



## Minzu University of China

### MATH340 Linear Algebra and Differential Equations

#### Summer 2020

#### Basic Information

**Class hours:** Monday through Thursday, 2 hours each day

**Discussion:** Friday, 1 hour (60 minutes)

**Review Section:** Saturday, 1 hour (60 minutes)

**Office Hour:** 2 hours (According to professors' teaching plan)

**Field trip:** China Science & Technology Museum, Beijing

**Credit:** 4

**Total contact hours:** 60 (50 minutes each)

**Instructor:** Shuxi Wang

#### Textbook

Differential Equations and Linear Algebra, 3rd Edition, by Stephen Goode and Scott Annin

#### Prerequisites

Calculus I and Calculus II: You should have completed two semesters of calculus. Specifically, you should be familiar with concepts of limits, continuity, derivatives, and integration of single variable functions.

#### Course Description

"...the most interesting natural phenomena involve change and are described by equations that relate changing quantities." (quoted from the textbook by Charles Edwards.) This course is an introduction to matrices, linear algebra and differential equations for future mathematicians, scientists, and engineers.

#### Course Outline/Objectives

Throughout the summer compact course, we will

- learn numerous techniques for identifying, modeling, interpreting, solving differential equations with application examples;
- learn how to solve the equations that have analytic solution in different types and discuss the initial-valued solutions, understand these characteristics are important;
- explore linear algebra and how the underlying structure of linear objects (particularly vector spaces);
- be able to use these skills in our analysis of differential equations and systems of differential equations.

#### Course Outline and Schedule

Week 1	<ul style="list-style-type: none"> <li>● Introduction to differential equations</li> <li>● First order linear differential equations, separable equations</li> <li>● Higher-order differential equations</li> <li>● Linear system, matrix algebra</li> <li>● Gaussian elimination and Gauss-Jordan elimination</li> <li>● Invertible matrices, transpose, permutations</li> </ul>
Week 2	<ul style="list-style-type: none"> <li>● Determinant, cofactors, Cramer's rule</li> <li>● Independence, Basis and Dimensions</li> <li>● Orthogonality</li> <li>● Inner product and cross product</li> <li>● Orthogonal set, orthogonal bases</li> </ul>
Week 3	<ul style="list-style-type: none"> <li>● Eigenvalues and eigenvectors</li> <li>● Characteristic equation and computation</li> </ul>



	<ul style="list-style-type: none"> <li>• Similar matrices, diagonalizing a matrix</li> <li>• Linear transformation</li> <li>• Linear differential equation systems of order n</li> </ul>
Week 4	<ul style="list-style-type: none"> <li>• Variation of parameters</li> <li>• First order linear systems of differential equations</li> <li>• Homogenous linear system of differential equations of order n</li> <li>• Non-homogeneous linear system of differential equations of order n</li> <li>• Variation of parameters for linear systems</li> <li>• <i>Field Trip: visiting China Science and Technology museum</i></li> </ul>
Week 5	<ul style="list-style-type: none"> <li>• More examples</li> <li>• Wrap up</li> <li>• Review and Final exam</li> </ul>

### Field Trip (FT)

Since people had counting numbers mathematics has been developed together with human evolution. The real-world practices challenge mathematicians to do deeper and advanced research. To the contrary, the development of mathematics allows human being to know the universe better and deeper. Mathematics has been applied to all science branched and our daily life. This course will arrange one class meeting time to visit **China Science & Technology Museum** (located at 北京市朝阳区北辰东路5号). Through this activity hope students will elevate the appreciation of mathematics and motivation of learning math well. Students will be requested to write an essay of this experience and share at the discussion time. This activity is of 5% overall credit.

### Grading Policy

Instructor will assign homework. Course Teaching Assistant (TA) will lead a discussion section on Friday every week. You are highly encouraged to discuss the homework problems with each other. This is an efficient way of learning.

Tests: There will be two quizzes (that will be give during week two and week four), a midterm (week three) and a final exam.

Credit distribution: Attendance 5%; FT 5%; Quizzes 30%; Midterm 30%; Final exam 30%

Grading scale: Letter grades will be assigned by the following percentages:

97-100	A+	87-89	B+	77-79	C+	67-69	D+	Below 60	F
94-96	A	84-86	B	74-76	C	64-66	D		
90-93	A-	80-83	B-	70-73	C-	60-63	D-		

### Exam Policy

No make-ups for missed quiz/exams by any reason. For legitimate absences, the quiz/exam may be excused. Instructor will consider replacing it by presenting homework.

### Attendance Policy

Attending all class meetings is required. Missing one (unexcused) class meeting day may be still considered as a good attendance. Attendance is of 5% of overall course credit. Missing one additional day would reduce 2.5%, so if a student missing three or more unexcused class meeting days the student will NOT receive attendance credit. Missing more than half of an hour (late come or early leave) may be considered as an absence. Students are responsible for missed course work by any reason. Summer sessions move fast! Be ready to work hard to achieve your goal.

### Academic Integrity

Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others' academic endeavors. Students who violate these standards must



be confronted and must accept the consequences of their actions.

If a solid proof of cheating/plagiarism found, the student may fail the course or disqualified from the class.

### **Disability Help**

Please let me know as soon as possible if anyone who has a disability which may require some modification of seating, testing or other class requirements so that appropriate arrangements may be made.

### **Expectations on Students' Learning and Behaving**

- You should come to classroom on time, and have a note book, a scientific calculator with you.
- You should shut down or mute your cellphone while entering the classroom and keep it out of your sight.
- Your motivation is the key to learn well. Be concentrated in classroom.
- You are encouraged to ask or answer question(s) in classroom, if any.
- Practice shows that classroom discussion is an efficient and effective way of learning. You are encouraged to join a group work in classroom, sharing ideas and contribute to a team work.

Instructor will assign classroom practical problems solving activities time to time, so be sure to follow instruction to do “hands on and minds on” work on these practices.

- Instructor may have some challenging questions to motivate students thinking and reasoning. You are encouraged to make a classroom presentation, if there is a chance to do so. Correctly or productively presenting a challenge question in the classroom may be awarded extra credit.
- Understanding is everything! To Study well, you must pay attention to instructor's explanation. For each example shown in classroom, the instructor intends to show you the problem-solving process, a logical idea, or a special case study to you. You should take notes and review after class to make sure you understand and be able to solve the problems again independently.
- By any reason, if you miss a class, you should copy notes from a classmate. While catching up, you may see the solution of an “example”. Take a minute to think about how you would solve each problem before reading the solution. Asking for help if needed in or out of classroom.
- Absolutely no cheating! Cheating is indeed to cheat yourself. You lose the opportunity of logical thinking and logical reasoning if you steal an answer from someone else. Cheating may stain your personal character. Cheating may be punished and may ruin your future career!
- Working hard! You should have a clear goal: Coming to the summer school you are willing to learn the knowledge that is required by your academic program and/or your study plan. Do your best to learn well while enjoying yourself. Best wishes!