MÜHENDİSLİK TEMEL BİLİMLERİ BÖLÜMÜ

Date	2015-16	Credits	6 credits
Course Title	Partial Differential Equations	Course Number	MAT372
Pre-requisite (s)	MAT113 Calculus I, MAT371 Differential Equations	Co-requisite (s)	
Hours	42 hours	Out Of Class Work Hours	42 Hours

Place and Time of Class Meeting

To be announced

Name and Contact Information of Instructor

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

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Book suggested

Beny Neta, **Partial Differential Equations** (http://faculty.nps.edu/bneta/pde.pdf).

Eren, Şaban and Mesut Razbonyalı, **Diferansiyel Denklemler**, Maltepe Üniversitesi Yayınları.

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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.

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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.

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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 commiting 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 commit plagiarism and will be punished accordingly.

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Course Description (must correspond exactly to Catalog description)

This course is designated to provide a basic introduction to the area of mathematics described by the course title. In particular, students will study: first order equations, linear, quasilinear and nonlinear equations, classification of second order linear partial differential equations, the Cauchy problem for the wave equation. Dirichlet and Neumann problems for the Laplace equation.

Date Syllabus Was Last Reviewed: Friday, October 09, 2015.

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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.

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Topical Outline and Schedule

DATE	WEEK 1
SPECIFIC OBJECTIVES	• Introduction to the course
TOPIC (S)	• Syllabus • Book • Course website • Homework • Expectations
LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• Download the textbook
DATE	**WEEK 2**
SPECIFIC OBJECTIVES	• Students will have developed a basic understanding of the topics listed below
TOPIC (S)	• Partial Differential Equation (PDE) • Solution • Order • Linear • Nonlinear • Quasilinear • Homogeneous • Non-homogeneous • Derivation of the Heat Equation, • Initial Conditions for the Heat Equation • Boundary Conditions for the Heat Equation

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LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• 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	• Students will have developed a basic understanding of the topics listed below
TOPIC (S)	• Derivation of the Wave Equation, • Boundary Conditions for the Wave Equation • Derivation of Laplace's Equation, • Classification of PDEs, • Hyperbolic 2nd order PDEs • Parabolic 2nd order PDEs • Elliptic 2nd order PDEs
LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• 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	• Students will have developed a basic understanding of the topics listed below

TOPIC (S)	- Classification of PDEs, - Hyperbolic 2nd order PDEs - Parabolic 2nd order PDEs - Elliptic 2nd order PDEs - Change of Variables - Canonical Forms, - The characteristic equation - Characteristic curves - General Solution
LEARNING ACTIVITIES	- Lectures - Independent Study
OUT OF CLASS WORK ASSIGMENT	- 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	Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	- Classification of PDEs, - Hyperbolic 2nd order PDEs - Parabolic 2nd order PDEs - Elliptic 2nd order PDEs - Change of Variables - Canonical Forms, - The characteristic equation - Characteristic curves - General Solution

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LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• 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**
SPECIFIC OBJECTIVES	• Students will have developed a basic understanding of the topics listed below
TOPIC (S)	• The Method of Characteristics, • The Advection Equation • Quasilinear Equations • Graphical Solution • Fan-like Characteristics, • The characteristic equation • Shock Waves, • the Wave Equation on infinite string • d'Alembert's solution • The Wave Equation on semi-infinite string • The Wave Equation on semi-infinite string with a free end • The Wave Equation on finite string • The Parallelogram Rule
LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• 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

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DATE	WEEK 7
SPECIFIC OBJECTIVES	• Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	• The Method of Characteristics, • The Advection Equation • Quasilinear Equations • Graphical Solution • Fan-like Characteristics, • The characteristic equation • Shock Waves, • the Wave Equation on infinite string • d'Alembert's solution • The Wave Equation on semi-infinite string • The Wave Equation on semi-infinite string with a free end • The Wave Equation on finite string • The Parallelogram Rule
LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• 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	• Assessment
TOPIC (S)	• Midterm Exam

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LEARNING ACTIVITIES	Exam
OUT OF CLASS WORK ASSIGMENT	• Revision
DATE	**WEEK 9**
SPECIFIC OBJECTIVES	• Students will have developed a basic understanding of the topics listed below
TOPIC (S)	• Separation of Variables, • Separation constant • The Heat Equation, • A discussion of homogeneous boundary conditions for the heat equation • Eigenvalues • Eigenfunctions
LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• 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	• Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	• Separation of Variables,

	• Separation constant • The Heat Equation, • A discussion of homogeneous boundary conditions for the heat equation • Eigenvalues • Eigenfunctions • Chapter Summary
LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• 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	• Students will have developed a basic understanding of the topics listed below
TOPIC (S)	• Fourier Series, • Piecewise continuous functions • Piecewise C^1 functions • The inner product • Orthogonality • Orthogonal Systems • Orthonormal Systems • Computation of coefficients of the Fourier Series • Derivation of the coefficient formulae • Convergence of Fourier Series • Fourier Sine Series • Fourier Cosine Series • Convergence of Fourier Sine Series • Convergence of Fourier Cosine Series • Term-by-term differentiation of Fourier Series • Term-by-term integration of Fourier Series

	• Full solutions of several problems using separation of variables and Fourier Series
LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• 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 12**
SPECIFIC OBJECTIVES	• Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	• Fourier Series, • Piecewise continuous functions • Piecewise C^1 functions • The inner product • Orthogonality • Orthogonal Systems • Orthonormal Systems • Computation of coefficients of the Fourier Series • Derivation of the coefficient formulae • Convergence of Fourier Series • Fourier Sine Series • Fourier Cosine Series • Convergence of Fourier Sine Series • Convergence of Fourier Cosine Series • Term-by-term differentiation of Fourier Series • Term-by-term integration of Fourier Series • Full solutions of several problems using separation of variables and Fourier Series
LEARNING	• Lectures

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ACTIVITIES	• Independent Study
OUT OF CLASS WORK ASSIGMENT	• 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	• Students will have developed a basic understanding of the topics listed below
TOPIC (S)	• Fourier Transforms • Inverse Fourier Transforms • The Heat Equations • Fourier Transforms of derivatives • The convolution theorem
LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• 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	• Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	• Fourier Transforms

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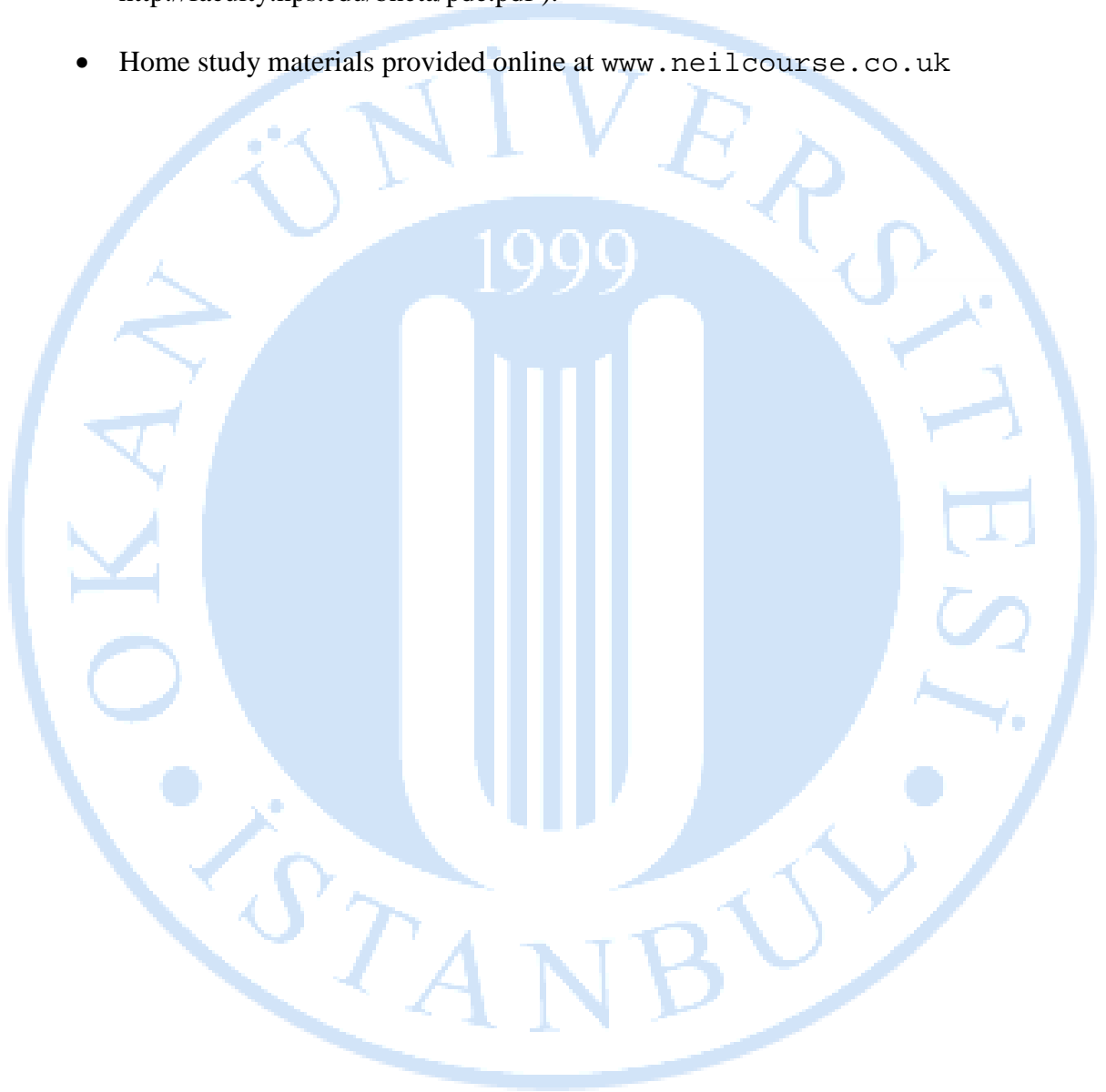
	• Inverse Fourier Transforms • The Heat Equations • Fourier Transforms of derivatives • The convolution theorem • Full solutions of several problems using the Fourier Transform
LEARNING ACTIVITIES	• Lectures • Independent Study
OUT OF CLASS WORK ASSIGMENT	• Read relevant sections of text book. Section 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

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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.

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Instructional Materials and References

- Beny Neta, **Partial Differential Equations** (http://faculty.nps.edu/bneta/pde.pdf).

- 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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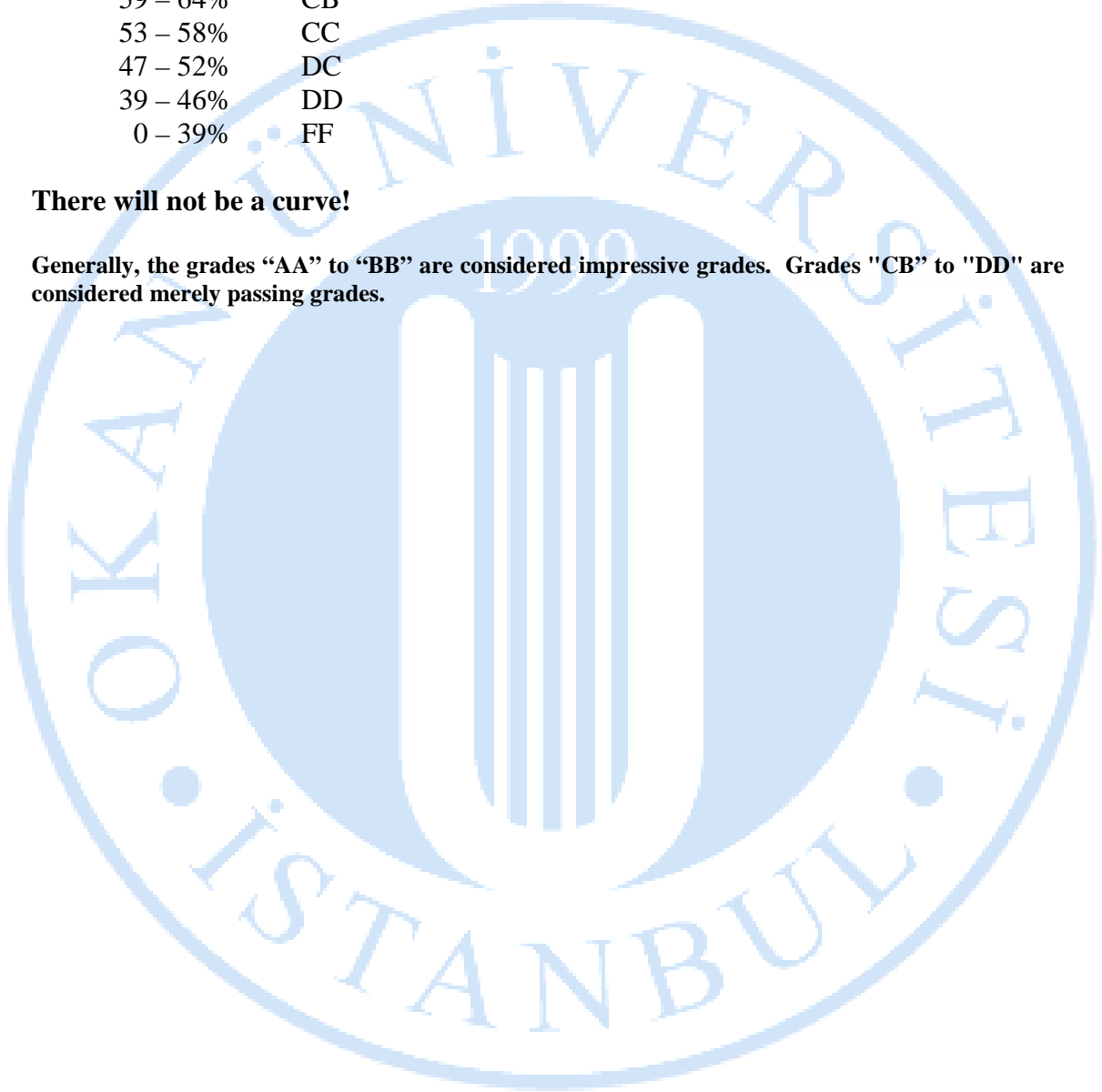
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Distribution of Grade Elements

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