### Essential information.

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Prof. Adrian Sandu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone</td>
<td>231-2193</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:sandu@cs.vt.edu">sandu@cs.vt.edu</a></td>
</tr>
<tr>
<td>Office</td>
<td>2224 KW-II</td>
</tr>
<tr>
<td>Office hours</td>
<td>By appointment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teaching Assistants</th>
<th>Steven Roberts and Arash Sarshar</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-mails</td>
<td><a href="mailto:steven94@vt.edu">steven94@vt.edu</a> and <a href="mailto:sarshar@vt.edu">sarshar@vt.edu</a>, respectively</td>
</tr>
<tr>
<td>Office</td>
<td>106 McBryde Hall</td>
</tr>
<tr>
<td>Office hours</td>
<td></td>
</tr>
</tbody>
</table>

| Lecture            | Tue–Thu 3:30pm–4:45pm, 232 McBryde Hall |
| Prerequisites      | CS–3204. Graduate standing or permission of the instructor. |
| Final Exam         | Section 15T, May 9, 2020, 7:45am–9:45am |

### Zoom lectures.

**Topic:** CS-5234 Lecture  
**Time:** This is a recurring meeting  
**Join Zoom Meeting**  
[https://virginiatech.zoom.us/j/253710230](https://virginiatech.zoom.us/j/253710230)  
**Meeting ID:** 253 710 230  
**One tap mobile**  
+13126266799,,253710230# US (Chicago)  
+19294362866,,253710230# US (New York)  
**Dial by your location**  
+1 312 626 6799 US (Chicago)  
+1 929 436 2866 US (New York)  
+1 346 248 7799 US (Houston)  
+1 669 900 6833 US (San Jose)  
+1 253 215 8782 US  
+1 301 715 8592 US  
**Meeting ID:** 253 710 230  
**Find your local number:** [https://virginiatech.zoom.us/u/aB6h2jv8x](https://virginiatech.zoom.us/u/aB6h2jv8x)  
**Join by SIP**  
253710230@zoomcrc.com
Join by H.323
162.255.37.11 (US West)
162.255.36.11 (US East)
221.122.88.195 (China)
115.114.131.7 (India Mumbai)
115.114.115.7 (India Hyderabad)
213.19.144.110 (EMEA)
103.122.166.55 (Australia)
209.9.211.110 (Hong Kong)
64.211.144.160 (Brazil)
69.174.57.160 (Canada)
207.226.132.110 (Japan)
Meeting ID: 253 710 230

Join by Skype for Business
https://virginiatech.zoom.us/skype/253710230

Textbook.


Additional References.


Additional Resources.


About the course.

This class discusses fundamental concepts of parallel computing. Topics include a survey of parallel computer architectures, models of parallel computation, and interconnection networks; parallel algorithm development and analysis; programming paradigms and languages for parallel computation; example applications; performance measurement and evaluation. If time permits we will discuss additional topics as well.
Topics.

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Introduction and motivation. Parallel architectures. Parallel programming models.</th>
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<tbody>
<tr>
<td>Weeks 2–4</td>
<td>Message passing programming. The Message Passing Interface (MPI) and applications.</td>
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<tr>
<td>Weeks 5–7</td>
<td>Shared memory programming. Race conditions. OpenMP and applications.</td>
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<tr>
<td>Weeks 8–9</td>
<td>Principles of parallel algorithm design: tasks, dependency graphs, mappings. Decomposition techniques: embarrassingly parallel, data decomposition, pipelined computations, etc.</td>
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<tr>
<td>Week 10</td>
<td>Analytical modeling of parallel programs. Performance metrics and parallel performance analysis.</td>
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<td>Week 11</td>
<td>Non-numerical Applications. Floyd’s algorithm. Sorting.</td>
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<tr>
<td>Weeks 14–15</td>
<td>Additional topics: programming heterogeneous multi-core architectures like graphics processing units (GPUs)</td>
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Grading.

The grade will be based on homework projects and on in-class presentations related to the project results.

Disclaimer.

Some information given to you in class may supersede the information in this syllabus or on the web page.

Student Complaints and Academic Misconduct.

Students are expected to comply to the Honor Code. If you have any problems, the first step is to discuss with me directly.

Disabilities.

Please let me know if you have a disability that requires special arrangements.