

# ES4F1-15 Radiowave Propagation and Wireless Communications Theory

**21/22**

**Department**

School of Engineering

**Level**

Undergraduate Level 4

**Module leader**

Christos Mias

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

40% coursework, 60% 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 is 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:

- Acquire specialised knowledge in radiowave propagation.
- Demonstrate mastery in solving radiowave propagation problems involving propagation mechanisms (such as reflection, diffraction and scattering) and antennas.
- Acquire advanced knowledge of efficiency-enhancing wireless techniques
- Evaluate important parts of wireless communications systems
- Advanced understanding of key principles of wireless communications theories
- Design important parts of wireless communications systems
- Use software to solve radiowave propagation problems involving propagation mechanisms (such as reflection, diffraction and scattering) and/or antennas. Be critical of the limitations of empirical and physical path loss models.

## **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

Type	Required
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 D1

	Weighting	Study time	Eligible for self-certification
Assessment component			
Assignment 1	20%		No
Assignment 1, approx. 4.5 pages (or 1125 words)			

Reassessment component is the same

Assessment component

	<b>Weighting</b>	<b>Study time</b>	<b>Eligible for self-certification</b>
Assignment 2	20%		No
Assignment 2, approx. 4.5 pages (or 1125 words)			

Reassessment component is the same

#### Assessment component

Online Examination	60%	No
QMP online examination		
~Platforms - AEP,QMP		

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

Reassessment component is the same

## Feedback on assessment

Support through advice and feedback hours.  
Written feedback on marked assignment.  
Cohort-level feedback on final exam.

[Past exam papers for ES4F1](#)

## 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 Option list A for:

- Year 4 of UESA-H114 MEng Engineering
- Year 4 of UESA-H606 Undergraduate Electrical and Electronic Engineering MEng