AMS 361, Applied Calculus IV

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1 TA Information

- Name: *Juan Kim*
- Email: juan.kim.1@stonybrook.edu
- Office address: B517
- Office hours: MWTh from 3:30 pm to 4:30 pm.

2 Course Description

- Prerequisites: AMS 161 or MAT 127 or 132 or 142 or MPE level 9.
- Required Textbook: "**Elementary Differential Equations and Boundary Value Problems**" by *C. Henry Edwards & David E. Penney*, **6th edition**, Pearson Education, Inc., 2008; **ISBN: 978-0136006138**.

  Please click here for more information.
- Software: You will learn to use **Sagemath** in this course.
  - For Mac users: click here to install.
  - For Window users: click here to install.
- Course Overview: Homogeneous and inhomogeneous linear differential equations; systems of linear differential equations; solution with power series and Laplace transforms; partial differential equations and Fourier series. May not be taken for credit in addition to the equivalent MAT 303.
- Course Objectives: Click here.

3 Course Structure

3.1 Homework

- Homework will be assigned weekly on the blackboard.
- There will be **6** assignments and **2** projects.
- Each homework must be submitted *via the blackboard*. **Late homework will not be accepted for any reason**. In case you are not able to access the blackboard, you MUST submit your HW *via email*.
- You may discuss homework problems with other classmates, or with TAs, or with me. However, you **MUST write** the solutions by yourselves. Copying the solutions from other classmates will not be accepted and your HW assignment will be scored 0 if you do so.

3.2 Quizzes and Exams

- There are **two midterm exams** and **the final exam**.
- **Exam Policy**: Only in the event of an unavoidable emergency will a make-up exam be considered.

3.3 Calculators

You can use a calculator during the quizzes and exams.

3.4 Grade Weighting

Attendance	5%
Homework + Project(s)	35%
Midterm Exam	35%
Final	30%

3.5 Grade Scale (as intervals of percentages)

Percentage	Latin Grade
[93,100]	A
[90,93)	A-
[87,90)	B+
[83,87)	B
[80,83)	B-
[77,80)	C+
[73,77)	C
[70,73)	C-
[67,70)	D+
[63,67)	D
[60,63)	D-
[0,60)	F

3.6 Final Exam

TBA

3.7 Tentative Course Schedule

Week	Date	Lecture	Material Covered
1	M 08/29	1	*Differential Equations and Mathematical Models*
		2	*Integrals as General and Particular Solutions*
	W 08/31	3	*Slope Fields and Solution Curves*
		4	*Separable Equations and Applications*
2	M 09/05	5	*Linear First-Order Equations*
		6	*Substitution Methods and Exact Equations*
	W 09/07	6	*Substitution Methods and Exact Equations (Cont.)*
		7	*Population Models*
3	W 09/14	8	*Acceleration-Velocity Models*
		9	*Introductions: Second-Order Linear Equations*
	M 09/19	9	*Introductions: Second-Order Linear Equations (Cont.)*
4	W 09/21	10	*General Solutions of Linear Equations*
	M 09/26	11	*Homogeneous Equations with Constant Coefficients*
		12	*Nonhomogeneous Equations and Undetermined Coefficients*
5	W 09/28	13	*Exam 1 Review*
		14	*Forced Oscillations and Resonance*
	W 10/05		*Exam 1*
6	M 10/10	15	*Electrical Circuits*
		16	*Endpoint Problems and Eigenvalues*
	W 10/12	17	*Power Series Methods*
		18	*Series Solutions Near Ordinary Points*
7	M 10/17	18	*Series Solutions Near Ordinary Points (Cont.)*
	W 10/19	19	*Laplace Transforms and Inverse Transforms*
		20	*Transformation of Initial Value Problems*
8	M 10/24	21	*Translation and Partial Fractions*
		22	*Derivatives, Integrals, and Products of Transforms*
	W 10/26	22	*Derivatives, Integrals, and Products of Transforms (Cont.)*
		23	*Periodic and Piecewise Continuous Input Functions*
9	M 10/31	24	*Impulses and Delta Functions*
		25	*First-Order Systems and Applications*
	W 11/02	25	*First-Order Systems and Applications (Cont.)*
		26	*The Method of Elimination*
10	M 11 /07	27	*Matrices and Linear Systems*
		28	*The Eigenvalue Method for Homogeneous Systems*
	W 11/16	28	*The Eigenvalue Method for Homogeneous Systems (Cont.)*
		29	*Exam 2 Review*

Week	Date	Lecture	Material Covered
11	M **11/14**		*Exam 2*
	W 11/26	30	*Multiple Eigenvalue Solutions*
		31	*Matrix Exponential and Linear Systems*
12	M 11/21	32	*Nonhomogeneous Linear Systems*
	W 11/23	33	*Numerical Approximations: Euler Method*
		34	*A Closer Look at the Euler Method*
13	M 11/28	35	*The Runge-Kutta Method*
		36	*Numerical Methods for Systems*
	W 11/30	36	*Numerical Methods for Systems (Cont.)*
		37	*Equilibrium Solutions and Stability*
14	M 12/05	38	*Stability and the Phase Plane*
		39	*Linear and Almost Linear Systems*
	W 12/07	40	*Ecological Models: Predators and Competitions*
		41	*Final Review*

4 Course Policies

4.1 Tardiness

Tardiness disturbs other students, disturbs me, and puts you at a disadvantage for doing well in the class. On the rare occasion that you are tardy, please come in quietly and take a seat in the back.

4.2 Attendance Policy

1. All students of SUNY Korea are required to attend every class.
2. Unexcused absences will affect seriously the student's final grade in the course.
3. If a student has over 20% unexcused absence (6 days), the student's final course grade will be an 'F'. Example:
   (a) If the class is a 150 minute class, and is held once a week, the 4th unexcused absence of a student will lead to an F grade of the course.
   (b) If the class is a 75 minute class, and is held twice a week, the 7th unexcused absence of a student will lead to an F grade of the course.
   (c) If the class is a 50 minute class, and is held three times a week, the 10th unexcused absence of a student will lead to an F grade of the course.
   (d) In Intensive English Course (IEC), if a student misses the class more than 40 hours in a semester, the student will receive an F grade on the course.
4. Students should report the reason of absence to the instructor in advance, or immediately after the absence.
5. When a student excuses his/her absence, the student must provide documentation of the reason for the absence to the instructor.

6. The instructor of the course reserves the right to excuse absences.
7. The course instructor may excuse the absence if the submitted documentation fulfills the conditions below.
   (a) Extreme emergencies (e.g. death in the family)
   (b) Severe medical reasons with doctor's note (Not a slight illness)
   (c) Very important events (e.g. national conference, official school event)
8. At the end of semester, the course instructor should submit a copy of the attendance sheet to the Academic Affairs Office.

4.3 Code of Conduct

Since every student is entitled to full participation in class without interruption, all students are expected to be in class and prepared to begin on time. All cell phones or other devices that make noise must be turned off and out of sight when you enter the classroom. Disruption of class, whether by talking, noisy devices, eating in class or other inconsiderate behavior, will not be tolerated. Students who violate these rules will be asked to leave the classroom and will not be allowed to return until they have spoken privately with me.

4.4 Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at this link.

4.5 Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

4.6 Religious Holidays

(from the online Academic Calendar): Because of the extraordinary variety of religious affiliations of the University student body and staff, the Academic Calendar makes no provisions for religious holidays. However, it is University policy to respect the faith and religious obligations of the individual. Students with classes or examinations that conflict with their religious

observances are expected to notify their instructors well in advance so that mutually agreeable alternatives may be worked out.

4.7 Accommodations for Disabilities

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact One-Stop Service Center, Academic Building A201, (82) 32-626-1117. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.
In addition, this statement on emergency evacuation is often included, but not required: Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and One-Stop Service Center.

4.8 Course Evaluations

Stony Brook University values student feedback in maintaining the high quality education it provides and is committed to the course evaluation process, which includes a mid-semester assessment as well as an end-of- the-semester assessment, giving students a chance to provide information and feedback to an instructor which allows for development and improvement of courses. Please click the link to access the course evaluation system.

5 Other Resources and Miscellaneous

Tips for Success

- Come to the class 5 – 10 minutes earlier.
- Read the lecture notes and the textbook before class.
- Review the lectures after class.
- Redo all examples covered in the lectures and compares your answers with the answers there.
- Start your assignments as soon as possible.
- Review for quizzes and exams in advance.
- Never wait until the last minute.

Commit yourself to the class on day one. If you devote ample time to working on homework, reading the textbook and your notes, and thinking about the concepts we are learning, you will learn this material and you will learn it well. You will build a strong foundation for future math and science classes, as well as good study and organizational habits, which will be essential throughout your university studies. You have the ability to reach success if you commit yourself to excellence. Moreover, you do not have to reach success alone. Get to know your classmates, and learn with and from each other. Come to see me whenever you have questions.

In addition, I would like to share with you “Ten rules of good studying". I do hope that you will enjoy them and improve your studying.

These rules form a synthesis of some of the main ideas of the course–they are excerpted from the book A Mind for Numbers: How to Excel in Math and Science (Even if You Flunked Algebra), by Barbara Oakley, Penguin, July, 2014. Feel free to copy these rules and redistribute them, as long as you keep the original wording and this citation.

Ten Rules of Good Studying

1. **Use recall.** After you read a page, look away and recall the main ideas. Highlight very little, and never highlight anything you haven't put in your mind first by recalling. Try recalling main ideas when you are walking to class or in a different room from where you originally learned it. An ability to recall – to generate the ideas from inside yourself – is one of the key indicators of good learning.

2. **Test yourself.** On everything. All the time. Flash cards are your friend.

3. **Chunk your problems.** Chunking is understanding and practicing with a problem solution so that it can all come to mind in a flash. After you solve a problem, rehearse it. Make sure you can solve it cold – every step. Pretend it's a song and learn to play it over and over again in your mind, so the information combines into one smooth chunk you can pull up whenever you want.

4. **Space your repetition.** Spread out your learning in any subject a little every day, just like an athlete. Your brain is like a muscle – it can handle only a limited amount of exercise on one subject at a time.

5. **Alternate different problem-solving techniques during your practice.** Never practice too long at any one session using only one problem-solving technique – after a while, you are just mimicking what you did on the previous problem. Mix it up and work on different types of problems. This teaches you both how and when to use a technique. (Books generally are not set up this way, so you?ll need to do this on your own.) After every assignment and test, go over your errors, make sure you understand why you made them, and then rework your solutions. To study most effectively, handwrite (don't type) a problem on one side of a flash card and the solution on the other. (Handwriting builds stronger neural structures in memory than typing.) You might also photograph the card if you want to load it into a study app on your smartphone. Quiz yourself randomly on different types of problems. Another way to do this is to randomly flip through your book, pick out a problem, and see whether you can solve it cold.

6. **Take breaks.** It is common to be unable to solve problems or figure out concepts in math or science the first time you encounter them. This is why a little study every day is much better than a lot of studying all at once. When you get frustrated with a math or science problem, take a break so that another part of your mind can take over and work in the background.

7. **Use explanatory questioning and simple analogies.** Whenever you are struggling with a concept, think to yourself, How can I explain this so that a ten-year-old could understand it? Using an analogy really helps, like saying that the flow of electricity is like the flow of water. Don't just think your explanation–say it out loud or put it in writing. The additional

effort of speaking and writing allows you to more deeply encode (that is, convert into neural memory structures) what you are learning.

8. **Focus.** Turn off all interrupting beeps and alarms on your phone and computer, and then turn on a timer for twenty-five minutes. Focus intently for those twenty-five minutes and try to work as diligently as you can. After the timer goes off, give yourself a small, fun reward. A few of these sessions in a day can really move your studies forward. Try to set up times and places where studying – not glancing at your computer or phone – is just something you naturally do.

9. **Eat your frogs first.** Do the hardest thing earliest in the day, when you are fresh.

10. **Make a mental contrast.** Imagine where you've come from and contrast that with the dream of where your studies will take you. Post a picture or words in your workspace to remind you of your dream. Look at that when you find your motivation lagging. This work will pay off both for you and those you love!

Ten Rules of Bad Studying

Excerpted from A Mind for Numbers: How to Excel in Math and Science (Even if You Flunked Algebra), by Barbara Oakley, Penguin, July, 2014.
Avoid these techniques?they can waste your time even while they fool you into thinking you're learning!

1. **Passive rereading** – sitting passively and running your eyes back over a page. Unless you can prove that the material is moving into your brain by recalling the main ideas without looking at the page, rereading is a waste of time.

2. **Letting highlights overwhelm you.** Highlighting your text can fool your mind into thinking you are putting something in your brain, when all you're really doing is moving your hand. A little highlighting here and there is okay – sometimes it can be helpful in flagging important points. But if you are using highlighting as a memory tool, make sure that what you mark is also going into your brain.

3. **Merely glancing at a problem's solution and thinking you know how to do it.** This is one of the worst errors students make while studying. You need to be able to solve a problem step-by-step, without looking at the solution.

4. **Waiting until the last minute to study.** Would you cram at the last minute if you were practicing for a track meet? Your brain is like a muscle – it can handle only a limited amount of exercise on one subject at a time.

5. **Repeatedly solving problems of the same type that you already know how to solve.** If you just sit around solving similar problems during your practice, you're not actually preparing for a test – it's like preparing for a big basketball game by just practicing your dribbling.

6. **Letting study sessions with friends turn into chat sessions.** Checking your problem solving with friends, and quizzing one another on what you know, can make learning more enjoyable, expose flaws in your thinking, and deepen your learning. But if your joint study sessions turn to fun before the work is done, you're wasting your time and should find another study group.

7. **Neglecting to read the textbook before you start working problems.** Would you dive into a pool before you knew how to swim? The textbook is your swimming instructor – it guides you toward the answers. You will flounder and waste your time if you don't bother to read it. Before you begin to read, however, take a quick glance over the chapter or section to get a sense of what it's about.

8. **Not checking with your instructors or classmates to clear up points of confusion.** Professors are used to lost students coming in for guidance – it's our job to help you. The students we worry about are the ones who don't come in. Don't be one of those students.

9. **Thinking you can learn deeply when you are being constantly distracted.** Every tiny pull toward an instant message or conversation means you have less brain power to devote to learning. Every tug of interrupted attention pulls out tiny neural roots before they can grow.

10. **Not getting enough sleep.** Your brain pieces together problem-solving techniques when you sleep, and it also practices and repeats whatever you put in mind before you go to sleep. Prolonged fatigue allows toxins to build up in the brain that disrupt the neural connections you need to think quickly and well. If you don't get a good sleep before a test, NOTHING ELSE YOU HAVE DONE WILL MATTER.