Universidad Carlos III de Madrid
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| COURSE: ELECTRONIC SYSTEMS | | |
|---|---|---|
| DEGREE: TELECOMUNICATION TECHNOLOGY / BIOMEDICAL ENGINEERING | YEAR: 3 | TERM: 1 |

**WEEKLY PLANNING**

| WEEK | SESSION | DESCRIPTION | GROUP | | | Session needs 2 teachers | WEEKLY PROGRAMMING FOR STUDENT | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | LECTURES | SEMINARS | | | DESCRIPTION | CLASS HOURS | HOMEWORK HOURS |
| 1 | | **Introduction** | X | | | NO | Review of theory covered in Chapter 1. Complete proposed application examples (analysis of feedback amplifiers) (amplifiers analysis and Bode diagram representation) | | **6** |
| 1 | 1 | **Chapter 1: Revision of the Basic Concepts of Electronic Amplifiers**<br>Gain, input and output impedances, bandwidth<br>Single stage amplifier: bias, gain, bandwidth<br>Multistage amplifier: charge effects | | X | | NO | | 1.67 | |
| 2 | 2 | **Chapter 2: Feedback Electronic Circuits. (I)**<br>1. Basic concepts of the theory related to feedback electronics.<br>2. Electronic feedback circuit topologies:<br>- Series-Shunt, Shunt-Shunt, Shunt-Series, Series-Series topologies.<br>3.Calculation of the gain, input impedance and output impedance in feedback circuits. | X | | | NO | Study of the theory covered in Chapter 2. Complete proposed application examples (analysis of feedback amplifiers). | 1.67 | **6** |
| 2 | 3 | **Exercises related to Chapter 2 (I): Feedback Electronic Circuits.**<br>1. Conception of the practical or approximate method used to solve negative feedback circuits<br>2. Examples | | X | | NO | | 1.67 | |
| 3 | 4 | **Chapter 2: Feedback Electronic Circuits (II).**<br>3. Basic configurations of the beta network according to the different topologies.<br>4. Study of feedback circuits for each one of the different topologies. | X | | | NO | Complete proposed application examples of Chapter 2 (analysis of feedback amplifiers) | 1.67 | **6** |
| 3 | 5 | **Exercises related to Chapter 2 (II):**<br>Exercises and problems related to real feedback circuits. | | X | | NO | | 1.67 | |
| 4 | 6 | **Chapter 3. Frequency Analysis of Electronic Feedback Circuits.**<br>1. Frequency analysis of a feedback amplifier:<br>- With 1, 2 and 3 poles<br>2.-Stablility study of a feedback amplifier using the Bode diagram | X | | | NO | Study of the theory covered in Chapter 3 | 1.67 | **7** |
| 4 | 7 | **Chapter 3: Frequency Analysis of Feedback Electronic Circuits**<br>3. Compensation Methods. Exercices -Beta network modification.<br>- Dominant pole compensation.<br>- Pole – Zero compensation. | | X | | NO | | 1.67 | |
| 5 | 8 | **Chapter 4. Sinusoidal Oscillators (I)**<br>1. Start up condition and oscillator maintenance.<br>2.General configuration of an oscillator.<br>3. RC oscillators:<br>- Wien Bridge Oscillator.<br>- Phase shift network oscillator.<br>4. Amplitude limiters | X | | | NO | Study of the theory covered in Chapter 4.<br>Complete proposed application examples of Chapter 3 (stability study and frequency compensation methods for feedback amplifiers) | 1.67 | **6** |
| 5 | 9 | **Exercises Chapter 3** | | X | | NO | | 1.67 | |
| 6 | 10 | **Chapter 4: Sinusoidal Oscillators (II)**<br>5. LC Oscillators:<br>- Colpitts Oscillator.<br>- Hartley Oscillator.<br>- Clapp Oscillator.<br>6. Crystal Oscillators (Xtal)<br>- Crystal characteristics (Xtal) piezoelectrics.<br>- Series and shunt crystal resonant frequencies.<br>- Crystal oscillator schemes | X | | | NO | Study and exercies of Chapter 4 (sinusoidal oscillator analysis)<br>**Exam 1 preparation** | 1.67 | **7** |
| 6 | 11 | **Application Exercises for Chapter 4: Problems RC, LC and Xtal Oscillators.** | | X | | NO | | 1.67 | |

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| 7 | 12 | **Chapter 5: Operational Amplifier and Application Circuits, and examples (I)**<br>1. Ideal Operational Amplifier (review)<br>2. Real Operational Amplifier<br>- DC Errors (voltage Offset, bias currents and Offset)<br>- Medium frequency characteristics (input and output resistance, differential gain, CMRR)<br>- Maximum output current<br>- Gain Bandwidth Product (GxBW)<br>- Slew Rate (SR)<br>**Exam 1 (50 min) Chapters 2-4** | X | | | NO | Study of the theory covered in Chapter 5. Complete proposed application examples (real opamps, linear and non-linear application circuits) | 1.67 | **5** |
| 7 | 13 | **Chapter 5: Operational Amplifier and Application Circuits, and examples (II)**<br>Active filters as linear application<br>- Ideal and real integrator. Ideal and real Differentiator<br>- First order circuits. Low pass, High pass, PI<br>- Second order circuits. Sallen-Key | | X | | NO | | 1.67 | |
| 8 | 14 | **Chapter 5: Operational Amplifier and Application Circuits, and examples (IV)**<br>Non linear applications<br>- Simple comparator<br>- Comparator with hysteresis (Schmitt Trigger)<br>- Relaxation oscillator | X | | | NO | Study of the theory covered in Chapter 5. Complete proposed application examples (active filters, comparators and relaxation oscillators) | 1.67 | **7** |
| 8 | 15 | **Exercises for Chapter 5** | | X | | NO | | 1.67 | |
| 9 | 16 | **Chapter 6. The 555 integrated timer and Examples**<br>- Structure and functioning principles<br>- Monostable<br>- Astable and VCO<br>- Application examples | X | | | NO | Study of the theory covered in Chapter 6 (applications of 555 timer)<br>**Lab Session 1 preparation** (detailed reading of manual and development of previous calculations) | 1.67 | **6** |
| 9 | 17 | **Lab Session 1** | | X | LAB | YES | | 2.50 | |
| 10 | 18 | **Chapter 8: Linear Voltage Regulators and Switching DC/DC Converters (I).**<br>- Series – Shunt feedback in linear voltage regulators.<br>- Basic design of a linear voltage regulator.<br>- Power and efficiency calculations. | X | | | NO | Study of the theory covered in Chapter 8 (Linear Voltage Regulators).<br>**Lab Session 2 preparation** (detailed reading of manual and development of previous calculations). | 1.67 | **7** |
| 10 | 19 | **Lab Session 2** | | X | LAB | YES | | 2.50 | |
| 11 | 20 | **Chapter 8: Linear Voltage Regulators and Switching DC/DC Converters (II).**<br>- Fundamentals of switching DC/DC Converters.<br>- Basic operation of Buck converter. | X | | | NO | Study of the theory covered in Chapter 8 (switching DC/DC Converters). Complete proposed application examples (Linear Voltage Regulators and Switching DC/DC Converters). | 1.67 | **6** |
| 11 | 21 | **Application Exercises for Chapter 8: Linear Voltage Regulators and Switching DC/DC Converters.**<br>- Basic design of Buck converter.<br>- Negative feedback in a switching DC/DC Converters. | | X | | NO | | 1.67 | |
| 12 | 22 | **Chapter 7: PLLs (I)**<br>- Blocks diagram and working principle.<br>- PLL components: phase detector, filter (first order), VCO.<br>- PLL transfer function. PLL types. | X | | | NO | Study of the theory covered in Chapter 7. Complete proposed application examples (PLL components: phase detector, filter (first order), VCO).<br>**Lab Session 3 preparation** (detailed reading of manual and development of previous calculations) | 1.67 | **5** |

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| 12 | 23 | **Lab Session 3** | | X | LAB | YES | **Exam 2 preparation** | 2.50 | |
| 13 | 24 | **Chapter 7: PLLs (II)**<br>- 1st order PLL. Examples.<br>- 2nd order PLL. Examples.<br>- PLL Applications.<br>**Exam 2 (50 min) Chapters 5,6,8.** | X | | | NO | Study of the theory covered in Chapter 7. Complete proposed application examples (1st and 2nd order PLLs and PLL applications) | 1.67 | **5** |
| 13 | 25 | **Application Exercises for Chapter 7: PLLs** | | X | | NO | | 1.67 | |
| 14 | 26 | **Chapter 9: energy systems for Telecommunications. Specifications, regulations and Topologies.**<br>- DC/DC and AC/DC Converters for Telecommunications.<br>- Uninterruptible power supply systems (UPS) for Telecommunications.<br>**Chapter 10: Energy Converters. Solar photovoltaic, eolic, others.**<br>- Basic analysis of a photovoltaic generator<br>- Basic analysis of the eolic generator.<br>- Description of other Systems related to electrical energy generation. | X | | | NO | Study of the theory covered in Chapter 9 and 10.<br>Lab Session 4 preparation (detailed reading of manual and development of previous calculations).<br>**Lab final report generation.** | 1.67 | **6** |
| 14 | 27 | **Lab Session 4. Lab exam.** | | X | LAB | YES | | 2.50 | |
| | | | | | | | | 48.33 | 85 |
| | | | | | | | **Subtotal 1** | 133.33 | |
| 15 | | Tutorials, handing in, etc | | | | | Tutorial | 1.67 | |
| 16 - 18 | | Assessment | | | | | | 3 | 12 |
| | | | | | | | **Subtotal 2** | 16.67 | |
| | | | | | | | | | |
| **TOTAL** *(Total 1 + Total 2. Maximum 180 hours )* | | | | | | | | **150.00** | |