

# Electromagnetic Emissions: Compatibility and Biological Effects

## Overview

This course covers two important fields involving the electromagnetic (EM) emissions of telecommunications equipment, EM compatibility (EMC) and biological effects. On one hand, EMC establishes the ability of the equipment to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment. On the other hand, the course focuses on the existing exposure limitations for humans to EM emissions and their biological and environmental impact. This topic, which popularity has increased proportional to the number of telecommunication applications which make use of the radio frequency spectrum, has particular interest for those applications where the transceiver devices are placed close to the human body. The importance of both fields in recent decades has stimulated the research work in these areas, and the corresponding publication of numerous regulations, guidelines and recommendations.

The syllabus of this course is divided in three sections. The first section includes topics 1 to 3 and provides an introduction to the course and covers the fundamentals on time-varying EM fields and antennas. Topics 4 to 6 focus on EMC including a study of the sources of EM interference, EMC requirements and regulations for electronic devices, and design guidelines for EMC-compliant devices. Finally, topics 7 to 10 cover different aspects related to EM emissions and biological effects such as the effects of non-ionizing radiation, exposure limitations and body-centric wireless communications.

Lecturer: Dr. Alvaro Palomo

Course duration: 5 days

Dates: 14<sup>th</sup> - 20<sup>th</sup> January 2015

Times: 10 am to 4 pm (lunch between 1 pm and 2 pm)

Location: Department of Electronic Engineering, Maynooth University.



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## Learning outcomes:

On successful completion of the module, students should be able to:

1. Explain time-varying EM fields fundamentals.
2. Explain different antenna properties and types of antennas.
3. Describe the main regulations and tests involved in EMC.
4. Analyse the possible internal and external sources of EM interference.
5. Design printed circuit boards compliant with EMC requirements.
6. Explain current research fields in relation to EM emissions and biological effects.
7. Describe the recommendations and regulations in relation to exposure to non-ionizing EM fields.
8. Analyse the factors involved when designing a body-centric wireless communication system.
9. Describe the surveying procedure for a RF antenna installation.

## Course outline:

1. Introduction to EM emissions, compatibility and biological effects
2. Time-varying EM fields
3. Antennas
4. Interference coupling mechanisms
5. EMC for electronic devices
6. EMC design guidelines
7. Biological effects of non-ionizing radiation
8. Limitations of exposure to non-ionizing EM fields
9. Body-centric wireless communications
10. RF coverage surveys

## Assessment:

Continuous assessment (Assignment) 100%

## Teaching & learning methods

Lectures	25 hours
Assignment	40 hours
Independent study	115 hours
<b>Total</b>	<b>180 hours</b>