

**Math 365 Linear Algebra 2**  
**Spring 2021**

**Instructor:** Dr. James Bisgard

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**Office Hours:** M-F 1:00 - 1:50 PM and by appointment.

**Meeting times:** Please plan on being on Zoom from 10 - 10:50 am M - Th.

**Course Goals:** The goal of this course is to approach linear algebra and inner-product spaces from an axiomatic point of view. This course also helps students develop proof-writing skills that are necessary for more advanced mathematics. From a general point of view, our outcomes are:

- Describe general vector spaces and their subspaces, besides subsets of  $\mathbb{R}^n$ .
- Use properties of abstract vector spaces.
- Employ properties of linear transformations defined on abstract vector spaces.
- Relate coordinates with respect to different bases of abstract vector spaces.
- Write proofs using standard mathematical techniques.

**Prerequisite:** MATH 265 and {MATH 351 or MATH 335}

**Required Text:** None; we'll be using lecture notes provided by me, which will be posted on Canvas under the Files tab.

**Evaluation:**

- Two oral exams (focusing on definitions and concepts): Wednesday, May 5 and Thursday, May 6 (5%); and during finals week on Wednesday June 9 and Thursday June 10 (10%);
- Take-home midterm exam available Tuesday April 27 and due Tuesday, May 4 (15%);
- Take-home final exam, available the last week of classes and due on Wednesday, June 9 at 10 am (20%);
- Homework (45%);
- Outlines for homework problems (5%).

Course grades will be assigned based upon the following scale:

	87 – 89.9 : B+	77 – 79.9 : C+	67 – 69.9 : D+	below 60 : F
93 – 100 : A	83 – 86.9 : B	73 – 76.9 : C	63 – 66.9 : D	
90 – 92.9 : A–	80 – 82.9 : B–	70 – 72.9 : C–	60 – 62.9 : D–	

**Course Components:**

- **Homework:** A new weekly homework will be available every week (except the week of the take-home exam) on Tuesday and will be due the following Tuesday at 4:00 pm. You will be given about one week to complete a regular assignment. You will also be asked to turn in outlines of some selected problems on Thursdays, two days after you get the homework.

Homework must be done neatly, legibly, be in a logical order, provide sufficient explanation, be double-spaced, and use complete sentences where appropriate. You may use/ask/talk to whatever/whoever you'd like, as long as you say what resources you used or who you worked with. *However*, you must write your solutions up in your own words to hand in. Copying is not the same as working together. In addition, simply changing a few symbols may result in work that makes no sense and earns very few points, even though it's "basically" the same as somebody else's work. A good way to avoid copying when working together is to figure out the problem together, but write up your solution by yourself.

- **Outlines for Homework Problems:** These are to help us get into the habit of productive mathematical thinking when we are faced with an unfamiliar challenge. There are four parts to this thinking: what are you assuming/proving? What are the relevant definitions? What are some examples? What should we try and relate? I will provide a  $\text{\LaTeX}$  template for this, but you are welcome to handwrite them as well.
- **Oral Exams:** There will be two oral "exams" (definition and concept checks). The dates are given above. For each exam, plan to allow 20 minutes. The exams will focus on definitions, concepts, and examples; more detail will be given before the first one. *For these exams, you will need to have a clear workspace. These are closed-book, with no notes, text, or other resources are allowed.* You may have blank paper and, of course, computer/tablet/phone for those doing the exam on Zoom. You will want to have a way to be able to write so that I can see it. Some options include:
  - If you have a drawing tablet or stylus, we can use that along with the whiteboard in Zoom.
  - You can use your phone as an improvised document camera. There are lots of ideas for this online; many people have made stands out of books or a cardboard box with a cutout for the camera. You can write on a small whiteboard or blank paper (if using paper, I suggest using a thick, dark pen or a marker).
  - If public health conditions permit and you would prefer, we can do the exam in-person. We'll grab a classroom or conference room and you can write on the whiteboard.

You'll need to start the exam by giving me a brief tour of your workspace. You are required to share your screen when asked.

- **Take-home Exams:** Take-home exams, like homework assignments, must be submitted according to the guidelines for written work for the course. For take-home exams, *you may not discuss the exam with anyone (besides me) or use outside resources.* There will be a take-home midterm and a take-home final; tentative dates are given above.

**General Course Policies:** Come to class. Do your own work. Work really hard; this is not going to be an easy course, but you will leave it with a more complete understanding of some fundamental linear algebraic ideas, as well as substantially stronger technical communication skills!

**Face Coverings and Social Distancing:** Due to COVID-19, and under the directive and mandate of public health officials and the president of Central Washington University, students

must adopt face covering protocol while on campus and before entering any classroom or building at CWU until further notice. Students must also follow the social distancing placement marks in buildings and classrooms. If you do not have a face covering, Central Washington University can provide one for you. If you have not yet received your CWU-supplied facial covering, please go the SURC Information Desk. Please do so prior to the start of your first class. Face coverings must cover both the mouth and nose. Your mask protects me; my mask protects you. Masks with one-way valves for exhalation don't have the protective value for others - please don't use them as your face covering for any in-person components. Thank you for helping keep all of us safe!

**Class Recordings:** Attendance is considered necessary for success in this class.

Lecture/discussion will be recorded and posted on Canvas for those who can't attend synchronously on a given day. You should plan on attending synchronously on an ongoing basis, however. We all benefit from the conversations in-class, and they will be richer for having you there! Also, please note that work done in breakout rooms will *not* be recorded.

If you are attending virtually, please turn on your camera if that is reasonable given your situation, bandwidth issues, etc. If you cannot turn on your camera, please use a profile picture on Zoom that matches your profile picture on Canvas (and please put one up on Canvas) so that we don't have to look at a sea of black and white names/initials!

**Written Work:** All work turned in for the course must be written neatly, legibly, clearly, using correct mathematical notation, double-spaced and with sufficient explanation. Complete sentences should be used where appropriate.

**Late Work:** Late homework assignments can be submitted late with a 20% penalty per 24-hour period, up until the time that graded work is returned to the rest of the class. Homework submitted after graded work is returned to the rest of the class will not receive credit, however, the lowest homework score will be dropped. If you have extenuating circumstances around the midterm or final, I encourage you to communicate with me as soon as possible; see the section on communication, below.

**Submitting Work Electronically:** All work for this course will be submitted electronically through Canvas. Only pdf files will be accepted.

- All typesetting must be done using correct symbols and mathematical notation; I strongly suggest using  $\LaTeX$ (or one of the  $\TeX$ variants).
- If you choose to hand-write your work, you have a couple of options for submission:
  - You can scan it to a PDF document using a cell phone camera. Some apps that do this (there are many others if you don't like these): Adobe (free) or CamScanner (free version) for Android phones; the Notes App (built-in) or CamScanner (free version) for iPhone.
  - You can take a well-lit, in-focus, easy-to-read photograph, insert it into a Microsoft Word or OpenOffice Writer document, make sure that the photo is oriented correctly and easy to read, and then save the document as a .pdf file for upload to Canvas.
  - Any handwritten work must be submitted as a single pdf file, even if it is multiple pages.

Whichever method you choose, please double-check that your image is oriented correctly and in-focus. Images not oriented correctly or images that are not easy to read will lead to the assignment being returned without being graded.

**Academic Honesty:** Consult university policies (CWUP 5-90-040(22), CWUR 2-90-040(22), and WAC 106-125-020) for student conduct, cheating, plagiarism, and other academic

expectations. CWU's policies and recommendations for academic misconduct will be followed, leading to disciplinary action up to and including failing the course.

**Inclusivity Statement:** As a member of a peer learning community, a high degree of professionalism is necessary. **CWU expects every member of the university community to contribute to an inclusive and respectful classroom culture.**

**Classroom Conduct:** Students in this class are expected to interact with students and the professor professionally. Instances of disruptive conduct, obstructive conduct, or harassment (see definitions below from the Washington Administrative Code: WAC 106-125-020) will be referred to the Dean of Student Success.

**Disability Support Services:** Central Washington University is committed to creating a learning environment that meets the needs of its diverse student body. Students with disabilities should contact Disability Services to discuss a range of options to removing barriers, including accommodations: Hogue Hall 126, 509.963.2214, DS@cwu.edu

**Is my absence excused?** Excused absences will not lower your overall grade in this class and are determined on a case-by-case basis. Excused absences include illness, bereavement, and school-related activities. With the exception of illness, documentation is required. Excused absences do not include travel for holiday breaks, work, or non-emergency travel delays.

**Religious Obligations and Schedule Conflicts:** In compliance with RCW 28B.137.010, Central Washington University makes every effort to deal reasonably and fairly with students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Students must present written notice to their instructor *within the first two weeks of class* listing the specific dates on which accommodations are required. Contact the Dean of Student Success at (509) 963-1515 for further information or questions.

**Communication:** Some of you are completely remote. Some of us may need to quarantine in the middle of the quarter. In all things, communication is going to be key. If you have something going on, please let me know **BEFORE** whatever is going on may affect your work. No details are necessary — just a general heads-up. As things need to change during the quarter, I will do my best to let you know as soon as I can. In all things, please extend grace to me and your classmates, and I will do my best to do the same.

I reserve the right to change the policies contained in this syllabus as dictated by developments during the quarter.