



Math 337– Differential Equations Course Syllabus

Course description: Solving of differential equations of physics, chemistry and engineering, and a study of the characteristics of the solutions.

Credit hours: 3

Course Prerequisites and Corequisites: MTH 333

Course outline:

	<u>Approximate time spent</u>
• First order Differential Equations	15%
○ Separation of variables, linear equations	
○ Qualitative techniques: Slope Fields	
○ Existence & Uniqueness	
○ Euler's Method	
○ Equilibria & the phase line	
○ Bifurcations	
• First Order systems	15%
○ Qualitative Methods	
○ Analytic Methods for Special Cases	
○ Euler's Method	
• Linear systems	20%
○ Properties and the Linearity Principle	
○ Eigenvalues, Eigenvectors, Straight Line Solutions	
○ Phase Plane	
○ Complex Eigenvalues	
○ 2 nd and Higher Order D.E.'s	
• Forcing and Resonance	20%
○ Forcing	
○ Sinusoidal Forcing	
○ Amplitude and Phase of Steady State	
• Nonlinear Systems	15%
○ Equilibrium Point Analysis and Linearization	
○ Qualitative Analysis	
○ Hamiltonian Systems	
• Discrete Dynamical Systems	15%
○ Discrete Logistic Function	
○ Fixed Points and Periodic Points	
○ Bifurcations	
○ Chaos	

MTH 337 – Differential Equations
Syllabus Continuation

Student Learning Outcomes (SLO): At the end of MTH 337, a student who has studied and learned the material should be able to:

1. Solve forced and unforced linear O.D.E.'s and linear systems of O.D.E.'s either explicitly or numerically. [PLO: 2, 4]
2. Explain the qualitative long term behavior of a the solutions to an ODE or system of ODE's. [PLO: 1, 3, 4, 5]
3. Explain the role that eigenvalues and eigenvectors play in the solutions to linear ODE's and linear systems. [PLO: 1, 3, 4, 5]
4. Solve a nonlinear system qualitatively by equilibrium point analysis and the phase plane. [PLO: 1, 2, 4]
5. Demonstrate understanding of the relationship between continuous differential equations and discrete difference equations. [PLO: 1, 4]
6. Demonstrate understanding of the relationship between periodic solutions and chaos. [PLO: 1, 4]

Program Learning Outcomes (PLO):

Students graduating from SFASU with a B.S. degree and a major in mathematics will:

1. Demonstrate comprehension of core mathematical concepts. [**Concepts**]
(notion of theorem, mathematical proof, logical argument)
2. Execute mathematical procedures accurately, appropriately, and efficiently. [**Skills**]
(calculus, algebra, routine, nonroutine, applied)
3. Apply principles of logic to develop and analyze conjectures and proofs. [**Logical Reasoning**]
(quantifiers, breaking down mathematical statements, counterexamples)
4. Demonstrate competence in using various mathematical tools, including technology, to formulate, represent, and solve problems. [**Problem Solving**]
(calculus tools, algebra tools, applied tools, nonstandard problem solving)
5. Demonstrate proficiency in communicating mathematics in a format appropriate to expected audiences. [**Communication**]
(written, visual, oral)