DEPARTMENT OF MATHEMATICS
SYLLABUS

Course # & Name: MAT 22B: Differential Equations

Recommended Text(s) & Price: Elementary Differential Equations and Boundary Value Problems, 8th Edition, by Boyce/DiPrima ($130.00)

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Lecture(s)	Sections	Comments/Topics
1 and 2	1.1-3	Introduction and terminology, direction fields, discussion and solution of some ODE
3	2.1	Linear equations; integrating factors
4	2.2	Separable equations
5	2.3-4	Modeling, mechanics; Linear versus non-linear equations
6	2.5	Autonomous equations; Population dynamics
7	2.7	Numerical approximation; Euler's method
8	2.8	Existence and uniqueness theorem
9	2.9	First order difference equations
10	3.1	Homogeneous 2^{nd} order equations with constant coefficients
11 and 12	3.2-3	Fundamental solutions, linear independence, Wronskian
13	3.4	Complex roots
14	3.5	Repeated roots; Reduction of order
15	3.6	Nonhomogeneous equations; Method of undetermined coefficients
16	3.7	Variation of parameters
17	3.8-9	Applications to oscillating systems
18	6.1	Laplace Transform, definition
19	6.2	Solution of initial value problems with Laplace Transform
20	7.1	Systems of linear ODE, introduction
21	7.2-3	Review of related linear algebra
22	7.4	Basic theory of first order linear systems
23	7.5	Homogeneous linear systems with constant coefficients
24	7.6	Complex eigenvalues
25	7.7	Fundamental matrices
26	7.8	Repeated eigenvalues
27	7.9	Nonhomogeneous linear systems
28		Applications and review

Additional Notes:

This syllabus is based on 27 50-minute lectures. This usually leaves two lectures for midterms, e.g. midterm one covering the material of Chapters 1 and 2, and midterm two covering the material of Chapters 3 and 6. Alternatively, one can hold one midterm and have a lecture on applications (and/or review) at the end.

There are several interesting options to extend and/or modify this material:

- One could spend additional time in the beginning on examples of different types of ODE, their solution and applications; then summarize the basic methods a bit more quickly.
- Include treatment of linear systems using the Laplace transform.
- Section 2.9 on first Order Difference Equations can be considered optional. Alternatively, it can be expanded with a discussion of iterated maps (e.g. the logistic map).
- Section 2.7 on Numerical Approximations: Euler's Method could be the starting point for project(s) using Matlab or another software package.