MATH 3323 FALL 2019

INSTRUCTOR: NESTOR GUILLEN
(SECTIONS 04 AN 05)

From the course catalog: "A course covering solutions to the more common types of ordinary differential equations, especially those of first and second order, with emphasis on geometrical and physical interpretations".

The objective of this course is to gain practice in the craft and science of differential equations, which are used to describe, understand, and predict things. This includes methods to find formulas for solutions, such as separation of variables, integrating factor, and variation of parameters. The class will also deal with more advanced methods such as the Laplace transform, series representation of solutions, and more. By the end of the course the student will be able to recognize which of the known methods applies to a given problem, to write formulas for solutions of various types of equations, and to infer qualitative properties of solutions to more complicated equations when explicit formulas are not available.

Prerequisites: Differential and integral calculus (limits, differentiation and integration techniques, series, basic Cartesian geometry). Familiarity with linear algebra and/or multivariable calculus is very helpful but not required.

Textbook: Elementary Differential Equations and Boundary Value Problems. Boyce, DiPrima, Meade. 11th Edition.
The book chapters relevant to this course are 1, 2, 3, 5, 6, and 7 (see course Schedule in page 4 for more details).

Lecture Times: MW 12:30-1:50 pm (Section 04) and MW 3:30-4:50 pm (Section 05)

Office Hours: Monday and Wednesday 10 am -12 pm.
"Email Office Hours": Fridays 9 am - 11 am.

My email: nestor@txstate.edu

Evaluation: There will be problem sets essentially every week (14 total), three exams (in class), and one final exam, attendance to SI sessions is required and it constitutes 5% of the final grade.

Grading policies: Your final numerical grade is placed on a scale of 100 (see below to see how this is calculated). Your final letter grade will be computed from your final numerical grade as follows:

A 90-100

B 80-89.9

C 70-79.9

D 60-69.9

F 0-59.9

Problem sets: These amount to 25% of the final numerical grade. Your lowest 3 problem set grades are dropped when computing this. Late problem sets will not be accepted: if you don't submit a problem set in time you will obtain 0 on that problem set. As your lowest 3 problem set grades are dropped , you could miss up to 3 problem sets and still be able to get a perfect final grade.

Exams: Exams corresponds to 0%, 15 %, 30 % of the final numerical grade, according to this rule: the best exam grade will be assigned 30%, the second best exam grade 15%, and the third best exam 0% (so your worst exam grade is dropped and you will be given more points for the exam you performed best in, regardless of whether it was the first, second, or third exam).

The final exam corresponds to 25% of the final numerical grade.

There will be no make up exams. Note if you miss just one exam it will not necessarily hurt your final grade as the lowest exam grade is dropped. If extraordinary circumstances lead to your missing a second exam, contact me immediately.

Bonus points: Each problem set will have one or two Bonus Problems, providing a solution for such a problem (due when the respective problem is due and no later than that) will earn you one 1% point for your final numerical grade. To illustrate this, if you your final numerical grade (before bonus points) is 83% and you solved 7 bonus problems throughout the semester, your final grade will be 90% (corresponding to A). Bonus problems will be more challenging and you will only earn points if the solution is entirely correct (that is, you cannot earn partial bonus credits).

Evaluation summary:

Problem sets: 25%
SI attendance: 5%
3 Exams: 30%, 15%, 0%
Final Exam: 25%
Bonus points: 1% extra point per bonus problem solved.

Important dates:
Problem sets will always be due on Monday (except Problem Set 1, due on 9/4).

Exams will be on Mondays:
First Exam: September 30th
Second Exam: October 21st
Third Exam November 18th.

Final exam time TBA.

Student Accommodations: It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, contact the Office of Disability Services as soon as possible at 512-245-3451 to establish reasonable accommodations. Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable. For further information, go to https://www.ods.txstate.edu/.

Supplemental Instructor: Kennedy Farrell

SI email: kaf124@txstate.edu

About Supplemental Instruction (SI):
Supplemental Instruction (SI) is a nontraditional form of tutoring provided by SLAC and Ingram School of Engineering that focuses on collaboration, group study, and interaction for assisting students in difficult courses. This program provides a trained peer who has already successfully completed the course to assist you. This peer, called the SI Leader, will attend this class each day, participate as any normal student (takes notes, exams, etc.), and then facilitate several one-hour study sessions per week for group study.

Because of the positive impact SI participation makes on course grade, you will be required to attend 10 SI sessions (once each week) by Monday, November 11. This will make up 5% of your course grade. You may attend no more than 2 hours of session the week of November 3-8, so please plan to attend one session each week. You will select a session to attend each week via a survey that will be emailed to you. Be sure to make note of the day/time/location of the session you select.

Please note that SI Leaders do not have administrative authority in this class and that attending session is not in any way a substitute for attending lecture! The SI attendance system is the ONLY basis for validation of your attendance. Students are responsible for ensuring that they attend and sign in properly to sessions.

If you have concerns regarding the SI program or wish to verify your number of sessions attended, please contact the Program Coordinators, Lindley Alyea (lindley@txstate.edu 512-245-2515) or Victor Capellan (victor@txstate.edu 512-245-2515)..

Class Schedule

Here is an approximate schedule for the class, together with the relevant book sections.

(8/26) Differential equations, what they are and how to solve them (1.1, 1.2, 1.3)

(8/28) First order equations. Integrating factor and separation of variables (2.1, 2.2)

(09/02) No class (Labor day holiday)

(09/04) First order equations (continued). A rapid course on linear algebra (2.2, 7.2).

(09/09) More linear algebra (linear systems of equations and matrices) (7.2, 7.3).

(09/11) Eigenvalues and eigenvectors. Systems of linear differential equations (7.1, 7.2, 7.3).

(09/16) Linear systems with constant coefficients (variation of parameters) (7.1, 7.4, 7.5).

(09/18) Linear systems with constant coefficients (continued) (7.5).

(09/23) Second order linear equations with constant coefficients (3.1).

(09/25) Second order linear equations with constant coefficients (continued) (3.1).

(09/30) **FIRST EXAM.**

(10/02) The Wronskian (3.2, 7.4).

(10/07) Nonhomogeneous linear systems (7.9).

(10/09) Oscillations (mechanical and electrical), damped oscillators (3.7, 3.8).

(10/14) More on oscillations. Nonlinear systems. (3.7, 3.8).

(10/16) Review / Catchup.

(10/21) **SECOND EXAM.**

(10/23) Nonlinear systems (autonomous equations and more) (2.5, 2.6).

(10/28) Linearization of nonlinear systems and types of equilibrium points (9.3).

(10/30) Hadamard's "well posed problem". Existence and uniqueness theorems (2.8).

(11/04) Basics of numerical schemes, Euler's method (2.7).

(11/06) Power series representation of solutions (part I) (5.1, 5.2).

(11/11) Power series representation of solutions (part II) (5.2, 5.3).

(11/13) Euler's and Bessel's equations (5.4, 5.7).

(11/18) **THIRD EXAM.**

(11/20) Laplace's transform and its properties (6.1).

(11/25) Solving linear equations via Laplace's transform (6.2).

(11/27) No class (Thanksgiving break).

(12/02) Differential equations with discontinuous ingredients (6.3, 6.4, 6.5).

(12/04) Convolutions and their uses (6.6).