CS 241L: Data Organization
Fall 2020 - Remote Scheduled modality

Instructor:
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Office: Farris Engineering Center, room 2040, phone: 277-3052

Virtual Office hours: will be recurring zoom meetings on

Tuesday and Thursday 3:30 - 4:30 pm

the Learn site for this class has the link to the zoom meeting on the left panel

Lectures   Tuesday and Thursday 2:00 - 3:15 pm, synchronous via zoom

the link is in the left panel of the Learn site

Lab Sections: (Section number, schedule, grader name and email)

001 F 10:00-10:50 am   Aislinn Handley   ahandley@unm.edu

002 R 10:00-10:50pm   Craig Parry   parryc@unm.edu

Many things have changed with the *remote scheduled* modality so here is a description of how that modality will work in this class.

1. **At least one weekly lecture will be synchronous via zoom.** You will find a zoom link on UNM Learn for the lectures, you will register once for the lectures using the link. We will try to record each lecture meeting and post them on Learn at the end of each week.

2. Student **participation during the lecture times** is encouraged and will be given some weight in the final grade. There are several ways to participate in a lecture, some of these are: raising your hand in zoom and asking or answering questions, answering questions via polls, sending questions or answers via the chat in zoom. Your participation should be significant to accumulate points for the final grade, this assessment will have a maximum of 5 points over the final score of 100. (Note: students who can justify their inability to attend any of the scheduled lectures, should talk to the instructor to find alternatives for this participation assessment.)

3. This is a three (3) credit-hour course. Students are expected to complete **between six (6) and nine (9) hours of out-of-lecture work (on homework, study, assignment/project completion, and class readings/activities) each week during the 16 class weeks of this semester**.

4. **The lab sessions will not be synchronous,** but rather check-in time with the teaching assisstant. Each student is expected to work on the topics of the CS241L course during their lab sessions time and get help from the TA during these times and during the TA other *open question times*.

1 Course Description

The UNM catalog says about CS-241L:

Data representation, storage and manipulation. Covers the memory organization of data storage and its relation to computation and efficiency. Topics include: linked vs. contiguous implementations, memory management, the use of indices and pointers, and an introduction to issues raised by the memory hierarchy. Programming assignments in C provide practice with programming styles that yield efficient code and computational experiments investigate the effect of storage design choices on the running time of programs.

1.1 Goals and Learning Objectives

The general *goals* for this class are:

G1: Students acquire a good working knowledge of programming in the C language.

G2: Students have an introduction to the fundamental data structures used in Computer Science.

Our approach is student-centered and we work toward specific *learning objectives*. We will use active learning techniques in the *virtual classroom* to help you attain the goals. At the end of the term, you should be able to:

LO1: list and define data types, operators and expressions, including bit manipulations, in C

LO2: explain, summarize, and utilize the control flow structures in C

LO3: describe, recognize, and apply the use of functions to create well structured C programs

LO4: apply the input/output libraries in C, and manipulate files using a C program.

LO5: manipulate strings and character arrays in C programs

LO6: organize data using the C features of structures and unions

LO7: define and explain arrays and their relationship to pointers in C

LO8: describe, summarize, and implement basic data structures such as *linked lists, stacks, queues, and trees* in the C language

2   Mandatory Textbook and resources

1. **Deitel[2] Textbook: "C How to program"**, Paul Deitel and Harvey Deitel. Eighth edition. Pearson 2016. Available in electronic format, inclusive access..

2. ***zyBook*** to practice C.
   This is an online interactive platform with some text, many animations of concepts, practice exercises with inmediate feedback, and special labs. You may access this platform directly through the UNM bookstore *with a discount* or you can acquire access following these steps: To register for the zybook and to obtain the material from the company, follow these instructions:

   (a) Sign in or create an account at `learn.zybooks.com`

   (b) Enter zyBook code: `UNMCS241LAbadMotaFall2020` you must register for the same section you are registered for this class in UNM.

   (c) Subscribe

3. **A journal.** We have created a journal on Learn for this class, so you can add entries to it, but you could also use a paper *notebook* or a computer file (notepad or similar) and later upload it to the journal on Learn. Every week you will write down what you have learned after each class. The entries on Learn will be graded and this grade will be considered under the Homeworks category of assessments (see section 3). (This helps, really. And it makes you have a stucture and a discipline to study for this class.)

4. **Supplementary material** in the form of readings or videos will be provided on Learn.

5. **UNM Learn.**
   For all announcements we will use UNM learn available with your Net ID at learn.unm.edu. When you register for this class your UNM id is automatically included in the course platform list. Students are responsible for being up to date with the announcements and material published in UNM Learn for this class on a daily basis.

3   Assessments

In this course you will be evaluated based on the following assessments, the weight of each category is in parenthesis, next to the name of the assessment.

- **Readings specified on the Deitel[2] textbook (questions/quizzes) and *Participation Activities* from the zyBook (5%)**, these will be done in preparation for the lectures and are due Tuesdays at 9:00 am.

- **Class participation (5%)** (individually or in a group during the virtual lectures)

- **Programming Assignments (40%)**: about nine (9), 1-2 weeks each of varying degrees of difficulty, their individual weight on the 40% total is not equal.

- **Homework assignments and journal entries (15%)** (some will be in the zybook, examples are: challenge activities and simpler zyLabs, others will be separate homework not in the zybook): between 8-12 homeworks and

- **Midterm exam (15%)**: Thursday, October 8, 2020

- **Final Exam (20%)**: Tuesday, Dec. 8, 2020

There is a detailed calendar subject to changes that shows the dates for the readings, programming assignments, homework assignments, and exams.

Some details about Grading:

- The two exams will be online on Learn.

- Readings from textbook will have asociated questions or homeworks in Learn and participation activities are from the zyBook.

- Class participation: virtual lecture attendance and participation in the active learning activities.
  (A small percentage of absences is allowed up to 25% of the lectures, approximately 8.)

- Programming assignments: automatic grade by zybook or manual grading if not in the zybook + **explanation and Q/A with grader remotely**

- Homework assignments: all exercises will be graded but some (randomly picked) will require an explanation or some Q&A with the teaching assitant to get the credit.

See section 3.1 for more details on the submissions of the assignments.

About the Final Letter Grade: The final grade of a student in the course will be calculated by weighing each exam and assignment score obtained by the student, according to the percentages described above. This numeric final grade (in a scale of 100) is converted into a letter final grade (A+,A,A-,B+,B, etc.). Since the conversion process (from number to letter) is left to the instructor to decide, the student should not compute their letter grade according to their own or other faculty's conversion table.

I do not use a fixed scale this is too rigid. An approximation to scales that I have used in the past is the following: below 40 is an F, less than 50 is the D range, 50 and up is the C range, 70 and up is the B range, 85 and up is the A range. I use the average and standard deviation to determine the borders around C to find the C- and C+ ranges, around B to find the B- and B+ ranges, and around A to find the ranges for A- and A+.

3.1 Submitting Assignments

All zyBook activities must be performed in the zybooks.com platform, grades obtained there will be transcribed to learn by the instructor and graders. All assignments excluding the zyBook activities must be submitted to UNM Learn in order to receive credit for them. If Learn is down, you may e-mail the assignment to the grader of your section in order to prove it was done on time. However, it must be inside Learn before you can receive credit for it.

It is your responsibility to make sure the correct file is submitted to Learn before the deadline. Always double-check your submissions. If you realize you accidentally attached the wrong file, immediately resubmit the correct file with a note explaining the error.

You are permitted to submit multiple times and the most recent on time submission will be the one graded, so feel free to submit partial solutions as you complete milestones.

4 Weekly Readings/Activities

Most of the reading required for this class will be done from the Deitel textbook. We indicate the sections to be read each week from this book in the three-part table presented below.

In the first five (5) weeks of instruction we concentrate on the *C language* and in passing provide the necessary background you need on Unix commands. But you are responsible for practicing with the Unix commands by logging in to your account in the `linux.unm.edu` platform and playing with those commands required to create, compile and execute the programs in C. You will also need to pick a text editor (plain text, no formatting) in which to write your C programs. Starting on Week 6, we introduce the notion of data structure and we will see that the first data structures we cover are native in C. Examples of these are *arrays* and *strings*.

Notice that the coverage of these topics in the textbook is in a different order than the one we are following. That is why looking at the list of sections for each week in the table below is necessary for you to be up to date with the material covered on that week. Most sections in the textbook have advice in small blue boxes, these pieces of advise refer to: good programming practices, common programming errors, performance and portability tips, among others.

In addition to the readings there are specific activities to be performed in the **zyBook** which is part of the required material for this class. Some of these activities are to keep up with the topics others will be evaluated as homework. The detailed list of activities from the zyBook will be indicated in the platform, here we only give a general idea of the topics to be practiced with the zybook.

Week	Lecture	Topics/Readings
Week 1	L1	Deitel. Chap 1. Sections 1.1 to 1.6 and 1.9, and Chap 2. Sections 2.1 and 2.2
	L2	Reserved Words. Number Systems. Integer types in C, 2's complement
		Operators and Precedence
		pages 44-53 (sec. 2.3-2.5), 129 (end of sec. 4.7), 168 (table 5.5 in sec 5.6),
		Appendix C
Week 2	L3	char, float, and cast. Deitel pages 86-87 (end of section 3.9),
		pages 167-168 (section 5.6),
		On floating point and casting
	L4	Section 4.10 (logical operators). Section 10.9 (bitwise operators)
Week 3	L5	Deitel. Chap. 7: Sections 7.1 - 7.3 (pointers), sections 7.8.7, 7.8.8 (void *)
	L6	Section 9.11 (scanf), sections 8.5.1 and 8.5.2 (getchar, putchar)
Week 4	L7	Sections 3.5, 3.6 (pages 70-78) if, if-else statements.
		Section 4.7 (pages 123-129) switch statement
	L8	Sections 3.7, 3.8 while loops. Sections 4.1-4.6, 4.8 for loops, do loops
		Section 4.9 break, continue
Week 5	**L9**	Sections 5.1-5.9 (functions)
	L10	Summary of gdb (debugging) source?

Week	Lecture	Topics/Readings
Week 6	**L11**	**Arrays**, bubble sort Ch. 6 Sections 6.1-6.4, 6.7, 6.8, Ch. 7 Sec. 7.12
	L12	strings, foo[ ] versus *foo. Section 6.5 and from Ch. 8, sec. 8-1 - 8.8
Week 7	**L13**	Sections 6.11, 6.12 (multi-dimensional arrays).
		Section 4.4 (command line arguments)
	L14	Ch. 10, sections 10.1-10.8 (structs, typedef, unions)
Week 8	**L15**	Sections 12.1 - 12.4 (**linked lists**, malloc and free)
	L16	Same as above + MIDTERM
Week 9	**L17**	Sections 5.12 - 5.13 (scope). Ch. 14. Section 14.5 (multiple file programs)
	L18	Chap. 12, sections 12.5 and 12.6 (**stacks and queues**)
Week 10	**L19**	Supplemental Reading on Quicksort Algorithm
	L20	Knight's Tour, Binary Search, Fibonacci Numbers (no reading assignment)
Week 11	**L21**	Supplemental reading on **Heaps**
	L22	Ch. 13, sections 13.1 - 13.10 (C pre-processor).
		Ch. 15, section 15.6 (inline functions)

Week	Lecture	Topics/Readings
Week 12	**L23**	Section 12.7 **Trees** (12.7.2 preorder, inorder and postorder traversals)
		This section discusses specifically a Binary Search Tree
		(as opposed to any kind of Binary Tree, such as a Heap-Trees).
		(Tuesday this week is a break day, so it has only one lecture.)
Week 13	**L24**	Reading on Huffman Trees from the book by Cormen et al. 2001.
	L25	Section 12.7 (Simple binary search trees). This section includes code for the
		insertNode function which is not well written.
Week 14	**L26**	Supplemental Reading: "Know your Algorithms" by Kode Vicious,
		CACM April 2019
		AVL trees (height-balanced tree) where do they read them from?
	L27	sections 11.1 - 11.10 (File Processing)
		Supp. Reading: "The future of Data Storage" CACM April 2019
Week 15	**L28**	Deitel pp. 446-447
		Deitel. Sec. 11.9 pp. 461-466
Week 16	**L29**	Cormen pp. 256-260. This pdf is posted in Week 15.
		Hashing, Chaining and Hash Functions.
	L30	Cormen pp. 262-272: Hash functions, Open addressing,
		Linear probing and Quadratic probing.

5   Course and UNM Policies

This section contains the most important policies students are expected to comply with. They are classified into general course policies and specific policies about: assignments, academic honesty, copyright issues, ADA, and Title IX. This section is long but very important, read it carefully. Ask questions as needed, don't wait until the end to read them, please read them now.

5.1   General Course Policies

1. When sending email to the instructor or graders, please include the word `CS241` in the subject line with a meaningful subject matter. Failure to identify your message with the class number, will result in a delayed response or no response at all.

2. For all direct written communication with the instructor, please use `soraya@cs.unm.edu` or `soraya@unm.edu`.

3. No make-up or extra credit assignments or tests will be given. In general, the dates of the exams and the due dates for assignments will be announced well in advance.

4. If you must miss the midterm, your final exam grade will count for that midterm grade as well.

5. Requests for regrades of assignments must be made within two weeks from when the assignment is returned/graded. Assignments will not be regraded after that point.

6. Assignments and tests for which a regrade is sought will be regraded in their entirety. Therefore the new grade could be lower or higher than the original grade (before regrading).

7. This course falls under all UNM policies for last day to drop courses, as described at http://www.unm.edu/studentinfo.html and in the UNM Course Catalog. Please see the UNM academic calendar for course dates, the last day to drop courses without penalty, and for financial disenrollment dates.

8. Any requests to drop the class or change grade mode (e.g. audit, CR/NC) with instructor permission must be made on or before the last regular class/lab meeting. Such request made after this date will not be approved except in the case of documented, extraordinary circumstances.

9. Working together and helping one another on all projects (but not on exams) is highly encouraged. This includes discussion of *project specification*, *algorithms*, *data structures*, and *test cases*. **It does not include code, i.e. you may not share code.** Each person must author his or her own code.

5.2   Academic Honesty

The university policy on academic honesty is contained in the Pathfinder; you should review this policy if you are unfamiliar with it. Any academic dishonesty will result in an automatic zero (0) on the offending assignment and could entail other consequendes, for example, be referred to the UNM Dean of Students for further disciplinary action as they deem appropriate. More than one offense on the same semester will lead to an F as the final grade in the class.

As a general rule, any work you hand in for this class must be your own original work. Do not, under any circumstances, share source code, writings, or assignments with your classmates without my explicit prior approval. Students can, however, verbally discuss assigned readings, written assignments, and programming assignments outside of class, or using online mechanisms (email, Piazza, etc) that are the general equivalent of verbal communication. For example, feel free to describe verbally over email generally how you attacked a particular problem in a programming assignment.

Any conversation or sharing of information that moves beyond simple verbal discussion and begins discussing or sharing specifics of source code or mathematical operations, however, is potentially a violation of academic honesty requirements. If you are unsure about whether or not you can share a particular piece of information, please consult with Prof. Abad-Mota prior to sharing it.

As examples, the following, are clearly not acceptable and will be considered cheating: copying another person's code; co-developing code with someone else; mailing your code to another person; using the Internet (e.g. StackOverflow) to find a solution to the problem; making your files readable so another person can copy them; reading another person's files; using another person's listing (taken from the trash, for example); having another person write a portion of your code for you.

5.3 Copyright issues

All materials in this course fall under copyright laws and should not be downloaded, distributed, or used by students for any purpose outside this course.

5.4 Respect the UNM Community by Preserving Health

You have the ability to prevent the spread of COVID-19 and to preserve the health of fellow students, your instructor, staff and the community by following UNM health protocols. The UNM Provost Administrative Directive on Mandatory Student Face Covering and Symptom Reporting of July 9, 2020 requires that all students on UNM-Main and UNM branch campuses wear face masks in the face-to-face classroom and on campus unless they have a specific mask accommodation (confidentially documented with the Accessibility Resource Center). UNM Provost Administrative Directive is consistent with Governor Lujan Grisham?s Public Health Emergency Order, as amended, and the Public Health Order of the New Mexico Health Secretary. It also requires daily participation in symptom screening through covidscreen, which will be sent via UNM e-mail. Please check Learn regularly for updates about our class and please check `https://bringbackthepack.unm.edu` regularly for general UNM updates.

5.5 Title IX

Our classroom and our university should always be spaces of mutual respect, kindness, and support, without fear of discrimination, harassment, or violence. Should you ever need assistance or have concerns about incidents that violate this principle, please access the resources available to you on campus, especially the LoboRESPECT Advocacy Center and the support services listed on its website (http://loborespect.unm.edu/). Please note that, because UNM faculty, TAs, and GAs are considered "responsible employees" by the Department of Education, any disclosure of gender discrimination (including sexual harassment, sexual misconduct, and sexual violence) made to a faculty member, TA, or GA must be reported by that faculty member, TA, or GA to the university's Title IX coordinator. For more information on the campus policy regarding sexual misconduct, please see: https://policy.unm.edu/university-policies/2000/2740.html.

5.6 ADA

In accordance with University Policy 2310 and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor?s attention, as I am not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow. Contact Accessibility Resource Center at 277-3506 for additional information.