CS 122: Programming for Engineering and Science
and CS122L (Lab for CS 122)

Spring 2015 Course Syllabus

Northern Arizona University • College of Engineering, Forestry, and Natural Sciences
Department of Electrical Engineering & Computer Science

Course Information
Catalog Description: Introduces computer programming for engineers, scientists, and math majors. Emphasizes problem solving, algorithms, and structured programming.

Broad Topics: Algorithms, MATLAB, Introduction to computer systems
(Note this course does not cover C++ or C programming. That will be covered in EE222, Intermediate Programming.)

Prerequisites: MAT 108 or better
Co-requisites: None
Skill Level: Introductory
Credit Hours: Lecture: 2, Lab: 1

<table>
<thead>
<tr>
<th>Course-Section</th>
<th>Type</th>
<th>Day</th>
<th>Building</th>
<th>Room</th>
<th>Time</th>
<th>Grader, Lab Aide, Teaching Asst.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS122-1</td>
<td>Lecture</td>
<td>M W</td>
<td>Engineer</td>
<td>Rm. 101</td>
<td>8:00AM – 8:50AM</td>
<td>Jessica Atkinson, Scott Peterson</td>
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<tr>
<td>(Dr. Michael Vanderberg)</td>
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<tr>
<td>CS122-2</td>
<td>Lecture</td>
<td>M W</td>
<td>Engineer</td>
<td>Eng. 101</td>
<td>10:20AM – 11:10AM</td>
<td>Nancy McCollough</td>
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<tr>
<td>(Dr. Ron McFarland)</td>
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<tr>
<td>CS122-3</td>
<td>Lecture</td>
<td>M W</td>
<td>Engineer</td>
<td>Eng. 224</td>
<td>12:40PM – 1:30PM</td>
<td>Chris Hood</td>
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<tr>
<td>(Dr. Michael Vanderberg)</td>
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<tr>
<td>CS122L-1</td>
<td>Lab</td>
<td>M</td>
<td>Engineer</td>
<td>106</td>
<td>11:30 AM – 1:30 PM</td>
<td>Michael McCormick, Makayla Shepherd</td>
</tr>
<tr>
<td>CS122L-2</td>
<td>Lab</td>
<td>M</td>
<td>Engineer</td>
<td>106</td>
<td>5:30 PM – 7:30PM</td>
<td>Emily Bartman, Grant Swenson</td>
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<tr>
<td>CS122L-3</td>
<td>Lab</td>
<td>Tu</td>
<td>Engineer</td>
<td>106</td>
<td>5:30 PM – 7:30PM</td>
<td>Joshua Frampton, Kevin Meyer</td>
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<tr>
<td>CS122L-4</td>
<td>Lab</td>
<td>W</td>
<td>Engineer</td>
<td>106</td>
<td>8:00AM – 10:00AM</td>
<td>Michael McCormick, Jorge Felix Caudillo</td>
</tr>
<tr>
<td>CS122L-5</td>
<td>Lab</td>
<td>Th</td>
<td>Engineer</td>
<td>106</td>
<td>2:20 PM – 4:20PM</td>
<td>Michael McCormick, Ryan Simmons</td>
</tr>
</tbody>
</table>
Here are the times available for you to work with our CS122 SI. Don't fall behind! See the SI: Mon. and Wed. Room 234 7:15-8:15pm and Thurs. Room 317 7:00-9:00pm, or when announced (e.g. test review times).

You will see a “Peer T.A.” in your class. For the lectures, the Peer TA is Jessica Collins. For the lab classes, you will see Salvatore Bottiglieri. Peer TA’s are very knowledgeable, upper division (junior/senior) students. They are here to answer questions and to help ensure your success.

Final Exam for CS122 (lecture): CS122-1: Mon. May 4, 2015, 7:30AM – 9:30AM
CS122-2: Mon. May 4, 2015, 10:00AM – 12:00PM
CS122-3 Mon. May 4, 2015, 12:30PM – 2:30PM
No final exam for CS122L (lab)


Course Websites: http://www.cefns.nau.edu/~smj93/CS122
http://bblearn.nau.edu
All assignments should be submitted electronically to Blackboard by the due date. All assignments must be the students own individual work, unless otherwise noted. Any group assignment must contain all member names to receive credit.

Information on Instructors
Lecture Instructor: Dr. Michael Vanderberg, Adjunct Faculty
Office Hours: Office hours: 8:00AM-9:00AM Tues. & Thurs., Room 131 SW Forest Science Complex.
Email: Michael [dot] Vanderberg [at] nau [dot] edu
Phone: Please email.
NAU Address: Box 15600, Flagstaff, AZ 86011-5600

Lecture Instructor: Dr. Ron McFarland, Adjunct Faculty
Office Hours: Office hours: Fri. 10:00AM – 11:30AM, Room 243
Email: Ronald [dot] McFarland [at] nau [dot] edu
Phone: Please email.
NAU Address: Box 15600, Flagstaff, AZ 86011-5600
Lab Instructor and Course Coordinator: Steven M. Jacobs, Lecturer

Office Hours: Office is Engineering Bldg. 69, Rm 254
Office hours: see on-line schedule at Prof. Jacobs’ faculty page: http://cefns.nau.edu/~smj93/ (click on “schedule”)

Email: Steven [dot] Jacobs [at] nau [dot] edu
Phone: Please email.
NAU Address: Box 15600, Flagstaff, AZ 86011-5600

**Assessment and Grading System (CS122 lecture)**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Attendance (see “Attendance” section of syllabus below)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework, projects, in-class activities</td>
<td>14 x 12pts each + 5pts (homework 0 introduction) = 173 pts</td>
<td>29.2</td>
</tr>
<tr>
<td>2 Exams</td>
<td>2 x 100pts each = 200 pts</td>
<td>33.7</td>
</tr>
<tr>
<td>Syllabus quiz and pre-lecture/review quizzes</td>
<td>12 x 10pts each = 120 pts (may vary due to class progress)</td>
<td>20.2</td>
</tr>
<tr>
<td>Final Exam</td>
<td>1 x 100 pts = 100</td>
<td>16.9</td>
</tr>
<tr>
<td>Total</td>
<td>593 pts (may vary due to class progress)</td>
<td>100.0</td>
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**Assessment and Grading System (CS122L lab)**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance (see “Attendance” section of syllabus below)</td>
<td></td>
<td></td>
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<tr>
<td>Process quiz</td>
<td>1 x 10 pts</td>
<td>3.6</td>
</tr>
<tr>
<td>Pre-labs</td>
<td>13 x 5 pts each = 65 pts</td>
<td>23.6</td>
</tr>
<tr>
<td>Labs</td>
<td>13 x 15 pts each (plus one Lab 0 intro of 5 pts) = 200 pts</td>
<td>72.7</td>
</tr>
<tr>
<td>Total</td>
<td>275 pts</td>
<td>100.0</td>
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Your class grade is based on the standard scale of points earned: 90%=A, 80%=B, 70%=C, 60%=D, below 60%=F.

No grades are curved or dropped, though there may be opportunities for extra credit.
Assignments are due on-line on the due date. Graded tests are handed back during class. Total points on the tests and final may vary. Regrade requests of test questions (or homework) may include regrade of entire test or homework.

Review the grading comments in BbLearn for any feedback on your work. If you feel a mistake was made in grading your assignment, please come and visit during office hours. I will very happily explain my reasoning for deductions and correct mistakes!

**Late Policy**

Project and homework assignments are accepted with a 10% late penalty per school day, i.e. 50% penalty may be imposed for work one week late and 100% penalty for work submitted over two weeks late.

If you miss a test or know you will miss a test, discuss the matter with me as soon as possible.

**Communication with professor:** *include your class/section info in email, e.g. CS122-1*

Outside of class, please contact Prof. Jacobs, Dr. McFarland, or Dr. Michael Vanderberg by attending an office hour or via regular email: steven.jacobs (at) nau.edu or ronald.mcfarland (at) nau.edu or michael.vanderberg (at) nau.edu (not BbLearn email) for any questions, e.g. requesting an excused absence, assignment content, or your status in the class. Please include "CS122-1" (for the MW 8:00AM class) or "CS122-2" (for the MW 10:20AM class) or “CS122-3” (for the MW 12:40PM class) in the body or subject of the email message. Likewise, for the CS122L lab students, make sure to include “CS122L-n”, where “n” is the lab section number (1 to 6) in which you are enrolled.

**Labs and Pre-Labs (CS122L)**

CS122L is the lab class for CS122. The lab and lecture classes are separate classes, yielding separate grades (one grade for the 2-unit lecture and one grade for the 1-unit lab). The lab class meets once a week in Engineering Room 106.

CS122L lab classes are conducted as “pair programming” (2-person team concept to be described in lab). In pair programming for CS122L, each student will submit a copy of the lab report into BbLearn. Make sure the lab report document has both names at the top. A point penalty will be assessed for unexcused absences in lab if the student submits the lab as an individual.

There are weekly pre-labs that are your ticket in to start the lab. With the pre-lab, you will learn concepts and be directed to specific videos or reading on relevant subject matter for the lab. This is analogous to a classes in other disciplines, e.g. biology, where you are learn some “anatomy” before proceeding into the lab. If you do not complete the CS122L pre-lab for a given week, you will be admitted to lab, however you cannot start your lab until the pre-lab is completed. There will be a point penalty, but please do come to lab.
“Plan, Analyze, Implement, Test”. This is a development methodology you will become comfortable with in CS122L. It has to do looking at a computer-based problem and formulating a solution BEFORE diving in and solving the problem. You will see this again during the semester. One good reference is: http://en.wikipedia.org/wiki/Systems_development_life_cycle

There are lab submission guidelines to make clear what is expected in each lab.

**Attendance & Absentee Point Reductions**

Regular attendance is expected. Attendance is taken. Don't be late, and don't leave until class is dismissed. While class attendance is expected, please be cautious about attending class if you are feeling ill. Please inform your instructor by email if you are feeling unwell; if you are experiencing flu-like symptoms, you should not attend class; please take precautions not to infect others, and seek medical attention if your symptoms worsen. Remember, unless you are ill or have a family emergency, it is unwise to not miss any classes. Recall that absences do not include institutionally documented and approved absences. Besides illness, absences are also permitted other medical reasons, or family matters, if discussed in advance of the missed class.

If attendance is poor, your instructor will use their judgment at the end of the semester to drop one letter grade for poor attendance. Make-up exams for excused absences will contain different content. Students taking an exam at Disability Resources (DR) must give the instructor and DR one-week notice prior to the exam date.

**Failed Final Policy**

If you score less than 50% on the final exam, your final class grade will be reduced by one letter grade.

**Lectures and the Book**

The lecture topics follow the same general outline as the book. However, the lecture complements the book rather than being a mirror of it. If you only read the book or only pay attention to the lecture you're likely to end up missing some key concepts. To get the most from the class, read each chapter before we discuss the corresponding topic in the lecture, then use the lecture as an opportunity to reconsider the key points of the material and ask questions on anything you're confused on. Complete the pre-lecture quizzes on time to reinforce your learning.

*Emergency Textbook Loan Program:*

To help students acquire the materials they need to be successful in class, NAU has partnered with Follett to create the Emergency Textbook Loan program. The program is administered by the LEADS Center. The program assists students with unmet financial need in obtaining required textbook(s) and other materials for courses. Students must apply and meet eligibility criteria before textbooks are purchased on their behalf. Textbooks must be returned at the end of the term in which the textbooks were loaned.
More information can be found online: [http://nau.edu/LEADS-Center/Textbook-Loan-Program/](http://nau.edu/LEADS-Center/Textbook-Loan-Program/)

**Plagiarism and Cheating**

Students are to work independently and without consultation with other students unless the assignment specifically states that you may collaborate. Grades are a way to motivate students and to evaluate students’ mastery of a subject and their ability to get work done. The grades you get are not themselves truly important, but instead are representative of your knowledge, capabilities, and work ethic, and *those* are the things that matter.

If you plagiarize source code, fabricate results, make fraudulent claims, or attempt to cheat in any way, you are misrepresenting yourself, your level of understanding, your capabilities, and your ability to accomplish things. It is dishonest and unethical.

Anyone who plagiarizes, copies, fabricates, or cheats will at the *least* receive a zero on that assignment or test. You will be asked to sign an Academic Dishonesty Statement for this class. It says “confirmed violations will result in a failing grade for the course and will be reported to the Dean of Students according to the policies set forth by Northern Arizona University, and Appendix G of the Student Handbook”.

Consulting with others and using their advice on projects is fine. However, the work you submit should be your own work that you thoroughly understand and are entirely responsible for.

**Pre-requisites and dropping the course**

If you have not completed the prerequisites for a course as stated in the academic catalog or if you are absent from class during the first week, you may be administratively dropped from the course before the 21st day of the term. Do not rely on your instructor to drop you from the courses that you want to drop. You are responsible for changing your own course schedule.

**Course Description**

Being able to perform billions of calculations on billions of numbers *per second*, computers are an incredibly useful tool. Although we are obviously unable to enter calculation instructions fast enough to keep up, we can harness the power of computers by writing programs that lay out in advance all the calculations we wish to perform."

While many people are able to use existing software, not many people know how to actually program computers. This is a pity because we’re surrounded by systems that allow us to define custom programs to solve unique problems - Excel spreadsheets, calculators, 3D modeling programs, and NAU web servers just to name a few.

This class will teach you the fundamentals of analyzing a problem, writing a program to process and analyze relevant data, and interpreting the output.

- Break down computational problems into a series of easily-managed steps.
• Create programs in the MATLAB language.
• Process numerical data and perform input and output operations on it.
• Use the Unix operating system at a basic level.

Liberal Studies
The mission of the Liberal Studies Program at Northern Arizona University is to prepare students to live responsible, productive, and creative lives as citizens of a dramatically changing world. To accomplish the mission of Liberal Studies, Northern Arizona University provides a program that challenges students to gain a deeper understanding of the natural environment and the world’s peoples, to explore the traditions and legacies that have created the dynamics and tensions that shape the world, to examine their potential contributions to society, and thus to better determine their own places in that world.

CS 122 supports this mission by helping you:
• Gain a deeper understanding of the tools and processes that enable and drive our technologically-oriented society.
• Explore the history and culture of MATLAB and Unix.
• Understand the basics of computer programming and be able to apply them to solve the various computational problems you encounter in life.

CS 122 is a course in the Science Distribution Block and supports the intent of that block by:
• Teaching you the basics of two programming languages and the Unix operating system.
• Teaching you how to program and problem-solve with a programming language.
• Cultivating highly logical and algorithmic thinking.
• Exposing you to the common algorithms and techniques that are the basic building blocks of all programming.

Through the program students acquire a broad range of knowledge and develop essential skills for professional success and life beyond graduation. In addition to discipline-specific skills, this course will emphasize quantitative reasoning, an essential skill defined in the University’s Liberal Studies Program. By completing all the coursework in the class, you will meet all six learning outcomes specifically linked to quantitative reasoning:
• You will assess descriptions of both raw and derived quantitative data by examining input data relevant to programs you wish to write.
• You will select and apply the appropriate mathematical, statistical, or graphical models by choosing the best organizational and algorithmic techniques for a particular programming problem.
• You will perform data manipulations through coding and then organize data graphically, numerically, or functionally by choosing and implementing an appropriate output format.
• You will interpret the results of models that you program, including margins of error from statistical data.
You will use graphs to solve problems such as scheduling, organizing information or finding optimal strategies.

You will describe and explain the processes and results by applying quantitative literacy skills in the project reports you write.

**Student Success**
Student success is a joint responsibility – that I am here to facilitate your success, but you need to come to class and do the work. Below is a list of what is required to be successful in this class.

*Habits of Highly Successful Students*
1. Attend class
2. Listen
3. Read the book
4. Ask questions
5. Get help when you need it
6. Make friends with someone in class
7. Do not miss assignments
8. Manage your time
9. Practice what you have learned
10. Start homework and programming projects early

We are here to facilitate your learning. We show you the way, you learn the material.

There is a **Supplemental Instructor** (SI) for CS122. Her name is Jeannette Nelson. She will hold review sessions to help you with lecture homework and projects, as well as to help review for tests.

You may also see Lab T.A.’s attend some lectures to ensure that lecture and lab content are synchronized. I will ask those of you in CS122L Lab to direct your lab questions to your Lab T.A.’s first, but the SI is very knowledgeable in all aspects of MATLAB programming. The SI is here to answer questions and to help ensure your success.

**Schedule**
*Week # (Monday of that week)  Topics covered*

Week 1 (Jan. 12)  Algorithmic thinking
Week 2 (Jan. 19)  (No class MLK Day, Jan. 19) Algorithmic thinking (concluded)
Week 3 (Jan. 26)  MATLAB - introduction and basics (Ch 1-2)
Week 4 (Feb. 2)  Vectors and matrices (Ch 1-2) concluded
Week 5 (Feb. 9)  2D plots (Ch 3). Math stats and conditionals. Test 1 *(Wed. Feb. 11, 2015)*
Week 6 (Feb. 16)  Branching statements & program design (Ch 4)
Week 7 (Feb. 23)  Loops and vectorization (Ch 5)
Week 8 (Mar. 2) Basic user-defined functions (Ch 6)
Week 9 (Mar. 9) Advanced features of user-defined functions (Ch 7)
Mar. 16 – Mar. 20 Spring break
Week 10 (Mar. 23) Strings (App. C)
Week 11 (Mar. 30) Input/output (App. B)
Week 12 (Apr. 6) Complex numbers and 3D plots (Ch 8)
Week 13 (Apr. 13) Importing data (Ch 9)
Week 14 (Apr. 20) Binary and hex number systems
Week 15 (Apr. 27) Intro to computer systems. Course review.
Finals Week
CS122-1: Mon. May 4, 2015, 7:30AM – 9:30AM
CS122-2: Mon. May 4, 2015, 10:00AM – 12:00PM
CS122-3 Mon. May 4, 2015, 12:30PM – 2:30PM
No final exam for CS122L (lab)

Computer Access
The projects and many of the homework assignments are programming problems requiring a computer to solve. You can use your NAU computer account to access lab computers and our CEFNS computer remotely.

We will not be spending any class time in the computer lab. You are responsible for going to the lab on your own time or working from home to complete the assignments. You can use the general lab in room 106, the PC lab in room 317, the computers in the building's Internet Cafe or any of the various PC labs around campus. However, only the computers in the engineering labs are guaranteed to have MATLAB installed - other computers may or may not. The computers in the math building should have MATLAB as well.

The Engineering Building's computer lab hours are posted in the building. After-hours access is also available with keypad access from the outside. If you are an Engineering student you can get a keycode at the Engineering front desk - unfortunately this option isn't available to non-Engineering majors.

We will be covering the MATLAB language. Because even the student version of MATLAB can be pricey, I would recommend NOT purchasing that software. MATLAB is available on all of our Engineering lab computers; to access MATLAB via Engineering lab computers, enter: Start > All Programs > Math Applications > MATLAB.

MATLAB is available to students anywhere via the remote desktop server. You can find how to connect to that on the CEFNS IT website through a link for a Windows, MAC, or Linux machine at http://nau.edu/CEFNS/IT/Support/

Most of your questions on general computer setup can be answered at the following web pages:
Univ

ersity Policies
There are a number of university policies that govern your education and safety that all
students should be aware of. These are:

- Safe Working and Learning Environment
- Students With Disabilities
- Accommodation of Religious Observance And Practice
- Institutional Review Board (And Use Of Human Subjects)
- Academic Dishonesty
- Medical Insurance Coverage For Students
- Classroom Management
- Evacuation Policies

The Safe Environment, Students with Disabilities, Academic Contact Hour, Academic
Integrity, Research Integrity, Sensitive Course Materials and Classroom Disruption
policies are available at: http://nau.edu/OCLDAA/_Forms/UCC/SyllabusPolicyStmts2-2014/

You will find a complete list of university policies here:
http://nau.edu/university-policies/

Also, please review the latest version of the on-line NAU Student Handbook here:
http://nau.edu/Student-Life/Student-Handbook/

Resources for Student Success
Successful university students take advantage of services and resources designed to
boost learning and achievement. NAU recommends that you begin with:

- Supplemental Instruction - attend these course-specific review sessions
  whenever offered; proven to reduce D’s and F’s
- Student Learning Centers - free drop-in, online, and individual tutoring
  appointments for math, writing, and over 100 courses; available Monday through
  Friday
- ResourceConnect - your online central navigation point for all NAU student
  resources
- Action Center - messages to keep you academically on track – when you get a
  message take action!

For a full-listing of University College services visit: http://nau.edu/University-
College/Your-First-Year/