

# ES4F1-15 Radiowave Propagation and Wireless Communications Theory

**24/25**

**Department**

School of Engineering

**Level**

Undergraduate Level 4

**Module leader**

Christos Mias

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

30% coursework, 70% exam

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

ES4F1 - Radiowave Propagation and Wireless Communications

[Module web page](#)

### Module aims

The module will enable students to carry out project work in radio-wave propagation and wireless communications. It is the module's aim to present fundamental theory and its application in understanding the operation and design aspects of the physical layer of a wireless communications system.

### Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Introduction to the wireless channel and the cellular concept.

Review of electromagnetic waves and antenna fundamentals. Consider antennas above ground.

Radiowave propagation models and propagation mechanisms (such as reflection, diffraction, scattering).

Shielding and absorption of radiowaves.

Basics of wireless channel modelling.

Diversity techniques.

Multiple-input-multiple-output techniques.

Equalizers and other important components of wireless systems

## **Learning outcomes**

By the end of the module, students should be able to:

- Demonstrate mastery in solving radiowave propagation problems involving propagation mechanisms (such as reflection, diffraction and scattering) and antennas. [M1, M2, M4]
- Use software to solve problems involving propagation mechanisms (such as reflection, diffraction and scattering) and/or antennas. Be critical of the limitations of models. [M3]
- With the aid of technical sources of information, solve problems in wireless communications (including efficiency-enhancing wireless techniques) [M1,M2,M4]
- Design parts of a wireless communication system [M3]

## **Indicative reading list**

1. Radio Propagation Measurement and Channel Modelling, S. Salous, Wiley, 2013.
2. Principles of Mobile Communications, 3rd edition, G.L. Stuber, Kluwer, 2012.
3. Wireless Communications: Principles and Practice, 2nd edition, T.S. Rappaport, Pearson,2002.

## **Subject specific skills**

Ability to be pragmatic, taking a systematic approach and the logical and practical steps necessary for, often complex, concepts to become reality

## **Transferable skills**

Numeracy: apply mathematical and computational methods to communicate parameters, model and optimize solutions

Apply problem solving skills, information retrieval, and the effective use of general IT facilities

Plan self-learning and improve performance, as the foundation for lifelong learning/CPD

Exercise initiative and personal responsibility, including time management, which may be as a team member or leader

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## **Study**

## **Study time**

<b>Type</b>	<b>Required</b>
Lectures	30 sessions of 1 hour (20%)
Other activity	2 hours (1%)
Private study	118 hours (79%)
Total	150 hours

### **Private study description**

118 hours of private study

### **Other activity description**

2 x 1 hour Revision Class

### **Costs**

No further costs have been identified for this module.

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### **Assessment**

You must pass all assessment components to pass the module.

### **Assessment group D3**

	<b>Weighting</b>	<b>Study time</b>
Assignment	30%	
Assignment , 10 pages		
Online Examination	70%	
QMP online examination		
~Platforms - AEP,QMP		

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- Online examination: No Answerbook required
- Students may use a calculator

### **Feedback on assessment**

Support through advice and feedback hours.

Written feedback on marked assignment.

Cohort-level feedback on final exam.

## Availability

### Pre-requisites

To take this module, you must have passed:

- All of
  - [ES335-15 Communications Systems](#)

### Courses

This module is Core for:

- Year 4 of UESA-H63X MEng Electronic Engineering
- Year 5 of UESA-H63Y MEng Electronic Engineering with Intercalated Year
- Year 1 of TESA-H641 Postgraduate Taught Communications and Information Engineering

This module is Optional for:

- Year 4 of UESA-H606 Undergraduate Electrical and Electronic Engineering MEng
- Year 5 of UESA-H607 Undergraduate Electrical and Electronic Engineering with Intercalated Year