

MUHENDISLIK TEMEL BILIMLERI BOLUMU

Date	2014-15	Credits	5 credits
Course Title	Advanced Calculus	Course Number	MAT234
Pre-requisite (s)	MAT233 Calculus III	Co-requisite (s)	
Hours	42 hours	Out Of Class Work Hours	42 Hours

Place and Time of Class Meeting

- Tuesdays, 3-5, D305
- Thursdays, 9-11, D305

Name and Contact Information of Instructor

Dr. Neil Course
neil.course@okan.edu.tr

Book suggested

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



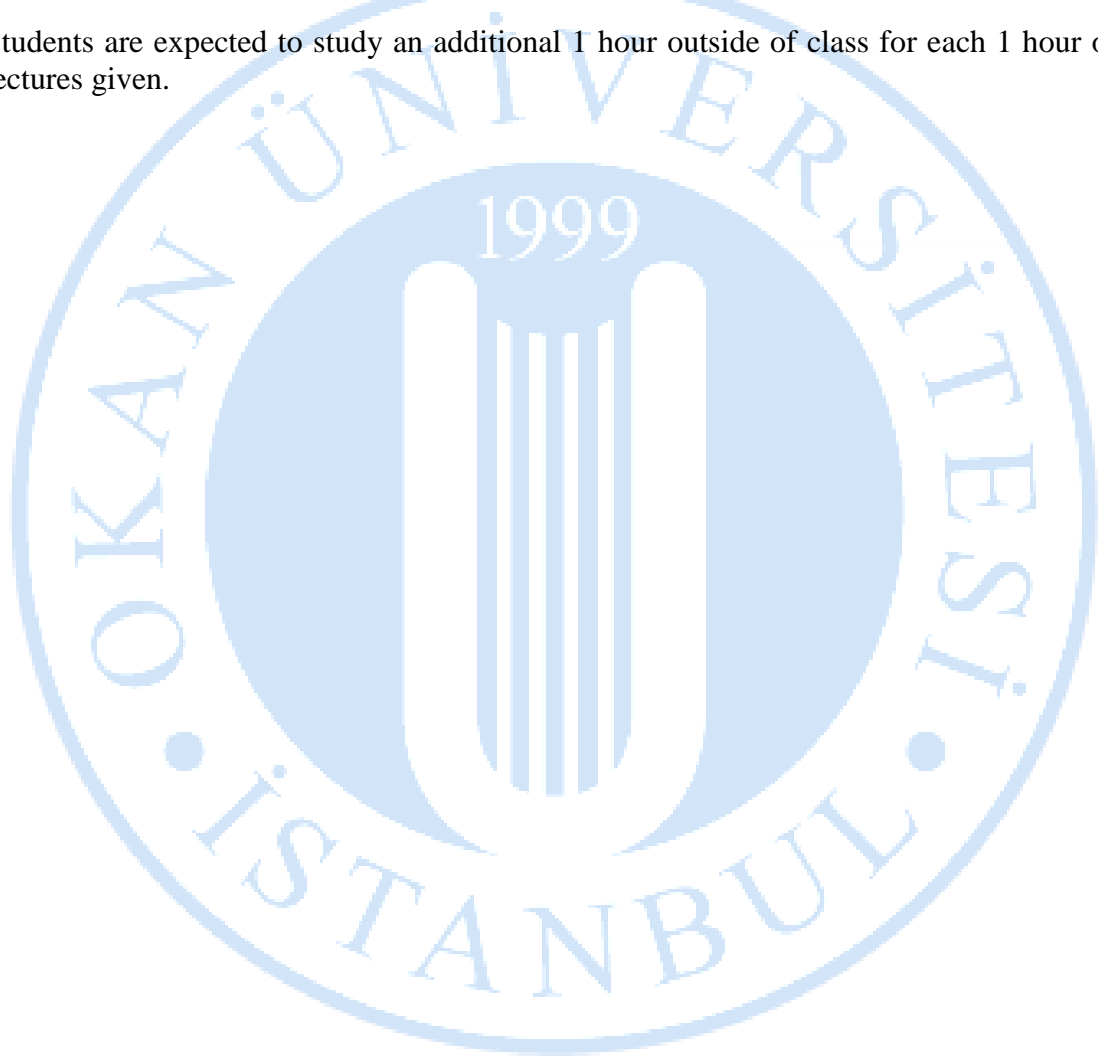
MUHENDISLIK TEMEL BILIMLERI BOLUMU

Classroom expectations for students

Attendance Policy

Students are expected to attend greater than 70% of scheduled lectures for the courses that they are registered for and to achieve the goals set forth by each class instructor. Attendance is taken for each lecture. It is the student's responsibility to arrange to make up work missed because of an absence. The assumption is that for each hour of class missed, the student will need to study for two hours independently to catch up.

Students are expected to study an additional 1 hour outside of class for each 1 hour of lectures given.



Student Tardiness Policy

A student is considered tardy/late if he/she comes to class 15 minutes late. With three tardies the student accumulates one full absence. If the student misses half of the class period, it is a full absence. When a student has more than 3 tardies, the instructor will contact the Institution Coordinator of Student Affairs and Academic Department and request an intervention session with the student. The goal of the intervention session is to develop and implement an intervention program to help students learn new ways to save and manage time.



Plagiarism

Plagiarism is defined as the use, without proper acknowledgment, of the ideas, phrases, sentences, or larger units of discourse from another writer or speaker. Plagiarism includes the unauthorized copying of software and the violation of copyright laws. Plagiarism is considered academic dishonesty.

Plagiarism includes, but is not limited to,

1. Submitting someone's work one's own.
2. Taking passages from their own previous work without adding citations.
3. Re-writing someone's work without properly citing sources.
4. Using quotations, but not citing the source.
5. Interweaving various sources together in the work without citing.
6. Citing some, but not all passages that should be cited.
7. Melding together cited and uncited sections of the piece.
8. Providing proper citations, but fails to change the structure and wording of the borrowed ideas enough.
9. Inaccurately citing the source.
10. Relying too heavily on other people's work. Fails to bring original thought into the text.

Plagiarism is not acceptable!

Students who commit plagiarism will obtain a mark of 'zero (0)' on their exam or assignment, and are subject to investigation according to the rules of Yükseköğretim

Kurumları Öğrenci Disiplin Yönetmeliği. In addition, students who facilitate the committing of plagiarism by others (for example but not limited to; allowing another student to copy one's work with the intention of passing it off as the second student's own) will also be considered to have committed plagiarism and will be punished accordingly.

Course Description (must correspond exactly to Catalog description)

Topology of \mathbb{R}, \mathbb{R}^2 and \mathbb{R}^3 . Functions of several variables, limit and continuity, partial derivatives. The mean value, Implicit and Inverse function theorems.



Learning Objectives

At the end of this course students will be able:

- To appreciate the motivation for study in this field;
- To understand and recall the definitions of key concepts in this area of mathematics;
- To understand and recall the important results discussed;
- To apply all of the methods and techniques discussed and developed in the course;
- To provide proofs to elementary problems in this area of mathematics;
- To be able explain the contents of this course to students in the year below.

MUHENDISLIK TEMEL BILIMLERI BOLUMU

Topical Outline and Schedule

DATE	WEEK 1
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Introduction to the course
TOPIC (S)	<ul style="list-style-type: none"> • Syllabus • Book • Course website • Homework • Expectations
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • none
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • none
DATE	WEEK 2
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a basic understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Symbolic Logic • Proposition • Or • And • Not • Implies • If and only if • Converse • Contrapositive • For all • There exists • Negating a proposition • 4 types of proof • Direct proof • Proof by induction • Proof by contrapositive • Proof by contradiction • The square root of two is not rational
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study

MUHENDISLIK TEMEL BİLİMLERİ BÖLÜMÜ

OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 3
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a basic substantial understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Sequences • Terms of a sequence • Sequences tending to infinity • Sequences tending to minus infinity • Sequences tending to zero • Null sequences • Tends to a real number • Convergent sequences • Divergent sequences • Bounded sequences • The sandwich rule • Standard limits of sequences • n^α • a^n • a^n / n^α • $a^{(1/n)}$ • $n^{(1/n)}$ • $a^n/n!$ • $n!/n^{(1/n)}$ • increasing sequences • strictly increasing sequences • decreasing sequences • strictly decreasing sequences • monotonic sequences • bounded above • bounded below • upper bound • lower bound • supremum • infimum • completeness axiom • subsequences

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	<ul style="list-style-type: none"> • terrace points • The Bolzano-Weierstrass Theorem • Cauchy sequences • The completeness of the real numbers
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 4
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Sequences • Terms of a sequence • Sequences tending to infinity • Sequences tending to minus infinity • Sequences tending to zero • Null sequences • Tends to a real number • Convergent sequences • Divergent sequences • Bounded sequences • The sandwich rule • Standard limits of sequences • n^α • a^n • a^n / n^α • $a^{(1/n)}$ • $n^{(1/n)}$ • $a^n/n!$

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	<ul style="list-style-type: none"> • $n!/n^{(1/n)}$ • increasing sequences • strictly increasing sequences • decreasing sequences • strictly decreasing sequences • monotonic sequences • bounded above • bounded below • upper bound • lower bound • supremum • infimum • completeness axiom • subsequences • terrace points • The Bolzano-Weierstrass Theorem • Cauchy sequences • The completeness of the real numbers •
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 5
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a deeper understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Sequences • Terms of a sequence • Sequences tending to infinity • Sequences tending to minus infinity • Sequences tending to zero • Null sequences • Tends to a real number

MUHENDISLIK TEMEL BİLİMLERİ BÖLÜMÜ

	<ul style="list-style-type: none"> • Convergent sequences • Divergent sequences • Bounded sequences • The sandwich rule • Standard limits of sequences • n^α • a^n • a^n / n^α • $a^{(1/n)}$ • $n^{(1/n)}$ • $a^n/n!$ • $n!/n^{(1/n)}$ • increasing sequences • strictly increasing sequences • decreasing sequences • strictly decreasing sequences • monotonic sequences • bounded above • bounded below • upper bound • lower bound • supremum • infimum • completeness axiom • subsequences • terrace points • The Bolzano-Weierstrass Theorem • Cauchy sequences • The completeness of the real numbers
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 6

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SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> Students will have developed a fuller understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> Sequences Terms of a sequence Sequences tending to infinity Sequences tending to minus infinity Sequences tending to zero Null sequences Tends to a real number Convergent sequences Divergent sequences Bounded sequences The sandwich rule Standard limits of sequences n^α a^n a^n / n^α $a^{(1/n)}$ $n^{(1/n)}$ $a^n/n!$ $n!/n^{(1/n)}$ increasing sequences strictly increasing sequences decreasing sequences strictly decreasing sequences monotonic sequences bounded above bounded below upper bound lower bound supremum infinum completeness axiom subsequences terrace points The Bolzano-Weierstrass Theorem Cauchy sequences The completeness of the real numbers
LEARNING ACTIVITIES	<ul style="list-style-type: none"> Lectures Independent Study

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OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 7
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a substantial understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Sequences • Terms of a sequence • Sequences tending to infinity • Sequences tending to minus infinity • Sequences tending to zero • Null sequences • Tends to a real number • Convergent sequences • Divergent sequences • Bounded sequences • The sandwich rule • Standard limits of sequences • n^α • a^n • a^n / n^α • $a^{(1/n)}$ • $n^{(1/n)}$ • $a^n/n!$ • $n!/n^{(1/n)}$ • increasing sequences • strictly increasing sequences • decreasing sequences • strictly decreasing sequences • monotonic sequences • bounded above • bounded below • upper bound • lower bound • supremum • infimum • completeness axiom • subsequences • terrace points

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	<ul style="list-style-type: none"> • The Bolzano-Weierstrass Theorem • Cauchy sequences • The completeness of the real numbers
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 8
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Assessment
TOPIC (S)	<ul style="list-style-type: none"> • Midterm Exam
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Exam
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Revision
DATE	WEEK 9
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a basic understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Series • Partial sum • Convergent series • The sum of the series • Divergent series • Tests for convergence • The divergence test • The comparison test • The limit comparison test

MUHENDISLIK TEMEL BILIMLERI BOLUMU

	<ul style="list-style-type: none"> • The ratio test • The integral test • Euler's constant • The alternating series test • Absolute convergence • Conditional convergence • The Ratio Test
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 10
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Series • Partial sum • Convergent series • The sum of the series • Divergent series • Tests for convergence • The divergence test • The comparison test • The limit comparison test • The ratio test • The integral test • Euler's constant • The alternating series test • Absolute convergence • Conditional convergence • The Ratio Test

MUHENDISLIK TEMEL BILIMLERI BOLUMU

LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 11
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a basic understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Power Series • Centre of expansion • Radius of convergence • Open interval of convergence • Rolle's Theorem • The Mean Value Theorem • Taylor's theorem • Differentiation of power series • Integration of power series • Power series with centre of expansion c • The exponential function • The natural logarithm
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems

MUHENDISLIK TEMEL BILIMLERI BOLUMU

DATE	WEEK 12
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> Power Series Centre of expansion Radius of convergence Open interval of convergence Rolle's Theorem The Mean Value Theorem Taylor's theorem Differentiation of power series Integration of power series Power series with centre of expansion c The exponential function The natural logarithm
LEARNING ACTIVITIES	<ul style="list-style-type: none"> Lectures Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. Attempt a significant number of the exercises in the text book Read around the subject Complete homework problems
DATE	WEEK 13
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> Students will have developed a basic understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> Taylor Series
LEARNING ACTIVITIES	<ul style="list-style-type: none"> Lectures Independent Study

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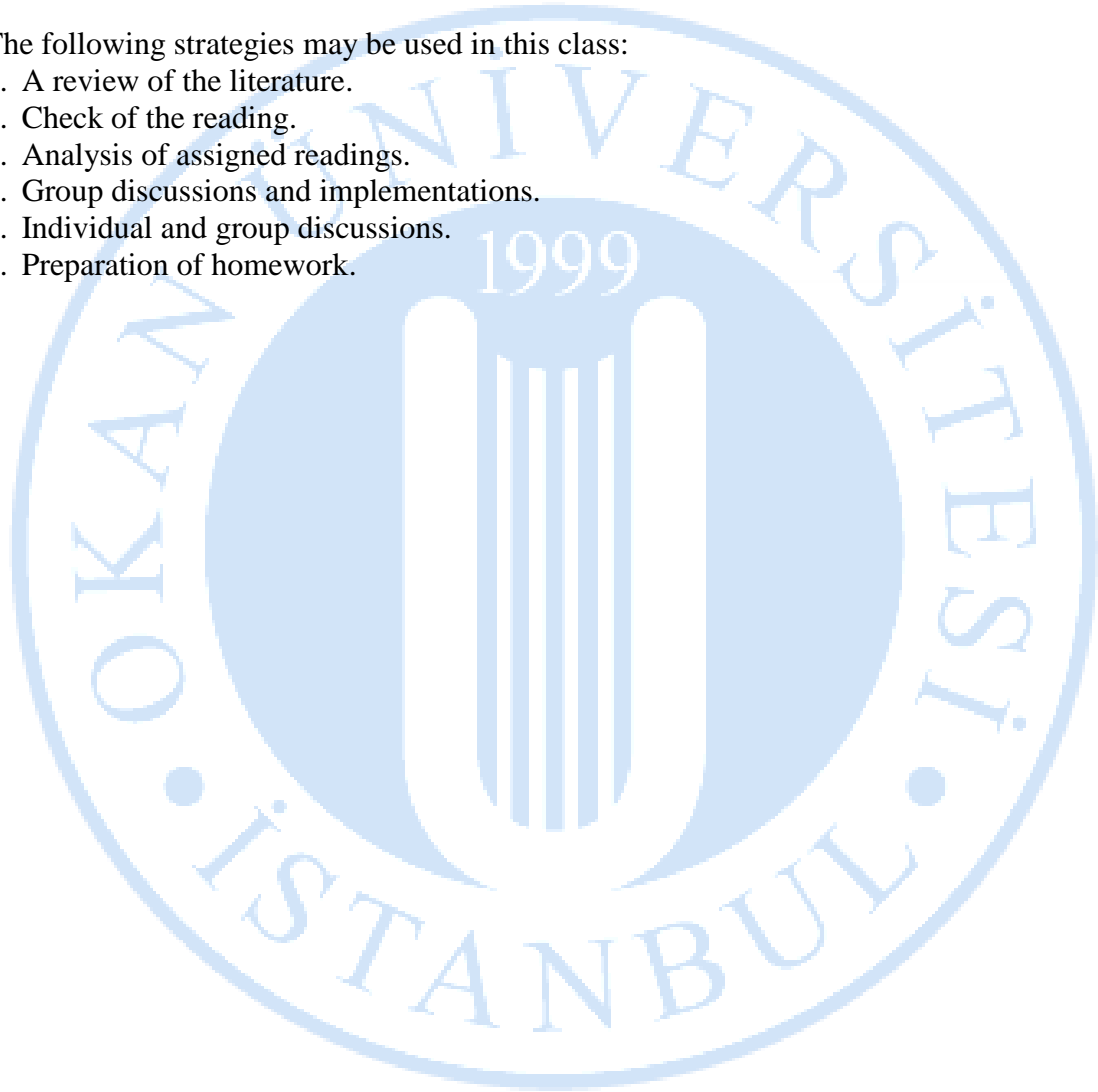
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none">• Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates.• Attempt a significant number of the exercises in the text book• Read around the subject• Complete homework problems
DATE	WEEK 14
SPECIFIC OBJECTIVES	<ul style="list-style-type: none">• Students will have developed a basic understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none">• Applications of Taylor Series
LEARNING ACTIVITIES	<ul style="list-style-type: none">• Lectures• Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none">• Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates.• Attempt a significant number of the exercises in the text book• Read around the subject• Complete homework problems

Instructional Methods

In developing methodological strategies, it is best to discuss them between teachers and students in an environment of freedom and mutual agreement in order to ensure that the students make them their own and take responsibility for their execution and for attaining the goals of this course.

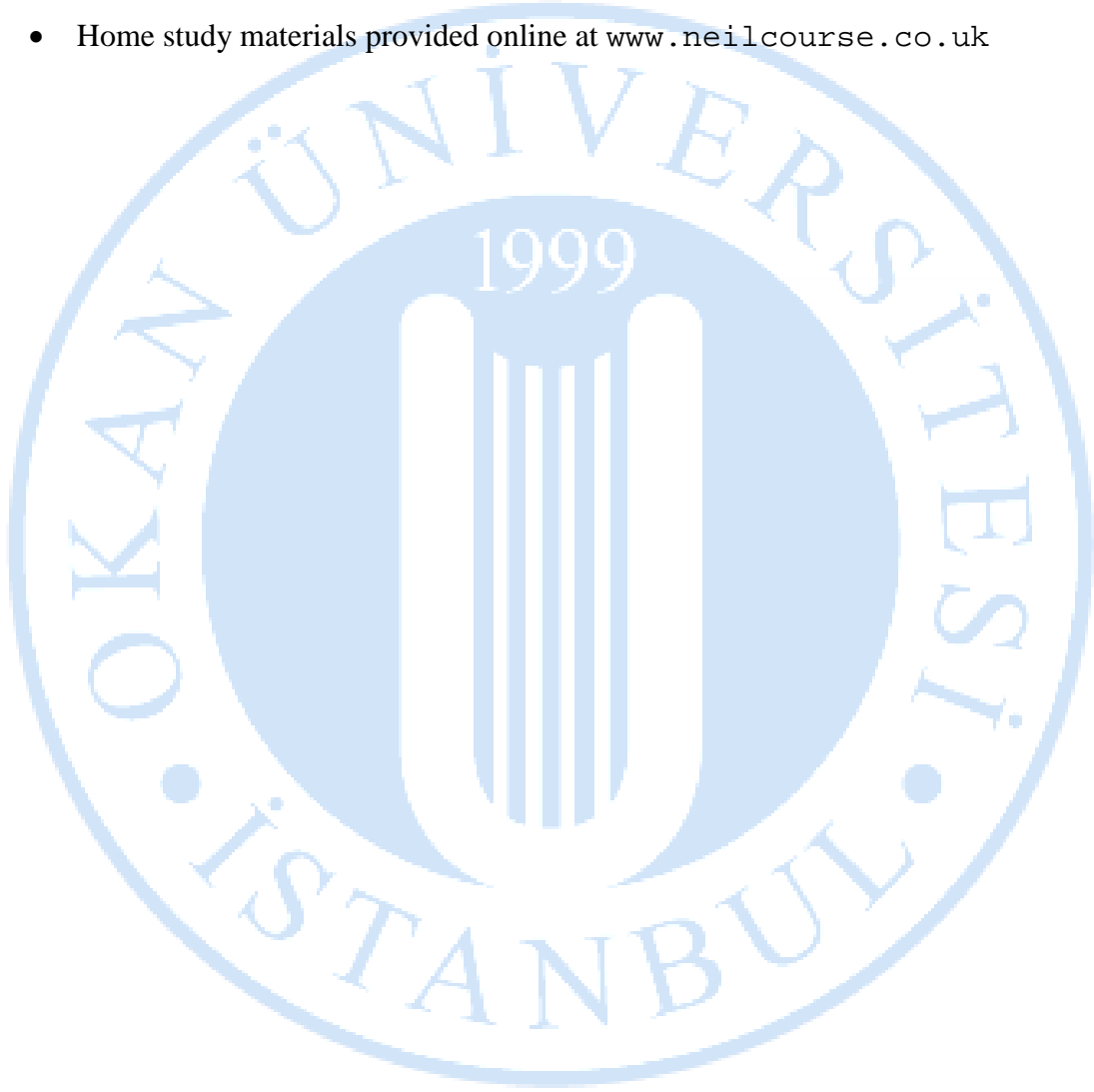
The following strategies may be used in this class:

1. A review of the literature.
2. Check of the reading.
3. Analysis of assigned readings.
4. Group discussions and implementations.
5. Individual and group discussions.
6. Preparation of homework.



Instructional Materials and References

- Mary Hart, Guide to Analysis, 2nd edition, Palgrave Macmillan (2001).
- Home study materials provided online at www.neilcourse.co.uk



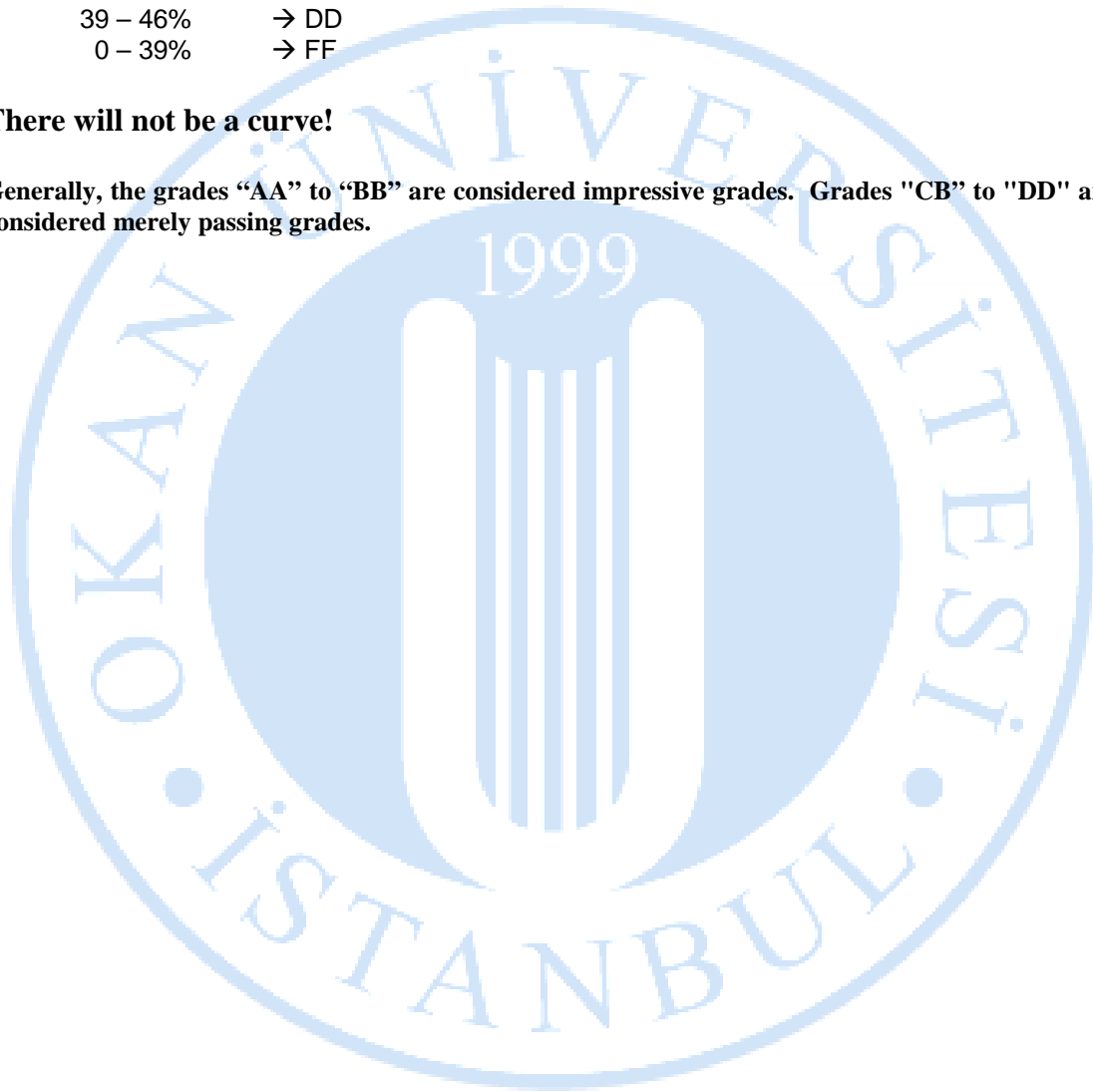
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Assessment Criteria and Methods of Evaluating Students

76 – 100%	→ AA
70 – 75%	→ BA
65 – 69%	→ BB
59 – 64%	→ CB
53 – 58%	→ CC
47 – 52%	→ DC
39 – 46%	→ DD
0 – 39%	→ FF

There will not be a curve!

Generally, the grades “AA” to “BB” are considered impressive grades. Grades “CB” to “DD” are considered merely passing grades.



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Distribution of Grade Elements

4 pieces of homework:	25%
Midterm Exam:	25%
Final Exam:	50%
Total:	100 %

