1. **Course number and name:** CSCI 4210 High Performance Computing

2. **Credits and contact hours:** 3 credit, 3 contact

3. **Instructor’s or course coordinator’s name:** Ashraf Saad, PhD

4. **Textbook, title, author and year:**
   
   a. **Other supplemental materials:** None

5. **Specific course information**
   a. **Brief description of the content of the course (Catalog Description)**
   b. **Prerequisites:** A minimum grade of “C” in CSCI 3341 or CSCI 3232
   c. **Indicate whether a required, elective, or selected elective course in the program**
      Elective course for BS-CS.

6. **Specific goals for the course**
   a. **Specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.**

<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>Student Outcomes</th>
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<tbody>
<tr>
<td>understand the fundamental computing issues for high</td>
<td>1a, 1i</td>
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<tr>
<td>performance computing</td>
<td></td>
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<tr>
<td>understand and implement parallel programs using</td>
<td>1a, 1b, 1c</td>
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<tr>
<td>message passing and threads</td>
<td></td>
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<tr>
<td>evaluate the performance and speed-up factor of parallel</td>
<td>1i, 2a</td>
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<tr>
<td>algorithms</td>
<td></td>
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<tr>
<td>optimize parallel algorithms for practical applications</td>
<td>1i, 2a</td>
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b. Student Outcomes:
   • 1a: An ability to apply knowledge of computing and mathematics appropriate to the discipline
   • 1b: An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
   • 1c: An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs
   • 1f: An ability to communicate effectively with a range of audiences
   • 1g: An ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues
   • 1h: Recognition of the need for, and an ability to engage in, continuing professional development
   • 1i: An ability to use current techniques, skills, and tools necessary for computing practice
   • 2a: An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices

7. Brief list of topics to be covered
   • parallel computation
   • partitioning strategies
   • message passing
   • pipelined computations
   • synchronous computation
   • load balancing and termination detection,
   • shared memory systems
   • parallelizing algorithms (sorting, numerical, image processing, searching and optimization)
   • modern architectures (clusters, multi-core).