Math 4233 - Intermediate Differential Equations
Syllabus - Fall 2019

Instructor:	Dr. Birne Binegar 430 Mathematical Sciences Tel. 744-5793 Email: binegar@math.okstate.edu Homepage: lie.math.okstate.edu/~binegar/courses.html
Lectures:	MWF , 12:30–1:20, 302 CLB
Office Hours:	MWF , 2:00–3:00, 430 MSCS
Required Text:	*Elementary Differential Equations and Boundary Value Problems*, 10th Edition, by W.E. Boyce and R.C. DiPrima, John Wiley & Sons, (2009).
Prerequisites:	Math 2233 (Elementary Differential Equations) Math 3013 (Linear Algebra)
Course Objectives:	This course focuses on the interaction of linear algebra and systems of linear differential equations, the theory of stability of nonlinear differential equations, partial differential equations and separation of variables, the theory of Fourier series and its application to partial differential equations, Sturm-Liouville theory, and orthogonal series of functions.
Homework:	Homework problems will be assigned daily in class. All the homework assigned during a given week will be due at the beginning of the first class of the following week. There will be two midterm examinations worth 100 pts each and one final examination worth 150 pts.

Grades: Grades will be determined exclusively from homework, midterm, and final exam scores.

Midterm Examination	100 possible pts.
Homework and Quizes	25 possible pts.
Final Examination	150 possible pts.
	275 possible pts.

Note: The final exam will be on Friday, December 13, 10:00 – 11:50pm, in 302 CLB

Letter grades will be assigned as follows:

A:	247	-	275 pts.
B:	220	-	246 pts.
C:	262	-	219 pts.
D:	192	-	261 pts.
F:	0	-	191 pts.

Math 4233
Course Outline

I. Systems of First Order Differential Equations
- A. Review of Linear Algebra and Matrices
- B. Eigenvectors and Eigenvalues
- C. Basic Theory of Systems of First Order Differential Equations
- D. Homogeneous Linear Systems with Constant Coefficients
- E. Complex Eigenvalues
- F. Fundamental Matrices
- G. Repeated Eigenvalues

II. Numerical Methods
- A. The Euler Method
- B. The Runge-Kutta Method
- C. Multi-step Methods

III. Nonlinear Differential Equations and Stability
- A. Phase Space: Linear Systems
- B. Autonomous Systems and Stability
- C. Almost Linear Systems
- D. Competing Species
- E. Predator-Prey Equations
- F. Liapunov's Second Method
- G. Periodic Solutions and Limit Cycles
- F. Chaos and Strange Attactors

FIRST EXAM

III. Partial Differential Equations and Fourier Series
- A. Two-Point Boundary Value Problems
- B. Fourier Series
- C. Convergence of Fourier Series
- D. Even and Odd Functions
- E. Separation of Variables
- F. The Heat Equation
- G. The Wave Equation
- H. Laplace's Equation

IV. Sturm-Liouville Theory
- A. Sturm-Liouville Boundary Value Problems
- B. Nonhomogeneous Boundary Value Problems
- C. Singular Sturm-Liouville Problems
- D. Bessel Functions
- E. Series of Orthogonal Functions

FINAL EXAM