MATH214
Linear Algebra

Syllabus
Manuel — UM-JI (Spring 2023)

1 Presentation

The focus of this course will be linear algebra, that is the study of the branch of mathematics related to linear equations. In order to fully benefit from this course, students are expected to only conduct and submit their own, personal work.

2 Teaching team

Details related to the instructor and Teaching Assistants (TAs) are summarized in the following table.

Members	Email address	Office hours	Location
Manuel	charlem@sjtu.edu.cn	Tuesday 10:00 − 11:20	JI-439C
Yuqi	aressegetes_stery@sjtu.edu.cn	TBA	TBA
Yizhi	yyz2020@sjtu.edu.cn	TBA	TBA
Xinhe	fanchuanqiaokeli@sjtu.edu.cn	TBA	TBA
Jingyan	menako2013529@sjtu.edu.cn	TBA	TBA

All teaching team members can be easily contacted on Mattermost or Piazza.

3 Schedule

The Spring semester is 10 weeks long, including one week for the finals.

Lectures:

- Monday 8:00 − 9:40
- Tuesday 8:00 − 9:40
- Friday 8:00 − 9:40

4 Course content and objectives

This course has been tailored with three main goals in mind:

- Become familiar with the concepts of vector space and matrix;
- Understand how to apply common proof methods;
- Be able to relate various topics to linear algebra;

Hence, at the end of this course, students should be provided with a solid basis for any further study requiring knowledge on vector spaces and matrices. In particular they should have developed the necessary skills to abstract a problem, rephrase it in terms of linear algebra, and prove the corresponding results.

These goals are fulfilled through the following course outcomes:

- Be familiar with the concepts of vector, vector space, and linear map (chap. 1,2)
- Know how to perform basic tasks with matrices (chap. 3)
- Understand the importance of the determinant and be able to use it (chap. 4)
- Know how to perform matrix diagonalization (chap. 5)
- Become familiar with common proof techniques and methods (mainly discussions)
- Understand the importance of isomorphisms to transfer the algebraic structures (chap. 1-5)
- Have a basic understanding of the connection between algebra and geometry (homework)

The detailed organisation of the course is given as follows.

Weeks 1–5	Weeks 6–10
0. Course information	3. Matrix and duality (section 3)
1. (Re)view	
2. Finite dimensional vector spaces	4. Linear systems and determinant
3. Matrix and duality (sections 1 and 2)	5. Reduction of endomorphisms
Midterm exam	**Final exam**

Although this course focuses on linear algebra from a purely mathematical perspective, the projects will open many doors to applications. Students will be able to choose topics related to their interest and investigate how linear algebra is applied in various fields of science such as Computer Science or Mechanics.

5 Grading policy

The final average will be composed of four "sub-grades", apportioned as follows:

- Homework: 15%
- Discussions: 15%
- Project: 20%
- Final exam: 25%
- Midterm exam: 25%

Any late submission will result in a 10% deduction per day from the grade of the corresponding work. After three days no submission will be accepted.

Any work submitted before the deadline and fully written in LATEX will be awarded a 10% bonus. Extra marks resulting from this bonus cannot lead a to grade larger than a full grade. This is not the case for other bonuses resulting from extra work, spotting major issues in the slides or assignments.

Important. The course being offered offline, all students are expected to attend in person. In particular, unless requested ahead of time and approved by both UEO and the instructor, any student not present in the classroom for exams will receive a 0.

The final grade will be curved such that the median is in the range B − B+.

Discussions

Discussions will be graded as part of participation, therefore **in person attendance** is mandatory. Students will be organised in small groups to solve simple exercises. A session is organised as follows:

- Students arrive in the classroom on time and are organised into small groups;

- Groups willing to present on that day should inform the teaching team ahead of time;

- The teaching team introduces the topics of the day;

- Students start discussing in their group about the exercises while the teaching team circulates around to answer questions and provide guidance.

- After a while, a member of the selected group goes to the blackboard to present their solution;

- Other teams and then invited to comment and ask questions on the provided solution;

The participation grade will be based on the presentations as well as extra questions and answers happening during the discussion. Extra marks can also be awarded to students with strong in-class participation during the lectures.

6   Honor code

It is of a major importance for any submitted work to be the result of one own research and understanding. In particular it is not acceptable to reuse the work from another student, or downloaded from the internet. Students can however help each others in an up-building way by sharing ideas and understanding on the course.

If in any case code or details from a textbook or internet is reused, the source should be clearly stated such as not to induce any possible confusion.

According to JI Honor Code copying the work of others will result in **severe penalties**.

Exams

Only the following documents are allowed during the exams.

- A single A4 paper sheet with original handwritten notes;

- A mono or bilingual paper dictionary;

Any document, material, or mean of information and communication not explicitly listed above is strictly prohibited. In particular a **non-exhaustive** list of forbidden materials is as follows.

- Homework and discussions (questions and answers);

- Notebooks or separate files containing notes;

- Calculator or any program allowing to run calculations;

Group works

Students are fully responsible for the work they submit. In particular in case of plagiarism the whole group will be sent to Honor Council, not only the student who did plagiarise.

7 General information

This course is not based on any textbook. However the following references and links can be used to find information relevant to the course.

- *Introduction to Linear Algebra*, by Gilbert Strang.

- *Linear Algebra and Geometry*, by Jean Dieudonne.

- All the course related materials will be available on Canvas.

- **Always** use English search engines for questions related to this course.

To improve communication between the students and the teaching team please observe the following guidelines.

- Any student facing a special situation likely to impact his studies, such as serious illness or full time work, is expected to contact the instructor as early as possible in order to discuss it and see if any solution can be found.

- When sending an email related to this course please include the tag `[MATH214]` in the subject e.g. `Subject: [MATH214] special request`

- When contacting a TA for a grade issue or any other major problem send me a carbon copy (`cc`). Not doing it might result in omissions, wrong grades etc.. If such problem occurs and there is no record of the issue the request will be **automatically rejected**.

- Never attach a large file (> 2 MB) to an email, use jbox instead and only include a link in the email.

- Keep in touch with the teaching team, feedbacks and suggestions will be much appreciated.