Expected Outcomes Math 3354

This course is intended to develop students skills in the following areas:

About the course:

This course is intended to present fundamentals in ordinary differential equations. We plan to discuss the following topics:

1. Solution of first-order ODE’s by analytical, graphical and numerical methods;
2. Linear ODE’s, especially second order with constant coefficients;
3. Undetermined coefficients and variation of parameters;
4. Laplace transform Methods
5. Sinusoidal and exponential signals: oscillations, damping, resonance;
6. Delta functions, convolution, and Laplace transform methods;
7. Matrix and first order linear systems: eigenvalues and eigenvectors

Tentative Lecture Outline

Lec. # 1: Introduction. General and particular solutions. Geometrical view of \( y' = f(x, y) \): direction fields, integral curves. (sections 1.1 ex. 1-6, 1.2 ex. 1-18, 1.3, ex. 1-9 odd, 11 -17)*

(Nice online software at http://math.rice.edu/~dfield/dfpp.html)

Lec. # 2: Separable equation (section 1.4, ex. 1-28).

Lec. # 3: First-order linear ODE’s (section 1.5, ex. 1-19).

Lec. # 4: First-order substitution methods: Bernouilli and homogeneous ODE’s. Exact equations. (section 1.6, ex. 1-54 odd)

Lec. # 5: Applications. Population and Acceleration/velocity. (sections 1.7, ex. 1-12, 1.8)

Lec. # 6: Introduction to second-order linear ODE’s. General facts about linear ODE. Wronskians. (sections 2.1 ex. 1-7 odd, 20-26, 33-48)

Lec. # 7: General solution linear homogeneous ODE’s: superposition, uniqueness, (section 2.2, ex. 1-12, 13-19 odd, 21, 23 )

*All these exercises are suggested problems like ones you can expect on the exams. Answers to these problems can be found in the back of the book. Graded homework will be given online using Webwork.
Lec. # 8: Constant coefficient case: characteristic roots. (sections 2.3, 1-31 odd)
Lec. # 9: Undamped and damped oscillations. Mechanical vibrations (sections 2.4)
Lec. # 10: Inhomogeneous ODE’s: undetermined coefficients, variation of parameters. (section 2.5, ex. 1-11, 21-27, 31-35, 47 55)
Lec. # 11: Forced oscillations and Resonance. (section 2.6) Electric Circuits. (sections 2.7)
Lec. # 12: Laplace transform; basic formulas. (section 4.1, ex. 1-32). Using Laplace transform to solve linear ODE’s. (section 4.2, ex. 1-16, 17-21)
Lec. # 14: Using Laplace transform to solve ODE’s with period, and piecewise continuous inputs. (section 4.5, ex. 1-15)
Lec. # 15: Impulse; Dirac delta function, weight and transfer functions. (section 4.6, ex. 1-11)
Lec. # 16: First-order systems of ODE’s; geometric interpretation of a system. (section 5.1, ex. 1-6, 11-14)
Lec. # 17: Solution by elimination, (section 5.2, ex. 1-4, 10, )
Lec. # 18: Linear systems (section 5.3, ex. 1, 3, 9, 11-13, 21-23)
Lec. # 19: Homogeneous linear systems with constant coefficients: solution via matrix eigenvalues (real and distinct case, complex eigenvalues). (section 5.4, ex. 1-5, 8-12, 17-21)
Lec. # 20: Repeated real eigenvalues. (section 5.6, 1-7)

Assessment of Learner Outcomes (Grading Policy): Assessment of learning outcomes will be based on exams and homework assignments. In more detail:

1. There will be 3 exams given in class. For review for an exam, sample tests will be handed out several days in advance of each exam. Each exam counts as one score. A missed exam gives a score of 0, i.e., there are no makeup exams. Under extreme (and well documented) circumstances, arrangements might be made to take a test in advance.
2. There will be approximately 12 online homework assignments using WebWork. The homework will count as 1 additional score.
3. There will be approximately 10 short in-class quizzes. The quizzes will count as one score. In computing your grade for quizzes your lowest quiz score will be dropped.
4. The final exam will count for 2 more scores. This final is a comprehensive final.
5. After the final you will have 7 scores. Your final grade for the course will be determined by the average of your best 5 of these 7 scores.
Important Dates:

1. August 31, Thursday, Last day for student-initiated add on the Web.
3. September 13, Wednesday, Last day for student-initiated drop on the Web.
4. October 30, Monday, Last day to drop a course. Last day to declare pass/fail intentions.
5. November 22 - 26, Wednesday - Sunday, Thanksgiving holiday.
6. November 30 - December 6, Thursday - Wednesday, Period of no examinations except for makeup exams or scheduled lab exams.
7. December 6, Wednesday, Last day of classes.
8. Final Exam: Saturday, December 9, 1:30 p.m. to 4:00 p.m. (location announced in class before exam time)

Attendance: While attendance will not be taken everyday it will be taken on a regular basis and you are expected to attend every class. In particular students are responsible for any and all information given in class, e.g., test dates, quizzes, assignments, and general course material.

ADA Accommodations: Any student who, because of a disability, may require special arrangements in order to meet course requirements should contact me as soon as possible to make necessary arrangements. The instructor may request verification of need from the Dean of Students Office.

Religious Holy Day: 1. “Religious holy day” means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. 2. A student who intends to observe a religious holy day should make that intention known to the instructor prior to the absence. 3. Any a student who is to be absent from classes for the observance of a religious holy day should arrange with the instructor to make up the missed work. 4. A student who is excused for religious observance may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

Student Honesty and Classroom Policy: Cheating will not be tolerated and may result in severe academic sanctions. Disruptive behavior during class will not be tolerated. All cell phones are to be turned off upon entering the classroom – there are no exceptions. Disruptive behavior includes talking out of turn, cell phones ringing during class, and repeatedly arriving late or leaving class early. Class starts promptly on the hour. Please try to arrive on time.