SUBJECT TEACHING GUIDE

1090 - Telecommunication Systems

Master's Degree in Telecommunication Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Master's Degree in Telecommunication Engineering			Type and Year	Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline					
Course unit title and code	1090 - Telecommunication Systems				
Number of ECTS credits allocated	5	Term		Semester based (1)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES
Name of lecturer	MARIA ISABEL PONTON LOBETE
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Other lecturers	AMPARO HERRERA GUARDADO

3.1 LEARNING OUTCOMES
- Knowledge of telecommunications systems, in particular satellite communications systems. Performance of orbit calculations and link balance calculations.
- Ability to design and size the communications system, choosing the necessary components to meet the specifications.
- Knowledge of modeling techniques and study of RF system characteristics.
- Operation of a simulation environment and its techniques for simulation of mixed systems: RF and microwave to baseband.
- Handling of measurement equipment and characterization of a mixed system: RF and microwave baseband.

4. OBJECTIVES
Design and dimension a satellite communications system according to the application.
To know the basic magnitudes of communications systems in mixed environments: RF and microwave with baseband.
Characterization of communications systems in mixed environments: RF and microwave with baseband.

6. SUBJECT PROGRAM	
CONTENTS	
1	Introduction: Origin and history of satellite communications. Current status and prospects of satellite communications. Organizations. Satellite telecommunication services. Assigned frequency bands. Basic elements: space and ground segments. Services.
2	Propagation. Losses. Attenuation. Polarization change due to rain. Faraday rotation in the ionosphere. Effects of rain, Sun and Moon. Transmission losses. Atmospheric losses. Antenna temperature. System noise temperature. G/T ratio in earth stations. Uplink and downlink balance Intersatellite links. Signal to noise ratios.
3	Orbital aspects - Orbital mechanics. Orbit description. Position of the satellite in the orbit. Location of the satellite with respect to the Earth. Orbital elements. Types of orbits.
4	Satellite subsystems. Orbital and position control subsystem. Telemetry, telecommand and control subsystems. Power subsystem. Communications subsystem: Transparent repeater, regenerative repeaters. Frequency bands. Transponder characteristics. Antenna subsystem: aperture antennas, gain and coverage area. Earth stations. Antennas for earth stations. Recommendations. Figure of merit. Earth station equipment.
5	Examples of links .- Intelsat links. Domestic satellites with small stations. Direct TV broadcasting direct TV broadcasting, DBS. Low speed satellite design. VSAT
6	Design and simulation of a satellite communications link. Design and define a QPSK modulator (2 weeks), define and simulate the RF chain for the transmitter and receiver with commercial components (3 weeks). Integrate the Baseband and RF subsystems (2 weeks), Integrate the entire transmitter-receiver chain (2 weeks).
7	Measurement of the designed equipment, RF blocks and baseband (2 weeks), measurements of the integration of the whole system (2 weeks).

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Individual Projects. Individual assignments will be carried out throughout the term with dates to be determined. Students will be given the option to correct their mistakes and re-submit the assignments. The individual work will include a work on orbital	Others	No	Yes	34,00
Laboratory practices. The minimum grade must be 5 to average with the rest. They will be carried out throughout the four-month period. Students will be given the option to improve the practicals and make a new delivery.	Others	No	Yes	36,00
Final exam. It will be held approximately the first week of February. The minimum grade is a 5/10, i.e. 1.5/3 to be able to average it with the rest of the grades of the continuous evaluation. The exam can be recovered by taking a new written exam.	Written exam	Yes	Yes	30,00
TOTAL				100,00

Observations

The subject is organized to be evaluated with the continuous evaluation method, the simulation practices and laboratory measurements are mandatory, as well as the final written exam. In the continuous evaluation, individual projects, class activities and practical sessions in the laboratory, which will be assessed throughout the course, will account for 70% of the final grade. Specifically, individual work will have a weight of 34% of the final grade and laboratory practices 36%. The remaining 30% corresponds to the final exam.
Students who have not passed any of the partial evaluations or do not follow the continuous evaluation method will have to take two exams. One corresponding to the practices of the subject whose weight of the final grade is 36% and another exam related to theoretical concepts and calculations that will consist of two parts and whose weight is the remaining 64% of the final grade. In the first part (34%) the student will have to demonstrate the knowledge related to topics of the subject, which are fundamental and basic (and that in the case of the continuous evaluation are evaluated throughout the course). The second part (30%) is equal to the final exam proposed with the continuous evaluation method. The final exams in any of its modalities of continuous evaluation or ordinary evaluation will be recoverable in the extraordinary call.

Observations for part-time students

Students who have chosen the part-time option must take a final exam which weight is 64% of the final grade. The remaining 36% will be obtained from the evaluation of the laboratory practices which are compulsory and recoverable.
The final exam will consist of two parts. In the first part (34%) the student will have to demonstrate the knowledge related to topics of the subject, which are fundamental and basic (and that in the case of the continuous evaluation are evaluated throughout the course). The second part (30%) is equal to the final exam proposed with the continuous evaluation method. The final exams will be recoverable in the extraordinary call.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

RF Circuit Design (Second edition) . Richard Chi-Hsi Li. ED Wiley ISBN 978-118-30990-2 versión Adobe-PDF. ISBN 978-1-118-12849-7 (Version impresa)

RF System Design of Transceivers for Wireless Communications (Qizheng Gu) ED: Springer 2005 ISBN: 978-0387241616