# OPERATIONAL AMPLIFIERS AND THEIR APPLICATIONS

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| 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: | Dr. Ögr. Üyesi ABDURRAHMAN GÜNDAY | |
| 15 | Course Lecturers: | | |
| 16 | Contact information of the Course Coordinator: | E-posta:agunday@uludag.edu.tr<br>Tel: (0 224) 294 2791 - 42791<br>Adres: Elektrik - Elektronik Mühendisliği Bölümü 3. Kat, No: 304 | |
| 17 | Website: | | |
| 18 | Objective of the Course: | Ensuring the students to learn the circiuts structures of OpAmp sucah as summing and difference amplifiers, differentiator-integral amplifiers, logaritmic, anti-logaritmic amplifierr and filter-oscillator amplifiers circuits. In addition to this, teaching to the students how to be calculated and analyzed the slew rate (SR), diffecrential and Common Mode output voltages, input bias curent 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 develope, 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 | 14 | 3.00 | 42.00 |
| Practicals/Labs | 0 | 0.00 | 0.00 |
| Self study and preperation | 14 | 2.00 | 28.00 |
| Homeworks | 0 | 0.00 | 0.00 |
| Projects | 0 | 0.00 | 0.00 |
| Field Studies | 0 | 0.00 | 0.00 |
| Midterm exams | 1 | 20.00 | 20.00 |
| Others | 0 | 0.00 | 0.00 |
| Final Exams | 1 | 30.00 | 30.00 |
| Total Work Load | | | 120.00 |
| Total work load/ 30 hr | | | 4.00 |
| ECTS Credit of the Course | | | 4.00 |

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Üniversitesi, İstanbul, 1998.
5. R. Boylestad and L. Nashelsky: Electronic Devices and

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| **23** | Assessment | **R** |
| Midterm Exam | 1 | 40.00 |
| Quiz | 0 | 0.00 |
| Home work project | 0 | 0.00 |
| Final Exam | 1 | 60.00 |
| Total | 2 | 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 | | Mid-term and final exams and homeworks related to the course content. |
| **24** | **ECTS / WORK LOAD TABLE** | |

| 25 | CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS | | | | | | | | | | | | | | | |
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| | **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** | | | | |