computer science professionals.

Course Topics:
- Parallel Computers
- Message-Passing Computing
- Embarrassingly Parallel Computations
- Partitioning and Divide-and-Conquer Strategies
- Pipelined Computations
- Synchronous Computations
- Load Balancing and Termination Detection
- Programming with Shared Memory
- Distributed Shared Memory Systems and Programming
• Sorting Algorithms
• Numerical Algorithms
• Image Processing
• Searching and Optimization

Course Policies:
• Students are expected to attend, and be on time, for every class. This demonstrates professionalism and consideration for your fellow students and your Instructor. While the course does not have an attendance policy, students who miss class and/or are late for class may experience an impact on their grade by missing classroom activities and/or quizzes
• Students are expected to turn in all assigned materials in a timely manner.
• Students are expected to demonstrate professionalism and courtesy by either silencing or turning off all cell phones and/or other alarm or audible indicator devices

• The Instructors reserve the right to add to, and/or modify any of the above policies as needed to maintain an appropriate and effective educational atmosphere in the classroom and the laboratory. In the case that this occurs, all students will be notified in advance of implementation of the new and/or modified policy.

UNR Athletics:
• If you are involved with any university-sponsored athletic activities that will have an impact on your attendance, please provide your Instructor with a letter from your coach and/or the UNR Athletic Department as soon as possible, but no later than the end of the second week of classes. This should include the official schedule of your activities which will impact your attendance throughout the semester.

Assignments, Examinations and Grading:

Homework Assignments:
• There will be a number of Homework Assignments. These consist of practice questions which are intended to assist the student in mastering the course content. Some of these assignments will be collected and graded, but you will be informed in advance when an assignment is to be handed in

Quizzes:
• There will be several announced and unannounced quizzes in lecture.

Exams:
• There will be one or two Midterm Exams. Exams will be closed books, closed notes.
• Permissions to take exams on other dates than scheduled will not be given, except for extreme medical emergencies.
• All exams will take place in the regular classroom.
Programming Assignments:
• The Programming assignments require the solutions to problems using the computer. We
will be using the UNR Research Grid. You will be instructed how to submit your projects
for grading. Typically you will be asked to submit an electronic version of your code, and
test runs, along with a folder with an appropriate write-up for your program.
• Projects will typically have an itemized list of topics where the undergraduates will have
to do the first few (specific number identified on the project) and the graduate students
have to do those plus a few more on the list (specific number again specified on the
project). Those items that are not required and are completed will be graded as extra
credit.

• All Formal Homework Assignments (Including exercises and Projects) and all Exams
(Quizzes, Hour Exams, and the Final) are to be treated as individual and not collective
efforts, unless specified otherwise. A severe penalty will be given to any assignment
which indicates collusion or cheating. The usual penalty for cheating on project or an
exam is failure in the course.

Late Submission Policy:
• Projects will be collected at the start of the class session in which they are due. A
programming assignment turned in after collection is done will be graded as late.
• The penalty for late assignments and projects will be as follows: max(10%,n^2%), where n
is the number of school days.

Grading Structure:
• The final grade will be based on (Tentative, subject to change):

<table>
<thead>
<tr>
<th>Section</th>
<th>415</th>
<th>615</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance/Participation/Homework</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Projects</td>
<td>35%</td>
<td>35%</td>
</tr>
<tr>
<td>Midterm Exams</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Presentation</td>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>

• Letter grades will be based on a 10 point scale ([90, 100] = A, [80, 90) = B, ...)

Important Notes:
• I will be using a +/- grading system.
• At the end of the semester (during the final exam period) a CD will be due with an
electronic version of all projects and write-ups
• Every project must be completed, working, and turned in. For each project that is not, the
final grade in the course may be lowered.
**Academic Integrity:**
Students are encouraged to study together, however each student must individually prepare his/her solutions. Cheating or plagiarism are not permitted and will be sanctioned according with the UNR policy on Academic Standards. You should carefully read the section on Academic Dishonesty found in the UNR Student Handbook (copies of this section are on-line at [http://www.unr.edu/stsv/acdispol.html](http://www.unr.edu/stsv/acdispol.html)). Your continued enrollment in this course implies that you have read it, and that you subscribe to the principles stated therein.

**Supplemental Instructions for 400-600 Courses:**
- As stated previously, Projects will typically have an itemized list of topics where the undergraduates will have to do the first few (specific number identified on the project) and the graduate students have to do those plus a few more on the list (specific number again specified on the project). Those items that are not required and are completed will be graded as extra credit.
- Graduate Students are also to read a paper which discusses a facet of Parallel Computing. This paper should appear in a respectable journal or conference such as those published by ACM or IEEE. You will do a presentation in class similar to a conference presentation in our field. Your presentation will be 15 minutes in length followed by 5 minutes of question/answer.

**Academic Success Services:**
Your student fees cover usage of the Math Center (784-4433 or [www.unr.edu/mathcenter/](http://www.unr.edu/mathcenter/)), Tutoring Center (784-6801 or [www.unr.edu/tutoring/](http://www.unr.edu/tutoring/)), and University Writing Center (784-6030 or [www.unr.edu/writing_center](http://www.unr.edu/writing_center)). These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student.

**Disability Statement:**
If you have a disability for which you will need to request accommodations, please contact me or someone at the Disability Resource Center (Thompson Building, Suite 101), as soon as possible to arrange for appropriate accommodations.

**Class Recording:**
Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.