Cím	*Electrical Engineering 2*
Tárgykód	*IVB469ANVM*
Heti óraszám: ea/gy/lab	*2/3/0*
Kreditpont	*5*
Szak(ok)/ típus	*Electrical Engineering (BsC)*
Tagozat	
Követelmény	*signature with exam grade*
Meghirdetés féléve	*2*
Előzetes követelmény(ek)	*Electrical Engineering 1*
Oktató tanszék(ek)	*Dept. of Electrical Networks*
Tárgyfelelős és oktatók	*Dr. Istvan GYURCSEK*

TANTÁRGY CÉLKITŰZÉSE

Electric circuit theory and electromagnetic theory are the fundamental principles upon, which many branches of engineering are built. Therefore, the basic electric circuit theory is not only the one of the most important courses for students learning information technology, electrical engineering but always an excellent starting point for the beginnings in all kind of engineering education.

Circuit theory is also valuable for students specializing in other branches of the physical sciences because circuits are good model for the study of energy systems in general, and because the applied mathematics, physics, and topology involved.

In different branches of engineering, we are often interested in communicating or transferring energy from one point to another. To do this an interconnection of electrical devices is required. The interconnection is referred as an electric circuit and each component of the circuit is known as an element.

This course is the short collection of the fundamental principles is given helping to understand the basics of practical electricity i.e. the basics of electric circuits.

TARTALMA

Short description:

This subject covers the fundamental principles of the electricity that is required to the study of students attending the B.Sc. program. It aims to increase students' knowledge and expertise and determine whether they satisfy the requirements of the course. The aim of the subject either is to convey fundamental knowledge on the advanced AC circuit analysis examining three-phase circuits, frequency responses and resonance behaviors, followed by first- and second order dynamic circuits. The aim of the subject is also to convey knowledge on methods of the general circuit analysis applying integral transform methods like Laplace transform and Fourier transform.

Syllabus:

Lectures:

The semester is divided into the following principle periods and attendant exercises. The rough outline of the schedule is summarized as below:

ADVANCED AC CIRCUITS

Sinusoidal steady-state analysis (nodal analysis, mesh analysis, superposition theorem, source transformation, Thevenin and Norton equivalent circuits, op amp AC circuits)
Magnetically coupled circuits (mutual inductance, energy in a coupled circuit, linear transformers, ideal transformers, three-phase transformers, applications) (examples)
Frequency response (transfer function, decibel scale, Bode plots) (examples)
Resonance circuits (series and parallel resonances, passive and active filters, applications) (examples)
Multi-wave signals and circuits (trigonometric and exponential Fourier series, symmetry considerations, frequency spectra, circuit applications, average power and RMS values) (examples)

TWO-PORT CIRCUIT ANALYSIS

Two-port networks (impedance and admittance parameters, hybrid parameters, transmission parameters, relationships between parameters, interconnection of networks, symmetric two-ports, applications) (examples)

DYNAMIC CIRCUITS

First-order circuits (source-free RC and RL circuits, singularity functions, step response of RC and RL circuits, applications) (examples)
Second-order circuits (finding initial and final values, source-free series and parallel RLC circuits, step response of a series and parallel RLC circuits, general second-order circuits, electrical duality, applications) (examples)

INTEGRAL TRANSFORMS IN CIRCUIT ANALYSIS

The Laplace transform (definitions, properties, inverse Laplace transform, , application to integrodifferential equations, convolution integral, circuit element models, circuit analysis, transfer functions in s-domain) (examples)
The Fourier transform (definitions, properties, circuit applications, Parseval's theorem, comparing the Fourier and Laplace transforms, applications) (examples)

Seminars/Labs:

Seminars are scheduled in accordance with the lectures.

Detailed timetable of the semester is the following.

Week	Topic	Communications (MS Teams)	Sources (NMS docs)	Additional materials	Skill check (NMS, UniPoll)
1	Solid state circuit analysis	Online presentation Online consulting	5.10-SSA.pdf	(2) Chapter 5 (3) Chapter 10	NMS voting
2	Resonance circuits	Online presentation Online consulting	5.20L-RES.pdf	(2) Chapter 10	NMS voting
3	Magnetically coupled circuits	Online presentation Online consulting	5.30-TRF.pdf	(3) Chapter 13 (2) Chapter 8	NMS voting
4	Frequency response	Online presentation Online consulting	5.40-FRQ.pdf	(3) Chapter 14 (2) Chapter 9	NMS voting
5	Mid-term test	MS Teams meeting	-	-	UniPoll E-exam
6	Two-port networks	Online presentation Online consulting	5.60-TWO.pdf	(3) Chapter 19 (1) Chapter 6 (2) Chapter 12	NMS voting
7	Break	-	-	-	-
8	First-order circuits	Online presentation Online consulting	6.10-FOC.pdf	(3) Chapter 7 (1) Chapter 7 (2) Chapter 13	NMS voting
9	Second-order circuits	Online presentation Online consulting	6.30-SOC.pdf	(3) Chapter 8 (2) Chapter 14	NMS voting
10	Calculation examples	Online presentation Online consulting	NMS docs	NMS docs	NMS voting
11	Mid-term test	MS Teams meeting	-	-	UniPoll E-exam
12	Fourier series	Online presentation Online consulting	5.50-FRS.pdf	(3) Chapter 17 (2) Chapter 11	NMS voting
13	Laplace transform	Online presentation Online consulting	7.10-LPT.pdf	(3) Chapter 15-16 (2) Chapter 15	NMS voting
14	Fourier transform	Online presentation Online consulting	7.30-FRT.pdf	(3) Chapter 19 (2) Chapter 16	NMS voting
15	Retake mid-terms	MS Teams meeting	-	-	UniPoll E-exam

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE

Attendance:

Attending is required all classes, in accordance with the rules of the online education and will impact the grade. Unexcused absences will adversely affect the grade and in case of absence from more than 30% of the total number of lessons will be grounds for failing the class. To be in the class at the beginning time and stay until the scheduled end of the lesson is required. Tardiness of more than 20 minutes will be counted as an absence. In the case of an illness or family emergency the student must present a valid excuse, such as a doctor's note.

The highest possible grade on the late performance (in two weeks) is '2'

Signature / Mid-semester grade:

The requirement is two approved mid-term studies, scheduled during the semester and the written examination scheduled for the exam terminus.

Exam: **online written**/oral, approval limit: min.:51 %

Grade of exam:

The grade of the examination will be based on the following guidelines:

5. Outstanding work. Execution of work is thoroughly complete and demonstrates a superior level of achievement overall with a clear attention to details. The student is able to synthesize the course material with new concepts and ideas in a thoughtful manner and is able to express those ideas in clear way.

4. High quality work. Student work demonstrates a high level of knowledge with consistency. The student demonstrates a level of thoughtfulness in addressing concepts and ideas. Work demonstrates excellence but less consistency than a '5' student.

3. Satisfactory work. Student work addresses all of the task and assignment objectives with few minor or major problems.

2. Less than satisfactory work. Work is incomplete in significant ways and lacks attention to details.

1. Unsatisfactory work. Work exhibits several major and minor problems with basic conceptual premise, lacking both intention and resolution. Results are severely lacking and are weak in clarity and completeness.

Grading Scale:

Numeric Grade	5	4	3	2	1
Evaluation interval	90-100%	76-89%	63-75 %	51-62 %	0-50 %

KÖTELEZŐ ÉS AJÁNLOTT IRODALOM

[1]   Dr. Gyurcsek – Dr. Elmer: Theories in Electric Circuits, GlobeEdit, 2016
        ISBN:978-3-330-71341-3
[2]   Dr. Gyurcsek: Electrical Circuits – Exercises, FEIT, University of Pécs, 2019
        ISBN:978-963-429-385-9
[3]   Ch. Alexander, M. Sadiku: Fundamentals of Electric Circuits, 6th Ed., McGraw Hill NY 2016
        ISBN: 978-0078028229
[4]   Neptun Meet Street (NMS) docs related to the subject