San José State University
Department of Mathematics and Statistics

Fall 2019

Math 134: Ordinary Differential Equations and Dynamical Systems

Instructor: Slobodan Simić

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Course web page: `http://www.sjsu.edu/people/slobodan.simic/courses/Math-134/`

Required texts:

- M. W. Hirsch, S. Smale, and R. L. Devaney, *Differential Equations, Dynamical Systems and an Introduction to Chaos*, third edition, Academic Press (Elsevier), 2013
- S. N. Simić, *Ordinary Differential Equations*, lecture notes, posted on Piazza

Prerequisite: Math 32 and Math 129A (with a grade of "C–" or better in each) or instructor consent.

Office hours: Mondays and Wednesdays 9:45–10:30 AM and 2:00-2:45 PM (in my office), by appointment, and almost any time on `Piazza` (see below).

Homework: There will be weekly homework assignments. You are welcome to work on the homework collaboratively with other students, but you should write up your own solutions independently. The homework will not be collected or graded, but you absolutely MUST do the homework to pass or do well in this class. I will provide solutions to all homework problems.

Quizzes: For each homework there will be a 10 minute quiz, given on the day the homework is due. Each quiz will consist of a single problem taken from the corresponding homework assignment.

Exams: There will be one midterm and a final exam. There will be no make-up exams. Please mark your calendars:

Midterm: October 16, 2019

Final exam: Section 1: December 12, 2019, 9:45 - 12:00.
Section 2: December 17, 2019, 12:15 - 14:30

Grading policy: Quizzes 20%, Midterm 35%, Final 45%

Course outline: Please see the course web site for a detailed course plan.

Course objectives: The student should be able to:

- Solve and sketch the phase portrait of a linear homogeneous system of differential equations in the plane.
- Define the notion of topological conjugacy.

- Classify planar linear homogeneous systems up to topological conjugacy.
- State the theorem on existence and uniqueness of solutions of ordinary differential equations and sketch its proof.
- Define the notion of an equilibrium of an autonomous dynamical system.
- Find equilibrium points of various simple planar nonlinear systems.
- Classify equilibria into sinks, sources and saddles, and centers.
- Define the notion of a stable/unstable manifold.
- Define the notion of stability and asymptotic stability of an equilibrium of a dynamical system.
- Investigate stability and asymptotic stability in various simple planar nonlinear systems.
- Define the notion of a closed orbit and that of a limit cycle.
- Define and analyze the Poincaré map associated with a closed orbit.
- State the Poincaré-Bendixson theorem.
- Apply the techniques learned in the course to analyze equations for modeling the 2-body problem in Newtonian mechanics.

Participation: During class please feel free to stop me at any time and ask questions. I encourage and greatly appreciate students' participation. You can earn up to five points of extra credit for participation.

Feedback: I appreciate constructive feedback which you can give me via anonymous (or not) posting on Piazza, by email, or in person.

Academic integrity: From the Office of Student Conduct and Ethical Development: Your own commitment to learning, as evidenced by your enrollment at San José State University, and the Universitys Academic Integrity Policy, require you to be honest in all your academic course work. Faculty are required to report all infractions to the Office of Student Conduct and Ethical Development. The policy on academic integrity can be found at `http://www.sjsu.edu/studentconduct/`.

Campus policy in compliance with the Americans with Disabilities Act: If you need course adaptations or accommodations because of a disability, or if you need special arrangements in case the building must be evacuated, please make an appointment with your instructors as soon as possible, or see them during office hours. Presidential Directive 97-03 requires that students with disabilities register with DRC to establish a record of their disability.

Class attendance: According to University policy F69-24, Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.

Piazza: To handle questions posed outside of class, we will be using Piazza (`https://piazza.com`), a free platform for instructors and GSIs to efficiently manage out-of-class Q&A. On the class dashboard, students can post questions and collaborate Wikipedia-style to edit responses to these questions. Instructors can also answer questions, endorse student answers, and edit or delete any posted content. Instead of emailing me math questions, I encourage you to post them to Piazza. Each student will be invited to join Piazza by email. Please join it as soon as you can, as I plan to use Piazza extensively.

Instead of sending me email, please create a post on Piazza with your question or concern. Private or anonymous post are fine, though they should be used rarely.

For more details, see the course web page.