SYLLABUS FOR MATH 255

(This syllabus will be updated and adjusted to reflct the pace of the course; please check it regularly.)

Purpose of the course The course is an introduction to the most basic concepts and methods in solving ordinary differential equations. Upon completion of this course students should know some applications of ordinary differential equations in engineering, physics and biology.

Text book: Elementary differential equations and boundary value Problems, by W.E.Boyce and R.C. DiPrima, (7th edition red cover custom version)

Ch 1 Introduction:

1.1 Some basic mathematical models ; direction fields,
1.2 Solutions of some differential equations,
1.3 Classification of differential equations.
(2 lecture)

Ch 2. First Order Differential Equations:

2.1 Linear Equations with variable coefficients,
2.2 Separable equations,
2.3 Only Example 4 (Escape velocity)
2.4 Difference between linear and nonlinear equations,
2.5 Autonomous equations and Population Dynamics,
2.6 Exact equations and integrating factors,
2.7 Numerical approximation, Euler Method,
2.8 The existence and uniqueness theorem.
(7 lecturs)

Ch 3 Second order Linear equations:

3.1 Homogeneous equations with constant coefficients,
3.2 Fundamental solutions of linear homogenoeus equations,
3.3 Linear independence and the Wronskian,
3.4 Complex roots of the characteristic equations,
3.5 Repeated roots, reduction of the order,
3.6 Nonhomogeneous equations, Method of undetermined coefficients,
3.7 Variation of parameters.
(5 lectures)

MIDTERM 1, most likely April 28 or 30

Ch 4 Higher Order Linear Equations:

4.1 General theory of $n-$th order linear equations,
4.2 Homogeneous equations with constant coefficients,
4.3 The method of undetermined coefficients,
4.4 The method of variation of parameters.
(4 lectures)

Ch 5. Series Solutions of Second order linear equations:

5.1 Review of power series,
5.2 Series solutions near ordinary point (part 1),
5.3 Seris solutions near ordinary point (part 2),
5.4 Regular singular points,
5.5 Euler equations,
5.6 Series solutions near regular singular point (part 1),
(3 lectures)

MIDTERM II, May 24 or 26

Ch 6 The Laplace Transform:

6.1 Definition of the Laplace transform,
6.2 Solution of the initial value problems,
6.3 Step functions,
6.4 Differential equations with discontinous forcing,
6.5 Functions,
6.6 Impulse functions,
6.6 The convolution integral.
(5 lectures)

FINAL EXAM, June 7 at 11:30 AM

bf. Home work assigments
1.1: 1,3,4, 18(difficult),
1.2: 1,3,6,7,10,13
1.3: 1, 4, 6, 7,9,14, 21,23, 25,27
2.1: 6,7,10,11 (only c), 13,15,17, 21,23,27, 37
2.2: 2,5,6,8, 13,17, 22, 26, 28. 31, 35
2.3: 21, 25, 26(without (b)), 26
2.4: all odd problems from 1 to 12, 21, 27, 29, 31
2.5: 1,3,5, 9,13, 15
2.6: 3, 7, 12, 15, 17, 19, 21, 25, 27, 1, 32
2.7: (decided in recitation class; most of the problems in this section require extensive numerical calculations)
2.8: 1, 2, 3, 11, 15-17
3.1: 5, 7, 19, 20, 22, 26, 28, 30, 32, 34, 38, 40, 42
3.2: 2, 5, 10, 12, 17, 23, 25, 28, 30, 33, 35
3.3: 1, 6, 10, 12, 13, 15, 16, 21, 23, 27
3.4: 7, 11, 15, 20, 23, 25, 26
3.5: 7, 9, 11, 13, 17, 19, 25, 27, 38, 40
3.6: 1, 5, 9, 11, 15, 16, 18, 21, 23,
3.7: 7,11, 14, 18, 28, 30, 32
4.1: 3,5,9,10, 15,16,17, 20,21,23, 26,28.
4.2: 11, 15, 19, 21, 25, 29, 31, 35, 37, 38
4.3: 5, 6, 7, 10, 12, 15, 17,
4.4: 3,5,7,10, 12 14,16
5.1 1, 2,7, 10, 13, 15, 19, 21

5.2 1, 7, 8, 12, 21, 26
5.3 1, 2, 5, 6, 7
5.4 1, 7, 9, 17,
5.5 3, 7, 10, 12, 17, 20, 21, 23
5.6 3, 7, 9 14, 15
5.7 1, 3, 14, 15, 20
The equivalent problems from edition 8 (for sections (1.1- 2.8):
The numbering remain the same except for sections 1.2 and 2.1.
section 1.2: 1, 3, 7, 8, 12, 17
section 2.1: 6, 7, 10, 13, 15, 17, 23, 24, 29, 40

Grading policy
Two midterms each graded with 100 pts.
Final exam graded with 200 pts.
Home work assignment 50 pts.

Office hours 11.30-12.30 MWF
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