

MATH 210: Applied Mathematics for Engineers (Spring 2016)

Frequency: Spring Term

Credit: (4-0)4

Catalog Description: Vector differential and integral calculus. Matrices. Determinants. Systems of linear equations. Characteristic values and characteristic vectors of matrices. Introduction to numerical methods.

Prerequisite: MAT 120 or consent of the Department.

Course Objectives: This course is designed to give second year engineering students fundamental concepts of vector calculus and linear algebra relevant to their fields, solutions of linear algebraic systems of equations, eigenvalues, roots of nonlinear equations, interpolation, and numerical differentiation and integration.

Course Coordinator: Benjamin Walter (office: T-124, phone: x3001, email: benjamin@metu.edu.tr)

Exams and Grading: Course grades are determined by homework, one (non-cumulative) midterm exam, and a (cumulative) final exam, as well as a small number of bonus points awarded on the basis of attendance.

- **Midterms :** 2x 30 %
- **Final:** 33 %
- **Homework:** 7 %
- **Bonus:** 5 %

Grading Scheme: DD (min 40); DC (min 48); CC (min 56); ... *division every 8* ... AA (min 88).

Homework: Online (WebWork) homework will be assigned and graded during the semester. We will also distribute (ungraded) written problem sheets for further practice.

Exams: At least 75% of all exam problems will be taken from written problem sheets and WebWork.

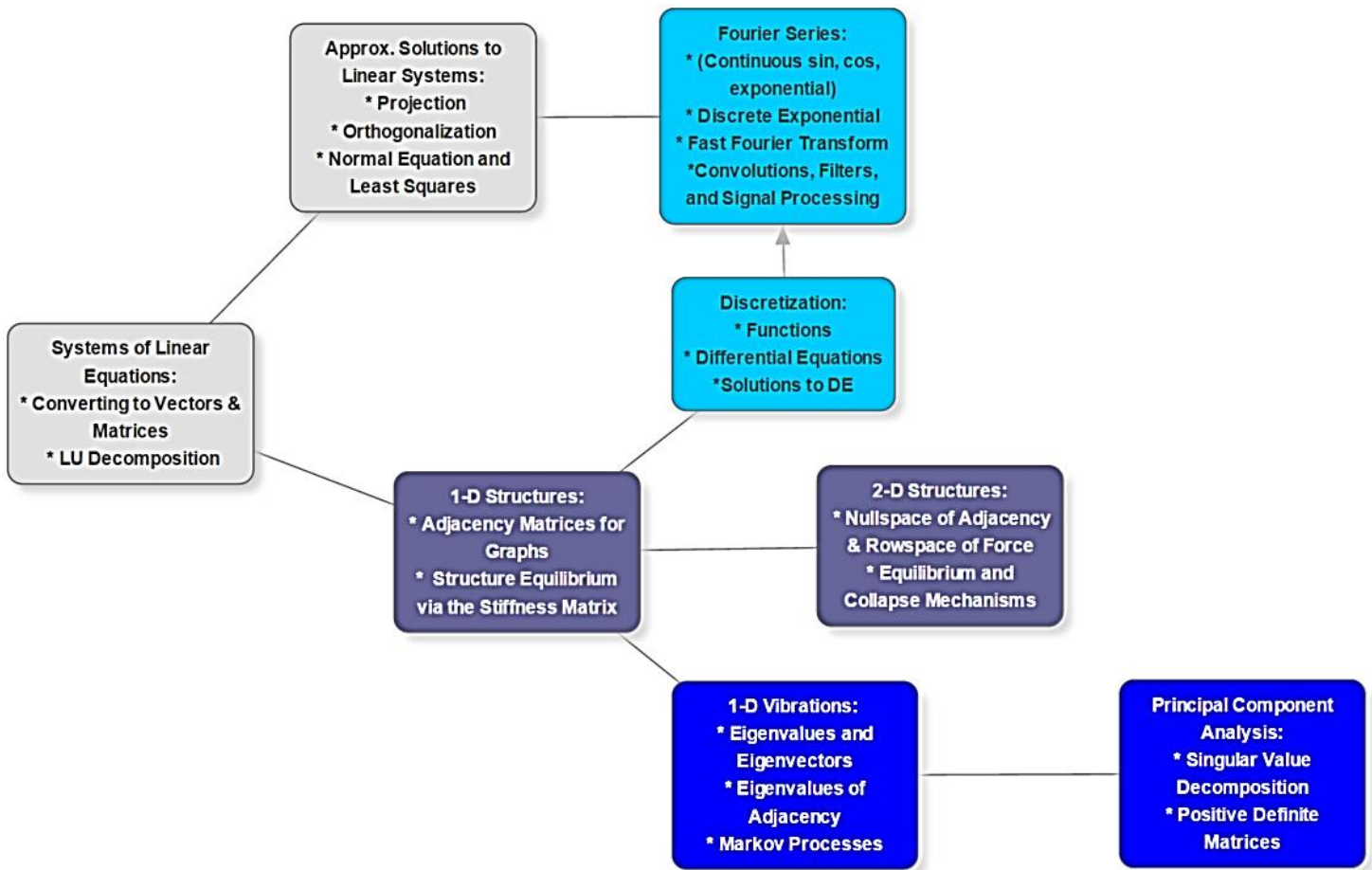
Textbooks: "Computational Science and Engineering." Strang, G., 1st ed. (*ask your professor about this*)
Online Notes (ODTÜ-Class)

Website: ODTÜ-Class [\[MAT 210 All Sections\]](#)

Make-up Policy: In order to be eligible to enter a make-up examination for a missed examination, a student should have a documented or verifiable, and officially acceptable excuse. A student cannot get make-up examinations for two missed exams. The make-up examination for all exams will be after the final exam, and will include all topics.

Math Help Room: The mathematics help room in T-103 is a room staffed by mathematics faculty and teaching assistants where students may gather to ask questions, work on homework, and view exams. *Students are also invited to seek out instructors in their offices.*

S1 K. Aker	Mon 13:40-15:30 Wed 13:40-15:30	TZ-19	INSTRUCTOR	OFFICE	E-MAIL
S2 B. Walter	Mon 8:40-10:30 Wed 8:40-10:30	TZ-22	Kürşat Aker	TZ-42	kaker@metu.edu.tr
S3 B. Walter	Mon 13:40-15:30 Wed 13:40-15:30	TZ-07	Benjamin Walter	T-124	benjamin@metu.edu.tr



<u>Week 1</u>	Systems of Linear Equations. Converting to Vector and Matrix Equations Computing LU Decomposition of a Matrix Solving Matrix Equations Using LU Decomposition
<u>Week 2</u>	Approximate Solutions of Linear Systems. Projection and Orthogonalization (<i>QR-Decomposition</i>) Normal Equation and Least Squares
<u>Week 3</u>	1-Dimensional Structures. Adjacency Matrices (Edge-Edge, Edge-Node, Node-Node) Structure Equilibrium via the Stiffness Matrix
<u>Week 4</u>	2-Dimensional Structures. Nullspace of Adjacency Matrix & RowSpace of Force Matrix Structure Equilibrium and Collapse Mechanisms
<u>Week 5</u>	1-Dimensional Vibrations. Eigenvalues and Eigenvectors (<i>Diagonalization</i>) Eigenvalues of Adjacency Matrix Markov Processes
<u>Week 6</u>	Principal Component Analysis. Singular Value Decomposition Positive Definite Matrices
<u>Weeks 7-9</u>	Discretization of Functions. Initial Value Problems and Euler's Method Matrices Corresponding to Differentiation Operators Boundary Value Problems and Discretization of Differential Equations Inverses and Delta Functions
<u>Weeks 10-14</u>	Fourier Series . (Projection onto sin, cos, Complex Exponential) Continuous and Discrete Fourier transforms Fast Fourier Transform Convolution, Filters, and Signal Processing

Important Dates

- **February 22:**
Classes Start
- **February 29-March 4:**
Add-Drop period
- **April 25-29:**
Withdrawal period
- **May 19:**
HOLIDAY (Thursday)
- **May 27:**
Classes End
- **May 30-June 11:**
Finals Period
- **June 18:**
Grades Announced