ECE4122/6122 - Advanced Programming Techniques

Instructor

Dr. George F. Riley
Office: Klaus 3360
Office hours: Tue/Thu 10:00-11:00, other times by email
Email: riley@ece.gatech.edu

Course Summary

The "Advanced Programming Techniques" course will cover a number of advanced topics in programming methods, data management, distributed computing, and advanced algorithms used in typical engineering applications. All class projects and in--class examples will use the C++ programming language. It is designed to be a 4000 level course cross listed with a 6000/8000 level course, taken by both advanced undergraduate and beginning graduate students. The undergraduate and graduate versions will meet in the same room at the same time, and graduate students will be expected to complete two or three additional assignments as compared to the undergraduate students. The format of the class is two 1-hour classroom lectures per week, where the new topic is introduced, and suggestions of how to go about implementing the topic in C++ is discussed. The students will have unsupervised lab to work on the programming projects and complete the assignments. The topics are diverse, and each could merit its own course. Instead, this course will cover each topic from a conceptual standpoint, and discuss in some detail a small number of specific instances of the programming techniques used to implement programs using that topic. One programming assignment for each topic will be provided to give students practical experience in each topic, and to improve the students overall programming skill via substantial practice in coding and debugging.

Tentative Topics

The list of topics to be discussed is tentative, but likely to include:

- Distributed programming with MPI (2 or3 lectures)
- Parallel programming with pthreads (3 lectures)
- Introduction to graphics programming using OpenGL (3 lectures)
- Object--Oriented code templates (2 lectures)
- Event--based Programming (2 lectures)
- Using web services (3 lectures)
- Using non--blocking system I/O (2 lectures)
- Discrete Event Simulation (2 lectures)

Teaching Philosophy

Teaching is interactive! Students are strongly encouraged to participate in class and offer opinions on the issues being discussed. I encourage (and expect) you to participate actively in the learning process. In particular, I welcome your comments and questions as we cover material in class. One-way lectures quickly becoming boring, both for you and for me. Also, I have found that students often learn more from other students comments than from the instructor! By asking lots of questions, your understanding of the material will be deepened significantly, and the course will be much more

fun! From time to time there will be readings for a class session; these will be posted on the class web page below in a downloadable format. Students are expected to download and read the assigned readings before class.

Policy for Completing Out-of-Class Assignments

We will have programming assignments every week or two weeks, excepting weeks when there is an examination. The policy of completing these assignments is clear and simple. **All students must personally and with their own two hands design, implement (type in) and debug their programs.** Two or more students " Working Together " and turning in one program (or copies of the program) is **not acceptable.** However, students are very much encouraged to seek help when it is needed. You can get help from anyone, including the instructor, teaching assistants, and fellow students. You can ask for help with debugging, help with how to formulate a solution, and help with the syntax of the C/C++ program. However, to be clear, each student must personally type in, compile and debug their own program. Cutting and pasting from other solutions is **not acceptable.**

Computing Resources

We will use the Deep Thought computing cluster. Details to follow.

Textbook

There is no textbook for this class. We will use research papers and handouts as required for our reading and discussion.

Getting Help

Students are encouraged to get help from either their fellow students or the instructor. However, when getting help from students be sure to adhere to the policy for completing out-of-class work as above.

- Teaching Assistant: TBD
- TA Office hours across from Klaus 3360

Grading

Programming Projects	50%
Midterm Exam	20%
Final Project	20%
Class Participation	10%
Total	**100%**

Grading (Distance Learning Students)

Programming Projects	50%
Midterm Exam	25%
Final Project	25%

Total	**100%**

Syllabus

Day	Month	Date	Description	Handout	Due Date
Tue	Aug	23	MPI Tutorial	https://computing.llnl.gov/tutorials/mpi/	
			Simple Blocking MPI Program	testMPI.cc	
			Simple Non-Blocking MPI Program	testMPI2.cc	
			MPI Programs(pdf)	mpi-examples.pdf	
Thu	Aug	25	MPI Continued		
Tue	Aug	30	MPI Continued		
Thu	Aug	32			
Tue	Sep	6			
Thu	Sep	8			
Tue	Sep	13			
Thu	Sep	15			
Tue	Sep	20			
Thu	Sep	22			
Tue	Sep	27			
Thu	Sep	29			
Tue	Oct	4			
Thu	Oct	6			
Tue	Oct	11			
Thu	Oct	13			
Tue	Oct	18			
Thu	Oct	20			
Tue	Oct	25			
Thu	Oct	27			
Tue	Oct	32			
Thu	Nov	3			
Tue	Nov	8			
Thu	Nov	10			
Tue	Nov	15			
Thu	Nov	17			
Tue	Nov	22			
Thu	Nov	24			
Tue	Nov	29			
Thu	Nov	31			
Tue	Dec	6			
Thu	Dec	8			
Tue	Dec	13			

Thu	Dec	15			

Contact Information:

riley@ece.gatech.edu
School of Electrical and Computer Computing
Georgia Institute of Technology
Atlanta, GA 30332-0250

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