

# ECS 158, Programming on Parallel Machines

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## Highlights

- **hard copy** of (open source) textbook is required, **student-printed**
- discussion section is required, **weekly Quizzes** given there
- heavy emphasis on Group work; **everyone must participate fully**
- Homework grading is interactive, in person, with the TA asking questions of each Group member, and with a separate (i.e. possibly different) grade given to each member
- no final exam; instead, have final Group Project/Homework
- it is **required** that you read the course Blog every day
- in-class Group Quiz, **last day of lecture**
- see Important Dates, Section 1
- textbook reading is required, taking at least **3-4 hours each week**

## 1 Important Dates and Deadlines

- ordinary Quizzes: weekly, in discussion section
- Group Quiz: December 6
- Group Project due: December 11, 11:59 pm

## 2 Textbook

The textbook is my open source book, available at <http://heather.cs.ucdavis.edu/~matloff/158/PLN/ParProcBookECS158S16.pdf>.

**You are required to print your own hard copy.** It is required that you have a hard copy of the book, as it will be used during Quizzes. You can print the book anywhere, say at Copyland on G Street, but you may find it's cheaper elsewhere. Cost, including binding, should be between \$20 and \$30. Just bring the store a copy of the correct PDF file, say on a memory stick.

**PLEASE NOTE:** Pagination matters! Quizzes (which are open book) will refer to specific pages in the book. So you need exactly the particular file stated above.

## 3 Each Student Must Have His/Her Own Course Materials

Note that Quizzes are open-book, and there is no sharing of books or other materials during Quizzes, nor are electronic devices allowed.<sup>1</sup> Thus every student must have his/her own hard copy of the textbook and any other course materials.

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<sup>1</sup>An exception is the Group Quiz, given the last day of class.

## 4 Bring the Course Materials with You to Class

Bring the entire textbook and other course materials to lectures, discussion sections and Quizzes.

If you forget to bring your book to a Quiz, the TA or instructor will lend you one; if several students forget, you'll need to take turns.

## 5 Quizzes

A Quiz will be given almost every week in discussion section. Quizzes will not be announced; assume that there will be one each week.

Note for ECS 132: In numeric problems, exact answers are required, not simulation, unless the latter is specified.

### 5.1 Why Quizzes?

**The Quizzes will form the biggest part of your course grade.**

This is a lot of work for me. For example, in Fall 2012, I was teaching two courses, one of which had two different discussion sections. That meant I needed to compose and grade 3 quizzes per week—yikes! But I do this for two reasons:

- It's a natural way to ensure that you don't fall behind, which is a serious problem for universities using the quarter system.
- It's much better for the student, with far less pressure. Giving a midterm and a final is quite stressful to the students, as they count so much in a course grade. Giving Quizzes instead relieves that stress. It's also better for your grade. In a final exam, you could be misgraded and never know it.

### 5.2 PLEASE NOTE: There Are No Makeup Quizzes

There are no makeup Quizzes, and no early or late ones. If you miss a Quiz, for whatever reason, it simply will become one of the two Quizzes you exclude from your grade.

### 5.3 Group Quiz, Last Day of Lecture

The last Quiz, given in lecture on the last day of class, will consist of an in-class Group effort, i.e. you will work on the Quiz with your Group. This will be done on your laptops.

(Please note: Unforeseen circumstances may result in this becoming an ordinary individual Quiz.)

You submit your Group Quiz in the same manner as for Homework, as detailed in Section 11.4. **Make sure to heed the point about subdirectories.** You use **handin**, in my directory on CSIF, using the subdirectory **xgroupquiz**, e.g. **50groupquiz** when I teach ECS 50.

## 5.4 Partial Credit on Quiz Problems

Quiz problems will be short answer, but you still may be able to get partial credit, in the case of arithmetic or algebra errors, or in the case of code, spelling or syntax errors. In fact, you will probably get full credit in those situations. But it is your responsibility to bring it to my attention after the grades are out.

## 5.5 OMSI

You will use the OMSI system to take the Quizzes, on your laptop computer in class. Details will be provided separately from this syllabus.

## 5.6 Numeric Questions (ECS 132)

You use R to answer any Quiz problem that requires a numerical answer. (Use of R code enables automatic grading of math problems.) And it must be real R! Here are some examples of non-R:

```
1 + 2 = 3
2 x 2
3 over 2
five
the matrix has 5 rows
```

In the case of questions with numerical answers, write them in program style, using R syntax, e.g. using `*` for multiplication, `^` (carat) for exponentiation, `%%` for the mod operator, etc. Call `exp()` for evaluating powers of  $e = 2.71\dots$  and `pi` for  $3.14\dots$

Use the concatenate function, `c()` if a numerical problem asks for more than one number, e.g.

```
> c(1.2, 88, 6)
[1] 1.2 88.0 6.0
```

Use `as.hexmode()` to print in hex, e.g.

```
> as.hexmode(18)
[1] "12"
```

Do NOT simplify your answers. For example, do NOT simplify  $(2/3) * (5/8)$  to  $10/24$  or  $5/12$  etc.; leave it as  $(2/3) * (5/8)$ ; SIMPLIFIED ANSWERS MIGHT NOT GET CREDIT, EVEN IF CORRECT.

Here are examples of R functions you may find useful: `choose()`, `combn()`, `sum()`, `min()`, `max()`, `exp()`, `log()`, `integrate()`.

Here are examples of `integrate()`:

```
> integrate(function(t) 2*t/15, 2.5, 4)$value
[1] 0.65
> integrate(function(t) 2*t^2/15, 1, 4)$value
[1] 2.8
> integrate(function(t) sqrt(abs(t)) *
dnorm(t, mean=10, sd=2.1), -Inf, Inf)$value
[1] 3.144017
```

Did you notice the `"$value"` above? Without it, the class object is printed—in English—and thus not readable by my grading script.

## 5.7 Open-Materials Policy

**TESTS ARE TAKEN ON AN OPEN-MATERIALS BASIS.** Bring the textbook and other course materials with you to each Quiz. You are also welcome to bring whatever other materials you wish, e.g. technical books, dictionaries, whatever you want. Whatever you bring, **make absolutely sure that you remember to bring all your course materials, as many of the Quiz questions will refer to specific pages in them.**

Please note that in program code on the Quizzes you are only allowed to use language, functions, etc. constructs presented so far in our course.

## 5.8 Electronic Devices

Other than using your laptop with OMSI, you are not allowed to use any electronic devices, INCLUDING CALCULATORS, during Quizzes.

## 5.9 Re-assessment of Quiz Grading

If you believe you deserve more points on a Quiz problem, I am happy to look at it again – PROVIDED you submit a request to me within two weeks of my sending out grades.

# 6 Regarding Academic Dishonesty

An embarrassing subject which nevertheless must be mentioned is academic dishonesty, i.e. cheating.

**If a student is found to be cheating, it will be treated as a VERY SERIOUS matter, not a harmless prank, AND WILL BE REFERRED TO STUDENT JUDICIAL AFFAIRS. It will harm his/her standing at the university, and also possibly make it difficult for him/her to get a job when seeking employment after graduation.**

## 6.1 UC Davis Honor Code

You can find the UC Davis Honor Code at <http://sja.ucdavis.edu/files/CAC.PDF>. Our course will be conducted according to that code, as of course all classes are.

There is nothing surprising in the code; it's just common sense.

## 6.2 Quizzes

Official university policy<sup>2</sup> forbids

“Wandering eyes,” talking during exams...or leaving the exam room without permission.

Please work as follows during Quizzes:

- **To avoid the appearance of cheating, MAKE SURE THAT THE OMSI APP FILLS YOUR ENTIRE SCREEN AT ALL TIMES.**

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<sup>2</sup>See the *Class Schedule and Registration Guide*.

- Try to sit in alternate seats if possible.
- **ABSOLUTELY NO TALKING** to classmates at any time during the Quiz, **ESPECIALLY INCLUDING** during the time the TA or I are collecting the Quizzes.
- Keep your Quiz paper covered when you are not actually writing, so that it will not be so exposed to view.
- It would be greatly appreciated if you **USE THE RESTROOM BEFORE THE EXAM STARTS, RATHER THAN DURING THE EXAM.**  
And never leave the exam room without permission. **If you do need to use the restroom, you must leave your paper with the proctor.**

Thanks very much for your help.

Please note that in the case of larger classes, students may be photographed, including video.

Please do not wear hats during Quizzes.

### 6.3 Homework

**Outright copying of homework**, whether in the form of code or algorithm or math, is of course a serious violation of university policy and personal ethics. Similarly, asking for advice on the Internet, paying people to do your work, or otherwise improper consultation, is again a serious violation of university policy and personal ethics.

**However, you are welcome, and indeed encouraged, to trade tips with people in other Groups.** You may also on rare occasions ask people whom you know outside the class for hints, say friends or relatives who have some knowledge of the field, on a very limited basis.

You are also welcome to make reasonable use of the Web. For example, I'm a big fan of Wikipedia and there is a ton of material on there.

## 7 Lecture Format

My lecture style is very nontraditional.

### 7.1 I Seldom Write on the Blackboard

Instead, I talk about what's in the textbook. I typically will ask you to open to a certain page, and then will call your attention to various sentences, examples and pictures on that page. **The lectures will consist mainly of discussion and amplification of the examples in the textbook, with additional explanation.**

*This is just like using PowerPoint, except that the information is in front of you in your book, rather than on a screen at the front of the class.*

### 7.2 You Will LEARN MORE This Way

Traditionally, the professor writes on the board (or shows slides), and the students copy down what he/she says. That's a waste of time! Instead, what I do is give you in print what I would have written on the board.

Since the textbook already contains my lecture, you don't take notes (other than miscellaneous comments in the margin). This frees your attention to ask questions and to engage in class discussion.

The latter aspect, discussion, is key. You are very much encouraged to bring up any questions you might have. Please don't be shy about asking questions; there is no such thing as a "dumb" question.

Similarly, listen carefully to the questions the other students ask; this can be a very valuable source of insight, to which you should pay special attention.

**Note carefully:** Often points that arise during discussion in lecture wind up as Quiz questions!

This is a lecture style which you may not be accustomed to, but you will LEARN MORE this way.

### **7.3 Bring the Materials to Lecture**

Make sure you bring the textbook to every lecture. It will play a very active role in the lectures.

### **7.4 Use of Laptops During Lecture**

Really, this is rude. And though it has become commonplace, I (and many other professors) do not like it, and surveys have shown that many of your fellow students are annoyed by it too. It is very distracting. If you wish to use a laptop in class, PLEASE SIT IN THE BACK OF THE ROOM.

Use of tablets is OK (during lectures, not Quizzes), as long as you do so quietly, with the device lying flat on the desk.

## **8 The Discussion Section**

**The discussion section is required.** It will be used for the purpose of giving Quizzes, and occasionally for presenting material not covered in lecture. (That material will appear on Quizzes.)

## **9 Groups**

The following will be done in Groups:

- Homework
- the last Quiz of the quarter, in class
- the take-home Final Project

So, get to be very good friends with your Group, as you will be working with them constantly!

### **9.1 Forming Groups**

Group size must be at least three (two if the class enrollment is under 25), and no more than four.

**You must submit to the TA your Group membership lists.** Often, the TA will use the first discussion section to organize Groups. In any case, the TA will arrange Groups for anyone who has not found a Group to join on his/her own.

## 9.2 Group Participation: Your Responsibilities

YOUR HOMEWORK PARTNERS DEPEND ON YOU.

**Repeated failure to work cooperatively with your Group may result in a substantial penalty being applied to your course grade, which could drop to an F.**

Please do not allow things to deteriorate to the point at which I send you an e-mail message titled, “Your course grade is in jeopardy.”

You must show up at agreed-upon meetings of your Group, or arrange virtual meetings through e-mail, Skype, Google+ Hangouts etc.

In working with your partners, you must work TOGETHER, instead of simply dividing up the work among the partners.

It is not acceptable to say something like “You do this assignment and I’ll do the next.” Each student in a group is expected to participate in every assignment.

IT IS EQUALLY UNACCEPTABLE for one group member to simply take on all the work him/herself. In a programming class, for instance, every member of the group must write part of the program. Maybe some will write bigger parts and some smaller, but everyone must be involved.

If a Group member repeatedly fails to participate, he/she will be placed in a separate, one-person Group consisting of only him/herself.

## 10 Our Class Web Page and Blog

Our class Web page is at <http://heather.cs.ucdavis.edu/~matloff/xxx.html>, where xxx is our course number, e.g. 132 for ECS 132. It contains information on office hours and the like.

Our class Blog is linked to from our class Web page. **IT IS REQUIRED THAT YOU READ THE BLOG EVERY DAY**; it’s used to announce Homework assignments (including clarifications), hints for Quizzes, and so on.

Any information disseminated on the Blog is considered part of official course materials. This means for example that it may be needed in Quizzes.

## 11 Homework

We will have approximately three to five Homework assignments through the quarter, depending on the course and other factors.

### 11.1 Homework Due Dates

The term *due date* means 11:59 p.m. of the stated date.

## 11.2 Announcements

Homework assignments will be announced in the class Blog. (Note: An assignment is not official until it is announced on the Blog, even though it may appear on the Web before then.) The Homework specs themselves will be on the course Web site, so look there when an assignment is announced on the Blog.

Occasionally there will be news about a current Homework assignment, such as clarifications, hints and so on. These will be announced in the Blog.

## 11.3 Programming Work

In general, you will not be docked points for poor style—indentation, comments, etc. But you should do these things FOR YOURSELF, to help organize your thinking, and to be able to understand your program two months from now.

Use a debugging tool! Learn my Principle of Confirmation! Don't flail for hours when you can actually shorten your debugging time by a large fraction.

## 11.4 Submitting Homework

If the assignment includes mathematical work, e.g. as in ECS 132, you must write up your solutions in LaTeX, in detailed, clear form. Don't just write down equations; *explain* them.

It is REQUIRED that you use the Unix **tar** command to package all of your files. For a programming course, this will be just your source code files, except in the Final Project, where you will include your **.tex**, associated **.pdf** files and possibly image files.

The file name will be **email1.email2....tar** where the “email” fields are the official UCD e-mail addresses of the members of your Group, e.g. **jsmith.agutierrez.streddy.tjwong.tar**. Be sure to get those addresses exactly correct, to avoid a situation in which your team member doesn't get credit. **Be sure to use the proper e-mail address, NOT a different one based on your UCD login. Your official address is the one used by the TA and me in mailing you; check your records.**

In submitting your **.tar** file, make SURE not to make subdirectories. When the grading script unpacks your **.tar** file, it will expect to see all your work files in the same directory from which the script invokes the **.tar** command.

You then submit your **.tar** file to the TA (not to me), using **handin** on CSIF.

## 11.5 Interactive Homework Grading

We will use interactive grading. The TA will announce Homework grading times, and each Group will sign up for a time slot. **All members of the Group must be present during the grading time.**

During a Group's time slot, the TA will ask each member of the Group questions about their Homework submission, such as “What if the problem had asked...”, “Explain in detail why you did it this way...”, “What if you were to do it this way instead...” The purpose of these questions is to ensure that all partners are actively involved in all the work. *The TA will also ask questions about the general course material.*

**The TA will assign separate grades for each Group member. In some cases, these grades will be identical, but if there is a disparity in the levels of understanding the different Group members have regarding the assignment, the TA will assign different grades to each member.**

It's not expected that all members of a Group are equally proficient in programming or math, and thus it's not expected that everyone contributed equally to their submitted work. However, it IS expected that everyone was very actively involved.

The TA will e-mail me a report after grading an assignment, with tentative grades for my approval. Below are samples of what the TA might say.

**Example 1:**

Group 3, John, Jim and Mary: All three students seemed to have actively contributed to this assignment, and all three answered my questions well. The program worked fine. Tentative grades—John A, Jim A, Mary A.

**Example 2:**

Group 3, John, Jim and Mary: The program worked fine, but Mary seems to have done most of the work. John had some trouble answering my questions, and Jim could answer almost nothing. Tentative grades—John C, Jim F, Mary A.

**Example 3:**

Group 3, John, Jim and Mary: The program worked mostly OK, but failed when I tried the input combination 8, 88 and 168. All three Group members did answer my questions well. Tentative grades—John A-, Jim A-, Mary A-.

In the case of ECS 132, there will be similar reports for math problems.

## **11.6 If You Need Help, Hints, Etc.**

**Please note that Homework assignments here will NOT lay out a detailed recipe, with tons of hints, telling you how to do the problems.**

The work is designed to be challenging and thought-provoking. This thought-provoking nature of the assignments is the vehicle by which you get to really understand the concepts. You are not necessarily expected to see right away how to do an assignment. Instead, you are expected to spend a considerable amount of time pondering the assignment, gradually seeing more and more, until you finally see how to do the whole thing. It is through that thought process that will develop insight into the course material.

**The TA and I will be quite happy to help you, definitely including giving you hints—but only if, after giving a matter considerable thought, you still don't see what to do.** Once you have reached the point where you cannot go any further, we very much encourage you to seek help from us. We want you to do well on the Homework!

## **11.7 Late Work**

An assignment is late if it is submitted to the TA after the due date. If you are late, you will be assessed a 5% penalty the first late day, and 10%-per-day penalty after that in your grade for that assignment. (Since **handin** is available every day, each of the seven days of the week counts as one day.) The maximum total penalty is 50%.

Each Group will be allowed a total of 2 late days over the quarter, time which is not penalized. You can use this as being late 2 days with no penalty on one assignment, or as being late 1 day with no penalty in each of two assignments.

Don't squander your grace period days in the first assignment! The subsequent ones will almost certainly be more difficult, so save your grace time for then.

The TA will keep the appropriate records as to how many days of grace period you have used.

## 12 Final Project

In lieu of a Final Exam, we have a Final Project, which also serves as the last Homework assignment. It will be take-home and collaborative with your Group, just as with your earlier assignments. It will be very different from regular assignments, though:

- It will be of a different nature, notably in its requirement that you submit a written report.
- It will involve work approximately 2 times that of a regular assignment, and will be weighted accordingly, especially given the dual role of the Project as both Homework and a replacement for a final exam.
- An especially good Final Project may be given heavy Extra Credit, substantially boosting your course grade, much more than a regular assignment would.
- You submit your Final Project to me, not to the TA, and I am the one who will grade it (submit it via **handin**).
- No late Final Projects will be accepted.

You submit your Project reports in the same manner as for Homework, as detailed in Section 11.4. **Make sure to heed the point about subdirectories.** You use **handin**, in my directory (not the TA's) on CSIF, using the subdirectory **xproject**, e.g. **50project**.

Note the Project requirements:

- Do a good, professional job.
- Correct grammar and spelling, clarity/fluidity of the writing, etc., do count — a LOT.
- You must use LaTeX.
- Use bold font for program variables in text.
- Use the **listings** package or similar for displayed code listings.
- Full code listings must be included in an appendix.
- Use Bibtex for references. Note: Lots of materials already have Bibtex entries available online, saving you work. In referencing a Web page, include at least the title and URL.

Details will be given later. If you are curious now, though, you can find model examples in files with names of the form "Exemplarx" on our class Web site, e.g. <http://heather.cs.ucdavis.edu~matloff/132/>.

## 13 Grading

Grading is noncompetitive (there is no “curve”), so it is possible for everyone to do well.

### 13.1 Weighting

The formula used is

$$\text{course grade} = 0.70 \times \text{Quizzes grade} + 0.30 \times \text{Homework grade}$$

where the Homework and Quizzes grades are each on the 4-point scale (4 for an A, 3 for a B, etc., with + adding 0.3 and - subtracting 0.3).

Remember, the Final Project is also considered part of the Homework. If this is missing, it will not merely be treated as an F. Instead, you will be imposed a heavy penalty on your course grade.

On the other hand, as noted in Section 12,

An especially good Final Project may be given heavy Extra Credit, substantially boosting your course grade, much more than a regular assignment would.

### 13.2 + and - Grades

The threshold for a grade of n is (n-1).85; the threshold for an ‘n-’ grade is (n-1).6; the threshold for a ‘+’ grade is n.2. So, for example, if your weighted average from the above formula is between 2.6 and 2.84, your course grade is B-; if the average is between 2.85 and 3.19, your course grade is B; if the average is between 3.2 and 3.59, your grade is B+.

### 13.3 Quizzes Grade

You will get a letter grade on each Quiz.

In recognition of the fact that on (rare) occasions — for whatever reason — you will not be able to attend discussion section, or you simply will have an “off day,” your lowest two (letter) Quiz grades will be thrown out. Your other Quiz letter grades will be averaged to produce your overall Quizzes grade.

If you receive an F grade on many quizzes, your course grade will be reduced, possibly to an F, regardless of overall grades on the Quizzes, and Homework.

### 13.4 Getting Feedback from the TA

My agreement with the TA is that he/she must grade Homework within one week. TAs are students themselves, so this shouldn’t be a completely firm rule, but if you find that the TA is consistently slow in grading, please remind him/her, and let me know as well.

### 13.5 Intangibles in Your Course Grade

This is not “CHEM 1A-style grading,” calculated purely by formula, in which falling 0.5% below the cutoff point for an A results in a grade of B. The grade as determined above is just a lower bound. I can and often

do use intangibles to increase your grade above that that the formula in Section 13 would give. I would estimate this occurs in 20-25% of all the course grades I assign. Here are examples (note that I use many of these in writing letters of recommendation too):

- Student has been making a really strong effort in the class (or not).
- TA's detailed reports to me of the student's performance in the interactive Homework grading sessions show that the student has better insight than his/her Quiz scores show.
- Student's group has an exceptionally good final project, and it is clear that the student made major contributions to this (e.g. because the student also got good Homework grades).
- "All's well that ends well"-student showed a marked improvement in Quiz grades as the quarter progressed.
- Student's insightful comments in class.
- Student got one or more really difficult Quiz problems right that few or no other students got.

Negatives can be an obstacle. Those who miss Quizzes (except for medical or similar reasons) will probably not receive the benefit of such intangibles, for instance. A pattern of missing many Quizzes, or lack of involvement in the Homework may produce a grade below what the rules of the course provide.

### **13.6 Failure to Participate**

If you miss a large number of the Quizzes, or do not actively participate with your group in the Homework and Project, you may receive a course grade lower than what the above formula computes, even an F.

### **13.7 Extra Credit**

I give Extra Credit (EC) for all kinds of things. If during lecture a student makes an insightful remark, or answers a tough question I throw out to the class, I record EC for the student. If a student gets a Quiz problem right that no other student gets, or only a couple of other students gets, then I give EC.

So, how do I use EC? There are two main ways: (a) EC can and often does raise the student's course grade at the end of the quarter. (b) I make use of EC when recommending the student, for a job or grad school.

## **14 I Do Care!**

I wish to emphasize that I care very much that you succeed in this course, and I look forward to getting to know all of you.