



Welcome to *Diferansiyel Denklemler* aka *Differential Equations*.

## Course Website

[x.co/mat371](http://x.co/mat371)



## Kitap/Suggested Text(s)

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

## Giriş/Introduction

Many problems – in engineering, science, economics and the social sciences – can be modelled using differential equations.

An equation containing derivatives is called a differential equation. For example

$$\frac{dy}{dx} = 2x$$

is a differential equation. The solution to this differential equation is easy to find:

$$y(x) = \int \frac{dy}{dx}(x) dx = \int 2x dx = x^2 + C,$$

for any constant  $C$ . A slightly more complicated differential equation is

$$\frac{dy}{dx} = y$$

which has solution  $y = Ce^x$  for any constant  $C$ . Check that this does solve the differential equation.

Other equations that you will study in this course include:

$$\frac{du}{dt} + p(t)u = g(t)$$

$$\frac{dy}{dx} = \frac{3x^2 + 4x + 2}{2(y - 1)}$$

$$\frac{dy}{dt} = \left(1 - \frac{y}{K}\right)y$$

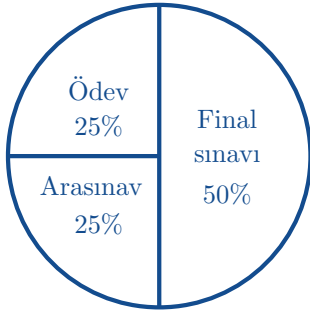
$$2x + y^2 + 2xy \frac{dy}{dx} = 0$$

$$\frac{d^2y}{dt^2} + 5 \frac{dy}{dt} + 6y = 0$$

$$\frac{d^2u}{dt^2} + 4u = \operatorname{cosec} t$$

## İçerik/Contents

“The only way to learn mathematics is to do mathematics.” – Paul Halmos (1916–2006)



During the course, there will be homework problems for you to study. While you can, of course, discuss the homework problems with other students; I expect you to write your final version on your own. Plagiarism is not acceptable: **If you copy another student’s homework, or if you allow someone to copy your homework, then you will both receive a mark of zero!** *İntihal bir suçtur: Başka bir öğrencinin ödevinden kopya çekerseniz, ya da sizin ödevinizden kopya çekmesine izin verirsiniz, her ikiniz de sıfır alacaksınız!*

There will be only one mid-term exam.

For a course with 3 hours of lectures per week; I expect you to spend at least 3 hours every week, studying outside of class. At a minimum, you should be reading the textbook, and attempting the exercise questions in there (not just the ones I set for homework).

If you miss a lecture; I expect you to copy your friends’ notes or read the textbook, to catch up.

## Not/Grades

I will give a pass (grade DD) for a mark of 40/100 or higher, grade DC for  $\geq 46$ , grade CC for  $\geq 52$ , grade CB for  $\geq 58$ , grade BB for  $\geq 64$ , grade BA for  $\geq 70$ , and grade AA for  $\geq 76$ .

## Dersler/Lectures

- Salı /Tuesday 14:00–16:00, oda D107
- Çarşamba /Wednesday 11:00–12:00, oda D107

## Ofis Saati/Office Hours

If you have any questions, or would like any extra hints for the homework, you can find me in my office at the following time:

- Pazartesi/Monday 16:00–17:00;

Alternately, you can email your questions to me at [neil.course@okan.edu.tr](mailto:neil.course@okan.edu.tr)

## Ders programı/Syllabus

- Examples of Ordinary Differential Equations, Direction Fields, Solutions to the ODE Examples, Classification of Differential Equations,
- First Order Differential Equations: Linear Differential Equations, Separable Differential Equations, Differences between Linear and Non-linear ODEs, Existence/Uniqueness Theorems, General Solutions, Implicit and Explicit Solutions, Autonomous Differential Equations, Population Dynamics, Equilibrium Solutions, Asymptotically Stable/Unstable Solutions, Exact Differential Equations, Numerical Approximations,
- Second Order Linear Differential Equations: Fundamental Solutions of Linear Homogeneous ODEs, Linear Independence and the Wronskian, Reduction of Order, Non-homogeneous Equations, the Method of Undetermined Coefficients, Variation of Parameters,
- Systems of Differential Equations, Phase Portraits, Higher Order ODEs.