Middle East Technical University  
Electrical and Electronics Engineering Department  

EE 202  
CIRCUIT THEORY II

**Instructors**

- Section 1: Çağatay Candan, EZ-11A, [web page](#)  
- Section 2: Zafer Ünver, D-207, [web page](#)  
- Section 3: Barış Nakiboğlu, C-207, [web page](#)  
- Section 4: Emre Tuna, C-103, [web page](#)  
- Section 5: Çağatay Candan, EZ-11A, [web page](#)

**Assistants**

- Gökhan Çakal, ARC-300, [web page](#)  
- Nurullah Gülmüş, D-228, [web page](#)  
- Serhat Özküçük, C-114, [web page](#)

**Reference Texts**


**Lectures and Office Hours**

At the beginning of each week lecture videos, reading assignments, and suggested problems for the week will be announced on EE 202 all sections class page on ODTUclass. Instructors will organize office hours; follow the announcements on the ODTUclass page of your section for the links, updates, and further instructions.

**Grading**

Three midterm examinations (20% each) and final examination (40%).

**Final Examination Policy**

A student

- i. missing any midterm examination without a valid excuse,  
- ii. having an average of less than 20 over 100 considering the 3 midterm examinations

will not be admitted to the final examination and will receive NA grade.

**Course Web page**  
[http://odtuclass.metu.edu.tr/](http://odtuclass.metu.edu.tr/)
Course Outline

I. Coupled Inductors (2 Hrs.)
1. Linear time-invariant (LTI) coupled (mutual) inductors; power and energy; passivity;
   initial condition models; series and parallel connections of branches; equivalent models.
2. Analysis of simple circuits with LTI coupled inductors.
3. Time-varying and nonlinear coupled inductors.

II. State Equations (8 Hrs.)
2. Complex frequency; complex exponential function.
3. Natural frequencies.
   Bounded/unbounded responses; modes and mode excitation.
   Phasors; KVL and KCL in the phasor domain; phasor domain elements,
   impedance and admittance; phasor domain circuits.

III. Analysis of LTI Dynamic Circuits (8 Hrs.)
1. Laplace transformation.
   Real rational functions; poles and zeros; partial fraction expansion.
2. Solution to state-equation by Laplace transformation.
3. Node, modified (polynomial) node, and mesh analyses.

IV. Sinusoidal Steady-State (SSS) Analysis (12 Hrs.)
1. Periodic functions; average and effective values.
2. Responses of LTI dynamic circuits to sinusoidal excitations; transient/steady-state responses.
3. Analysis of phasor domain circuits; phasor diagrams.
5. Superposition in the SSS.
6. Instantaneous, average, complex, real, reactive, and apparent powers;
   power factor; conservation of power.
7. Power calculations in the SSS; superposition in power calculations.
8. Power factor correction.
9. Maximum power transfer.

V. Balanced Three-Phase Circuits (6 Hrs.)
1. Three-phase voltage sources and loads; Y and Δ connections.
2. Analysis of balanced three-phase circuits; phasor diagrams.
3. Power calculations.

VI. Complex Frequency Domain Analysis (8 Hrs.)
1. Complex frequency domain voltages and currents; KVL and KCL in the complex frequency
domain; complex frequency domain elements, impedance and admittance; complex
frequency domain circuits.
2. Analysis of complex frequency domain circuits.
3. System functions: input and transfer functions; impulse response and
   convolution integral; step response; SSS response.

VII. Frequency Response (12 Hrs.)

1. Frequency response functions; magnitude, phase, and group-delay characteristics.
2. First order lowpass, highpass, and allpass passive LC filters.
   Second order lowpass, highpass, bandpass, bandstop, and allpass passive LC and active RC filters.
3. Parallel and series resonance; resonant frequency, quality factor, resonant circuits with finite-Q capacitors and inductors.
4. Magnitude and frequency scalings.
5. Bode plots.