2015–16 **MAT234 Matematik IV – Bilgi** N. Course

Welcome to *Matematik IV* aka *Advanced Calculus*.

Course Website

`x.co/mat234`

Kitap/Suggested Text(s)

The best book for this course is

- Mary Hart, *Guide to Analysis*, 2nd edition, Palgrave Macmillan (2001).

If you can't find Mary Hart's book, then have a look in the library for

- Walter Rudin, *Principles of Mathematical Analysis*, McGraw-Hill (1976).

Note: *Thomas' Calculus* does contain a chapter about sequences and series (which you should read), but it is not in-depth enough for us. Mary Hart's and Walter Rudin's books contain more details.

In addition, I have typeset my lecture notes for you (which you can download from my website), but I would still encourage you to look for Mary Hart's book.

Giriş/Introduction

This course will be an introduction to an area of pure mathematics called "Analysis".

We will start by briefly discussing *symbolic logic*. For example, you will understand why

$$\neg(P \Rightarrow Q) = \neg(\neg P \vee Q) = (P \wedge \neg Q).$$

We will quickly move on to discussing 3 common types of mathematical proof (proof by contradiction, proof by contrapositive, and proof by induction).

A *sequence* is a(n infinitely long) list of numbers $a_1, a_2, a_3, \ldots, a_n, \ldots$ in a given order. Each of the a_j represents a number. These are the terms of the sequence. For example, the sequence $2, 4, 6, 8, 10, 12, \ldots, 2n, \ldots$ has first term $a_1 = 2$, second term $a_2 = 4$ and nth term $a_n = 2n$.

If $(a_n)_{n=1}^{\infty}$ is a sequence, then we can add all of the terms in the sequence together

$$\sum_{n=1}^{\infty} a_n = a_1 + a_2 + a_3 + \ldots + a_n + \ldots.$$

This is called a *series*. For example, if $a_n = 2^{1-n}$ for all $n \in \mathbb{N}$, then we can calculate

$$\sum_{n=1}^{\infty} a_n = \sum_{n=1}^{\infty} 2^{1-n} = 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \ldots = 2.$$

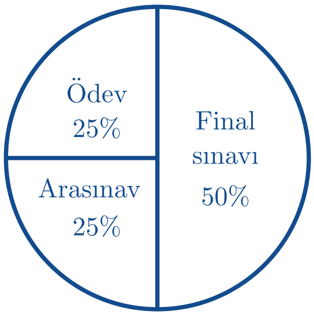
Or, we can use a sequence $(a_n)_{n=0}^{\infty}$ to define a function

$$\sum_{n=0}^{\infty} a_n x^n = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \ldots + a_n x^n + \ldots.$$

This is called a *power series*.

Içerik/Contents

"Mathematics is not a spectator sport."



During the course, there will be homework problems for you to study. Please remember that your answers to the homework problems must be your own work. 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 verirseniz, her ikiniz de sıfır alacaksınız!*

There will be only one mid-term exam.

For a course with 4 hours of lectures per week; I expect you to spend atleast 4 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 ≥ 46, grade CC for ≥ 52, grade CB for ≥ 58, grade BB for ≥ 64, grade BA for ≥ 70, and grade AA for ≥ 76.

Dersler/Lectures

- Salı 15:00–17:00, oda D305
- Perşembe 9:00–11:00, oda D305

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:

- Perşembe/Thursday 12:00-13:00.

Alternately, you can email your questions to me at `neil.course@okan.edu.tr`

Ders programı/Syllabus

- Symbolic Logic,
- Proof by Contradiction, Proof by Contrapositive, Proof by Induction,
- Sequences, Convergent Sequences, Divergent Sequences, Subsequences, Cauchy Sequences, Monotonic Sequences, Bounded Sequences,
- Series, Geometric Series, Divergent Series, The Divergence Test, The Comparison Test, The Limit Comparison Test, The Ratio Test, The Integral Test, The Alternating Series Test, Absolute Convergence, Conditional Convergence,
- Power Series, Radii of Convergence, Taylor's Theorem, Taylor Series, Applications of Taylor Series.