

# OPERATIONAL AMPLIFIERS AND THEIR APPLICATIONS

1	Course Title:	OPERATIONAL AMPLIFIERS AND THEIR APPLICATIONS	
2	Course Code:	EEM4313	
3	Type of Course:	Optional	
4	Level of Course:	First Cycle	
5	Year of Study:	4	
6	Semester:	7	
7	ECTS Credits Allocated:	4.00	
8	Theoretical (hour/week):	3.00	
9	Practice (hour/week):	0.00	
10	Laboratory (hour/week):	0	
11	Prerequisites:		
12	Language:	Turkish	
13	Mode of Delivery:	Face to face	
14	Course Coordinator:	Doç. Dr. ABDURRAHMAN GÜNDAY	
15	Course Lecturers:	-	
16	Contact information of the Course Coordinator:	E-posta: agunday@uludag.edu.tr Tel: (224) 29 42791 Adres: Elektrik - Elektronik Mühendisliği Bölümü 3. Kat, No: 304	
17	Website:		
18	Objective of the Course:	Ensuring the students to learn the circuits structures of OpAmp such as summing and difference amplifiers, differentiator-integral amplifiers, logarithmic, anti-logarithmic amplifiers and filter-oscillator amplifiers circuits. In addition to this, teaching to the students how to be calculated and analyzed the slew rate (SR), differential and Common Mode output voltages, input bias current and offset voltages.	
19	Contribution of the Course to Professional Development:	Comprehend the Operational Amplifier circuits structures and use all them in the practical studies.	
20	Learning Outcomes:		
		1	Ability to apply theoretical and practical knowledge for modeling and solving engineering problems in the field of operational amplifiers and applications
		2	Ability to solve, formulate and identify complex engineering problems encountered in the field of operational amplifiers by selecting the appropriate analysis and modeling methods
		3	Ability to design complex system in operational amplifiers under realistic constraints and conditions by applying modern design methods
		4	Ability to develop, select and use modern techniques and tools for operational amplifiers
		5	Ability to interpret the results and collect data for analysing engineering problems in the field of operational amplifiers.
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21	Course Content:		

	Course Content:			
Week	Theoretical	Practice		
1	Operational amplifiers and their characteristic properties			
2	Open and close loop operation, voltage gain, offset voltage, negative and positive feedback concepts			
3	Inverting and non-inverting amplifiers (OpAmps)			
4	Summing and difference amplifiers (OpAmps)			
5	Summing and difference amplifiers (OpAmps)			
6	OpAmp curent-voltage converter circuits			
7	Voltage follower and comparator amplifiers (OpAmps)			
8	Midterm Exam + Review of Past Lectures			
9	Differentiator and integral amplifiers (OpAmps)			
10	Logarithmic and anti-logarithmic amplifiers (OpAmps)			
11	OpAmp filter circuits			
12	OpAmp filter circuits			
13	OpAmp oscillator circuits			
14	OpAmp oscillator circuits			
Activites		Number	Duration (hour)	Total Work Load (hour)
Theoretical		20	3.00	42.00
Practicals/Labs		0	0.00	0.00
Self study and preperation		University, Istanbul, 1998	28.00	28.00
Homeworks		0	0.00	0.00
Projects		0	0.00	0.00
Field Studies		0	0.00	0.00
Midterm Assessment		1	20.00	20.00
Others		0	0.00	0.00
Final Exams		1	30.00	30.00
Midterm Exam		1	40.00	40.00
Total Work Load				140.00
Quiz		0	0.00	0.00
Total work load/ 30 hr				4.00
Home work project		0	0.00	0.00
ECTS Credit of the Course				4.00
Final Exam		1	60.00	60.00
Total		2	100.00	100.00
Contribution of Term (Year) Learning Activities to Success Grade		40.00		
Contribution of Final Exam to Success Grade		60.00		
Total		100.00		
Measurement and Evaluation Techniques Used in the Course		Measurement and evaluation are performed according to the Rules & Regulations of Bursa Uludağ University on undergraduate and graduate educations.		
24	ECTS / WORK LOAD TABLE			

25	CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS															
	PQ1	PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ10	PQ11	PQ12	PQ13	PQ14	PQ15	PQ16
ÖK1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK2	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK3	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK4	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
ÖK5	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
LO: Learning Objectives    PQ: Program Qualifications																
Contribution Level:	1 very low			2 low			3 Medium			4 High			5 Very High			