

SUBJECT TEACHING GUIDE

G821 - Electromagnetic and Acoustic Waves

Degree in Telecommunication Technologies Engineering

Academic year 2019-2020

1. IDENTIFYING DATA					
Degree	Degree in Telecommunication Technologies Engineering			Type and Year	Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Electromagnetic and Acoustic Waves Module in Common with the Telecommunications Branch				
Course unit title and code	G821 - Electromagnetic and Acoustic Waves				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES				
Name of lecturer	ALICIA CASANUEVA LOPEZ				
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Other lecturers	TOMAS FERNANDEZ IBAÑEZ JUAN LUIS CANO DE DIEGO				

3.1 LEARNING OUTCOMES

- Learn the basics of the generation and propagation of electromagnetic signals in transmission lines and waveguides . Analyze devices liabilities based on more conventional transmission lines . Knowing the way the acoustic wave propagation and the basics of their generated . Ability to analyze and design systems using acoustic components, devices and electro acoustic systems. Analyze the radiated electromagnetic waves. Generation through antennas, knowing the fundamentals antennas most basic , para different frequency bands.

4. OBJECTIVES

Understanding capacity and master the general laws of electromagnetic and acoustic waves.

Ability to acquire the basics of signal propagation in space, comprising the mechanisms wave propagation and transmission in the art .

Ability to analyze the propagation of sound waves in different physical media

Capacity development of problem solving in the areas of knowledge previous.

Performing simulation of a practical wave transmission system.

Oral defense of the work on propagation of electromagnetic and sound waves..

Specific Skills

Development of a written work and oral presentation of it using new information technologies.

Literature search.

Team work.

Internet search .

Developing a theme using new resources.

LEARNING OUTCOMES OF THE COURSE

To give students a basic training in general aspects of the propagation of electromagnetic and acoustic waves .

OBJECTIVES OF SUBJECT

The overall objective of the course is to get students to understand the electromagnetic propagation and the generation and propagation of acoustic waves. Human acoustic system. Time and frequency characterization of acoustic signals .

Electroacoustic.

6. COURSE ORGANIZATION

CONTENTS

1	<p>CHAPTER 1: REVIEW OF WAVES AND PHASORS Introduction . Dimensions, units and notation. Wave motion. Wavefunction. Harmonic Waves. Speed of a wave. A wave energy . In a sinusoidal wave in Middle losses . Sinusoidal wave in a medium with losses. The electromagnetic spectrum. Review of Phasors.</p> <p>CHAPTER 2: VECTOR ANALYSIS Basic Laws of vector algebra. Position and distance vectors. Vector multiplication. Vector and scalar triple product. Orthogonal coordinate systems. Cartesian coordinates. Cylindrical coordinates . Spherical coordinates. Transformations between coordinate systems. Un gradient scalar field . Properties gradient operator. Divergence of vector field . Gauss theorem . Curl of a vector field. Stokes theorem . Vector identities. Laplacian operator.</p>
2	<p>CHAPTER 3: REVIEW OF ELECTROSTATIC BASICS Maxwell equations. Charge and current distributions. Coulomb's law. Electric field produced by multiple loads. Electric field produced by continuous charge distributions. Gauss' law. Electric scalar potential. Electric potential according to the electric field. Electrical potential produced by point charges. Electrical potential produced by continuous distributions. Electric field depending on the electric potential. Poisson equation. Electrical properties of materials. Conductors. Resistance. Joule law. Dielectrics. Electrical boundary conditions. Border between dielectric and conductor. Border between a driver and another. Capacity. Potential energy.</p> <p>CHAPTER 4: REVIEWING THE BASICS MAGNETOSTATIC Magnetic forces and torque moments. Magnetic force on a current carrying conductor. Magnetic twisting moment on a current-carrying coil. Biot-Savart law. Magnetic field produced by distributions and surface current densities. Magnetic field of a magnetic dipole. Magnetic force between two parallel conductors. Magnetostatic Maxwell equations. Gauss' law for magnetism. Ampere law. Magnetic vector potential. Magnetic properties of materials. Magnetic permeability. Magnetic boundary conditions. Inductance. Magnetic field in a solenoid. Autoinducción. Mutual inductance. Magnetic energy.</p>
3	<p>CHAPTER 5 : MAXWELL EQUATIONS Faraday's law. Stationary loop in a variable magnetic field in time. The ideal transformer . Conductor moving in a static magnetic field . Displacement current . The boundary conditions . Load continuity equation - real. Complex permittivity . Complex permeability.</p> <p>CHAPTER 6: ELECTROMAGNETIC WAVES IN MEDIA Wave equation for free medium loads. Propagation of plane waves in a wave equation for a medium lossless. Uniform plane waves. Relationship Between E and H. Wave polarization: Linear polarization circular and elliptical. Plane wave propagation in media with losses. Low dielectric losses. Good conductor. Electromagnetic power density. The decibel (dB), a logarithmic unit used to describe a ratio.</p> <p>CHAPTER 7: ELECTROMAGNETIC WAVES IN MEDIA AND INTERFACES Normal incidence. Reflection and transmission of oblique incident waves. Snell laws. Perpendicular polarization. Parallel polarization. Reflection coefficient and transmission. Brewster angle.</p> <p>CHAPTER 8: GUIDED WAVES General considerations. The function of the wavelength. Propagation modes. Concentrate element model. Transmission line equations. Wave propagation of a transmission line. Transmission line losses. Loaded transmission line. Reflection coefficient. Standing waves. Input impedance The Line Losses. Special Cases :Lines half wavelength. Quarter wave transformer. Power flow in a transmission line losses sin. Instantaneous power. Average power with respect to time. Examples. Transmission Line: 2 L. Conductors. and homogeneous dielectric. Parallel Plate Line. Coaxial Cable twisted pair. Stripline or Microstripline 2 Conductors and no homogeneous dielectric. Microstrip or microstrip line. Line online slot. Coplanar line. Waveguide. General Relations paragraph E and H. modes. TM modes rectangular waveguides. TE modes una rectangular waveguide. Propagation velocities.</p>

4	<p>CHAPTER 9: RADIATION AND ANTENNA The short dipole. Far-field approximation. Power density. Radiation characteristics of an antenna. Antenna pattern. Dimensions beam. An antenna directivity. Antenna gain. Radiation resistance. Half-wave dipole antenna. Directivity of a dipole. Radiation resistance of a dipole. Monopole antenna quarter wave. Dipole of arbitrary length. Effective area of a receiving antenna. Friis transmission formula. Radiation large aperture antennas. Rectangular opening with uniform distribution in the opening. Beamwidth. Directivity and effective area. Antenna arrays. Settlement of N elements with uniform distribution phase. Electronic tracking arrangements. Uniform amplitude excitation. Feeding an antenna array.</p> <p>CHAPTER 10: SOUND WAVES Introduction. Fundamentals of Acoustics: Sound wave theory. Vibrations and waves. Sound waves. Radiation of sound waves. Transmission and sound absorption. perceptual and cognitive aspects Perceptual aspect : acoustic shows. The ear and hearing: Bands criticism, loudness, pitch, timbre, smoothies, distortion and echoes. Electro: audio amplifiers. Electro acoustics, transducers. Microphones. Speakers. Loudspeakers. Amplifiers.</p>
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7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Description Corresponding exercises Examination (Chapters 1-2)	Written exam	No	Yes	20,00
Description Corresponding exercises Examination (Chapters 3-5)	Written exam	No	Yes	20,00
Description Corresponding exercises Examination (Chapters 6-7)	Written exam	No	Yes	20,00
Description Corresponding exercises Examination (Chapters 8-9-10)	Written exam	No	Yes	20,00
Description Evaluation of laboratory practice and work	Others	No	Yes	20,00
Description Final exam	Written exam	Yes	Yes	0,00
TOTAL				100,00
Observations				
<p>Continuous assessment (Learning Activities): Continuous assessment presupposes regular attendance and all assessment tests. At the end of each topic the student via email will present an exercise in applying the concepts developed in the subject the teacher to be corrected and the end of course deliver a CD with all exercises and corrected, among them the Students will conduct a computer class presentation, which will be assessed by the teacher, valuing the originality of the results, along with the presentation. Final exam: The student who has not passed the continuous assessment will be entitled to take an exam, on the date set for an examination center for the February and one for the September exam is raised. The final grade for the course is set according to: The average of the results obtained in the four tests written note + + work performed note of the evaluation of laboratory practices. Overcoming the subject by continuous assessment required is exceeded each partial evaluation than 3.5 out of 10 rating. The final examination aims to recover any of the written examinations, conducting personal / group work and laboratory practices are not recoverable.</p>				
Observations for part-time students				

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Fundamentos de aplicaciones en electromagnetismo / Fawwaz T. Ulaby.
 5ª ed. Naucalpan de Juárez : Pearson Educación de México, 2007.
 ISBN:978-970-26-1055-7

Fundamentals of applied electromagnetics / Fawwaz T. Ulaby, Eric Michielssen, Umberto Ravaioli.
 Edición: 6th ed. Editorial: Upper Saddle River, New Jersey : Prentice Hall, cop. 2010.
 Sears, Zemansky, Young & Freedman, "Física Universitaria", Ed. Décimo primera. Pearson Education. 2009
 Fundamentos De Acustica por Kinsler, Editorial Limusa S.a De C.v. - Mexico Año de Edición: 1995

