



Course guides

230629 - WAS - Waves and Systems

Last modified: 13/05/2015

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications.

Degree: MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Optional subject).

Academic year: 2015 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: Cardama Aznar, Angel; Jofre Roca, Luis

Others: Cardama Aznar, Angel; Jofre Roca, Luis

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

STUDY LOAD

Type	Hours	Percentage
Self study	86,0	68.80
Hours large group	39,0	31.20

Total learning time: 125 h

CONTENTS

(ENG) 1. The EM spectrum. Communications and sensing. System and channel models

Full-or-part-time: 3 h
Theory classes: 3h

(ENG) 2. Radiation theory: retarded field and moving charges

Full-or-part-time: 3 h
Theory classes: 3h

(ENG) 3. Radiometry and radioastronomy: brightness models and laws, radiotelescopes

Full-or-part-time: 3 h
Theory classes: 3h



(ENG) 4. Wave solutions in time and frequency domains: wave equations, modes and fields

Full-or-part-time: 3 h

Theory classes: 3h

(ENG) 5. Wave polarization and polarimetry: Poincaré sphere, polarization scattering matrix

Full-or-part-time: 3 h

Theory classes: 3h

(ENG) 6. Waves in matter. Conductors, superconductors, dielectrics, ferroelectric

Full-or-part-time: 3 h

Theory classes: 3h

(ENG) 7. Interaction of the EM waves with the human body: Energy and human metabolism.

Full-or-part-time: 3 h

Theory classes: 3h

(ENG) 8. Fourier wave fields.: Propagation and imaging, Diffraction theorem consequences

Full-or-part-time: 3 h

Theory classes: 3h

(ENG) 9. Wave propagation: Reflexion, diffraction, scattering, 2-way model,

Full-or-part-time: 3 h

Theory classes: 3h

(ENG) 10. Time and frequency-variant radio channels: narrow and broadband models

Full-or-part-time: 3 h

Theory classes: 3h

(ENG) 11. Transmitting and receiving antennas: circuital and radiation parameters, feeding

Full-or-part-time: 3 h

Theory classes: 3h

(ENG) 12. Arrays and multi-antenna geometries: antenna and channel models

Full-or-part-time: 3 h

Theory classes: 3h



(ENG) 13. Ultra wideband antennas: standards, antenna and channel models, impulse response

Full-or-part-time: 3 h

Theory classes: 3h

(ENG) 14. Free space optical systems: ray optics, Gaussian beams, laser applications

Full-or-part-time: 3 h

Theory classes: 3h

GRADING SYSTEM

BIBLIOGRAPHY

Basic:

- Staelin, D. Receivers, antennas, and signals [on line]. MIT, 2003 [Consultation: 17/02/2012]. Available on: <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-661-receivers-antennas-and-signals-spring-2003/>.
- Martone, M. Multiantenna digital radio transmission. Boston [etc.]: Artech House, 2002. ISBN 1580533183.

Complementary:

- Orfanidis, S.J. Electromagnetic waves and antennas [on line]. Piscataway, NJ: ECE Department, 2008 [Consultation: 25/02/2015]. Available on: <http://www.ece.rutgers.edu/~orfanidi/ewa/>.
- Saunders, S.R.; Aragón-Zavala, A. Antennas and propagation for wireless communication systems. 2nd ed. Chichester (UK)[etc.]: John Wiley & Sons, 2007. ISBN 9780470848791.
- Cardama, Á. [et al.]. Antenas [on line]. 2a ed. Barcelona: Edicions UPC, 2002 [Consultation: 09/02/2015]. Available on: <http://hdl.handle.net/2099.3/36797>. ISBN 8483016257.