ECE 706:  
Advanced Parallel Computer Architecture  
NC State University  
Spring 2009  
Tues/Thurs, 9:35 – 10:50 am, EB2 1230

Course Syllabus

<table>
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<th>INSTRUCTOR</th>
<th>OFFICE HRS</th>
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| Dr. Greg Byrd ( gbyrd@ncsu.edu )  
Assoc. Professor, ECE Dept.  
Partners I, Suite 2300  
(919) 513-2508 | 10:50-11:30pm T H, EB2 2116 |

Course Content

This course addresses advanced topics and recent developments in the architecture of high-performance multiprocessor systems.

The course material will primarily be recent and classic papers from the research literature, covering material that represents the current state of research in parallel processing. A representative sample of topics for the course includes:

- speculation and prediction in parallel systems
- synchronization mechanisms
- mechanisms for latency reduction and latency tolerance
- applications and specialized architectures, such as network processors and sensor networks

There is no text for the course. All material will be derived from papers and notes. Electronic copies of all papers will be provided.

Prerequisites

I assume that students have satisfied the prerequisite of ECE 506. If you have not had this class, or an equivalent class at another institution, see me immediately. I will not be reviewing ECE 506 material, and I will assume that you have a working knowledge of parallel programming and parallel architectures.
Assignments and Grading

The overall grade will be a weighted average of the following components:

- Exams (30%) – two exams, 15% each
- Quizzes/Summaries (10%)
- Project (60%) – three parts: 10%, 15%, 35%

Exams (30%)
There will be two exams, equally weighted at 15% each. One exam will occur around the midpoint of the semester (tentatively, Feb. 26). The second exam will be held during the scheduled final exam period (8-11am, May 5), but it will not be cumulative and it will be 75 mins, just like the first exam.

Quizzes/Summaries (10%)
There will be short quizzes during the regular class time, based on the content of the reading assignments. There will be approximately one quiz per week.

Distance education students will submit one-page summaries of selected papers (approx. one per week), instead of the in-class quizzes. The specific summary and format may be adjusted for specific papers.

Project (60%)
There are three project assignments. The first two are assigned projects, to be completed individually. The third is a student-selected project, which may be completed either individually or in pairs.

The first two projects are based on the Simics system simulator. The first project (10%) will involve using the simulator to measure and report benchmark performance. The second project (15%) will involve writing simulation code to model a specific multiprocessor architecture. Grades for these two projects will be based on a written report.

Simics will also be used for the third project (35%). This project should investigate the implementation and performance of a specific architectural feature. The third project grade will be based on a final project report. The final written report is due by midnight on the last Friday before final exams (April 24). There will be no extensions granted for the final report. (I need time to grade them, and I do not want to interfere with studying for exams.)

Course Grade
The total course grade is a weighted average, with the weights described above. I guarantee the following assignment of grades based on the weighted average:

- 97-100: A+
- 92-97: A
- 87-92: A-/B+
- 82-87: B
- 77-82: B-/C+
The assigned grade in a borderline area (e.g., A-/B+) is at the instructor's discretion and will depend on overall class participation (including Message Board), improvement (or decline) in exam scores, and quality of the final project.

I reserve the right to shift the numerical cutoff points down (but never up), based on overall class performance, problems with a particular assignment, etc. This adjustment rarely happens, especially in a graduate-level course.

*Note: I do not curve grades in this course.* It is possible for everyone in the class to get an A (or an F). Your performance depends only on how you do, not on how everyone else in the class does. So it is not harmful to your grade to help your fellow students in any legal manner.

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**Class Policies**

**Computer Resources**

Course home page: [http://courses.ncsu.edu/ece706/lec/001/](http://courses.ncsu.edu/ece706/lec/001/)

Message Board: (see home page)

Course locker: [afs/eos/lockers/workspace/ece/ece706/001](afs/eos/lockers/workspace/ece/ece706/001)


All class announcements will be posted to the message board. The web site will also contain project assignments and other relevant information. The message board is intended for questions and comments about projects, lectures, or anything else. Anyone in the class may post to the message board. If inappropriate material is posted, the message board will be deleted.

I may choose to broadcast an email message to the entire class for time-critical announcements. For the most part, however, you are responsible for getting information in class, from the web site, or from the message board.

A course locker will be provided for projects. This space may **only** be used for class-related activities. Anything stored in the locker will be deleted at the end of the semester and cannot be recovered. Storing non-course material in your course locker may result in the removal of your locker.

The Wiki page primarily contains information about the simulation tools used in the class.

The NCSU **Virtual Computing Laboratory** (VCL) is recommended for project simulations. See [http://vcl.ncsu.edu](http://vcl.ncsu.edu) for more information, or to make a reservation.

**Course Communication**

My preferred mode of communication is the Message Board, followed by email. Try to reserve email for questions that require privacy. By using the Message Board, you may get a faster answer from another student. I encourage all students to use the Message Board for both sharing
and requesting information. Use of the Message Board is considered “class participation” for the purposes of assigning your final grade.

If you need to discuss something with me by telephone, please email to arrange a convenient time.

I will attempt to respond to all email within 24 hours during the work week. I do check email on evenings and weekends, but response time may be delayed.

Students are also encouraged to use the Anonymous Feedback link. (See the Contact page on the course web site.) Please do not send questions via the feedback link, because I can’t respond to a question if I don’t know who asked it.

**Late Assignments/Makeup Work**

Late assignments will not be accepted, except for university-excused absences. If you have a certified medical excuse or instructor approval, you may receive full credit if the assignment is turned in as soon as possible.

Quizzes will not be made up, but the lowest two quiz grades will be dropped. A missed exam can only be made up in the case of a university-excused absence.

**Office Hours**

I will have scheduled office hours in EB2 2116, immediately after class.

My office is in the Partners I building, Suite 2300. The suite door is always locked; ring the doorbell, and someone will let you in. You can drop by my office anytime, but if you want to make sure I’m available, call or email me to arrange an appointment. See my Google calendar (link on course web site).

A reserved time for *online* office hours will be provided for distance ed. The day and time will be determined by surveying the online students after classes begin. If possible, the Elluminate Live Web conferencing application will be used.

**Academic Integrity**

All exams, reports, and presentations are individual assignments, unless otherwise stated in writing. Evidence of cheating, plagiarism, or other violations of the Code of Student Conduct will be investigated and, if appropriate, referred to the Office of Student Conduct for disciplinary review.

Recycling of projects from another class will be considered an academic integrity violation. If you wish to extend or refine the work done for another class project, this must be approved in advance, and you must provide the results from the previous project.

The Code of Student Conduct can be found at: [http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php](http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php)

Information about policies and procedures of the Office of Student Conduct can be found at: [http://www2.ncsu.edu/student_affairs/osc/](http://www2.ncsu.edu/student_affairs/osc/)
**Inclement Weather**

The class will follow the University’s closure policy. If classes are not cancelled, I will make every effort to be in class on time, and so should you. Please do not send me email asking whether class is going to meet. Instead, check the University website or the weather hotline (513-8888).

**Students with Disabilities**

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653.

[http://www.ncsu.edu/provost/offices/affirm_action/dss/](http://www.ncsu.edu/provost/offices/affirm_action/dss/)

For more information on NC State's policy on working with students with disabilities, please see: [http://www.ncsu.edu/provost/hat/current/appendix/appen_k.html](http://www.ncsu.edu/provost/hat/current/appendix/appen_k.html)

**Important Dates**

**Jan 8:** First class  
**Jan 29:** Project #1 due  
**Feb 19:** Project #2 due  
**Feb 26:** Exam 1 (tentative)  
**Mar 2-6:** Fall Break  
**Mar 11:** Last day to drop class or change from credit to audit  
**Mar 12:** Project #3 proposal due  
**Apr 10:** Spring Holiday  
**Apr 24:** Last day of classes, Project #3 report due  
**May 5:** Exam 2 –9:30-11am