CS–4234 (CRN 83127)
Parallel Computation
Fall 2021

Essential information.

Instructor: Dr. Adrian Sandu
• Phone: 231-2193
• E-mail: sandu@cs.vt.edu
• Office: 2222 KW-II
• Office hours: Friday, 10am–11am, [https://virginiatech.zoom.us/my/asandu7](https://virginiatech.zoom.us/my/asandu7)

Lecture: Tu-Th 11:00am –12:15pm, 349 Whittemore Hall (WHIT)
Prerequisites: CS–3214
Final Exam: Section: 11T, December 11, 2021, 1:05pm–3:05pm

Textbook.


Additional References for Parallel Algorithms and Design.

• Ian Foster, “Designing and Building Parallel Programs”

Additional References for Parallel Programming.

  • “The MPI Standard”
  • “The MPI Complete Reference”
  • “The OpenMP Specifications”
  • “Introduction to OpenMP”
**About the course.**

This class will introduce the 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.

**Topics.**

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<td>Weeks 2–3</td>
<td>Shared memory programming. Race conditions. OpenMP and applications.</td>
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<td>Weeks 4–7</td>
<td>Message passing programming. The Message Passing Interface (MPI) and applications.</td>
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<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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<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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<td>Weeks 14–15</td>
<td>Additional topics: programming heterogeneous multi-core architectures like graphics processing units (GPUs)</td>
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**Grading.**

For students registered for CS4234 the grade will be based on:

25% Mid-term exam

25% Final exam

50% Homework (theoretical and programming assignments)

**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 which requires special arrangements.

**COVID Information.**

By participating in this class, all students agree to abide by the Virginia Tech Wellness principles and the guidance stated in the Fall 2021 plans.