2019–20 **MATH216 Mathematics IV – Information** N. Course

Teacher

Dr Neil Course

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Course Website

You will find course information, handouts, past exams, exam dates, etc. on my website

- www.neilcourse.co.uk/math216.html

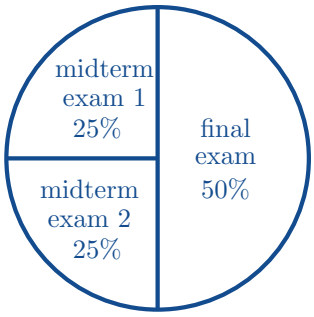
Suggested Text

- William E. Boyce and Richard C. DiPrima, *Elementary Differential Equations and Boundary Value Problems*, Wiley.

Please note that this is *not* a required purchase. Obtaining a copy of this book may be beneficial for you. Since we are not using a homework website for this course, you do not have to buy a new copy of this book.

Contents

"Mathematics is not a spectator sport."



This course has 4 hours of lectures per week.. I expect you to spend atleast 8 hours every week, studying outside of class. Every week you should be reading your lecture notes, discussing the material with other students, reading the textbook, and attempting the exercise questions.

This course does not have assessed homework. Instead I will distribute exercises for you to study. Later I will provide solutions. On request, we can also solve some exercises in class.

Office Hour

If you have any questions, you can find me in my office (C333) each

- Wednesday, from 14:00 to 15:00;

Alternately, you can email your questions to me. Please don't forget to write "MATH216" or "Differential Equations" in your emails.

Topics

Classification of differential equations; Direction fields; First order differential equations: solution of separable, linear and exact differential equations, substitution methods and order reduction, autonomous equations and population dynamics; Higher order differential equations: linear, homogeneous equations with constant coefficients, nonhomogeneous equations, the method of undetermined coefficients, the method of variation of parameters; Laplace transform solutions of initial value problems; Linear systems of differential equations: homogeneous differential equations in $\mathbb{R}^2$, homogeneous differential equations in $\mathbb{R}^3$, matrix exponential and fundamental matrix solutions, solutions of systems of nonhomogeneous equations, Laplace transform methods;

Syllabus[1]

Week	Topics Covered	Independent Study Expected
1	**Introduction** 1.1 Some Basic Mathematical Models; Direction Fields 1.2 Solutions of Some Differential Equations 1.3 Classification of Differential Equations	
2	**First Order Differential Equations** 2.1 Linear Equations; Method of Integrating Factors 2.2 Separable Equations 2.4 Differences Between Linear and Nonlinear Equations	Read Chapter 2
3	2.5 Autonomous Equations and Population Dynamics 2.6 Exact Equations and Integrating Factors	Read Chapter 2
4	**Second Order Linear Equations** 3.1 Homogeneous Equations with Constant Coefficients 3.3 Complex Roots of the Characteristic Equation 3.4 Repeated Roots	Read Chapter 3
5	3.5 Nonhomogeneous Equations; Method of Undetermined Coefficients 3.6 Variation of Parameters **Higher Order Linear Equations** 4.2 Homogeneous Equations with Constant Coefficients	Read Chapters 3-4
6	**The Laplace Transform** 6.1 Definition of the Laplace Transform 6.2 Solution of Initial Value Problems	Read Chapter 6
7	**The Laplace Transform** 6.3 Step Functions 6.4 Differential Equations with Discontinuous Forcing Functions	Read Chapter 6 Use WileyPlus
8	**The Laplace Transform** 6.5 Impulse Functions 6.6 The Convolution Integral	Read Chapter 6
9	(no lessons this week)	Reread your lecture notes and textbook
10	**Systems of First Order Linear Equations** 7.1 Introduction 7.4 Basic Theory of Systems of First Order Linear Equations 7.5 Homogeneous Linear Systems with Constant Coefficients	Read Chapter 7
11	7.6 Complex Eigenvalues 7.7 Fundamental Matrices	Read Chapter 7
13	7.8 Repeated Eigenvalues	Read Chapter 7
14	7.9 Nonhomogeneous Linear Systems	Read Chapter 7

[1] Schedule subject to change.