

# ES335-15 Communications Systems

**23/24**

**Department**

School of Engineering

**Level**

Undergraduate Level 3

**Module leader**

Yunfei Chen

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

100% exam

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

ES335-15 Communication Systems

[Module web page](#)

### Module aims

The module aims to study communications techniques that send and receive information reliably and efficiently in wired or wireless systems.

### 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.

Communications history and types. Fourier transform for communications. Analogue modulation methods. Comparison of analogue systems. Probability analysis. Optical fibre and optical communication systems.

Introduction to digitalisation: Sampling, Pulse amplitude modulation, Pulse position modulation, Quantisation characteristic, Pulse code modulation, Delta modulation, Bandwidth.

Baseband transmission: Digital signals, Noise and errors, Pulse shaping, ISI, Equalisation, Matched filtering.

Bandpass transmission: Carrier wave modulation, Coherent and non-coherent binary systems, M-ary systems, Comparison of digital systems.

Error-control coding: Definitions, Linear block codes.

Advanced topics: may vary from year to year, could for example include the following: Quadrature carrier systems, Spread-spectrum systems, Cryptography, Fading channels, Compression.

## **Learning outcomes**

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

- Solve communications problems using relevant transforms.
- Design methods for improving system performance based on required specifications.
- Apply fundamental communications theories to evaluate the performance of communications systems.
- Evaluate the main principles of modern optical and electronic communication

## **Indicative reading list**

[1] Haykin & Mohr, Introduction to Analog and Digital Communications, 2nd Ed. John Wiley and Sons, 2007. (ISBN-13: 978-0471432227)

[2] Lathi & Ding, Modern Digital and Analog Communication Systems, 4th Ed. Oxford University Press, 2009. (ISBN-13: 978-0195331455)

[3] Proakis, Digital Communications, 5th Ed. Mc-Graw Hill, 2008. (ISBN-13: 978-0071263788)

[4] Upamanyu Madhow, Introduction to Communication Systems, Cambridge University Press, 2014, ISBN 1107022770

[5] G P Agrawal, Fiber-optic communication systems, 4th Ed. Wiley, 2010. (ISBN: 9780470918517)

[6] Ramaswami, Sivarajan & Sasaki, Optical Networks: A Practical Perspective, 3rd Ed. Morgan Kaufmann, 2009. (ISBN 9780123740922 [TK 5103.8.R2])

## **Subject specific skills**

Ability to conceive and make modulators, filters and other components for communications systems

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

Ability to seek to achieve sustainable solutions to problems and have strategies for being creative and innovative

## **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

Overcome difficulties by employing skills, knowledge and understanding in a flexible manner  
Appreciation of the global dimensions of engineering, commerce and communication

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## Study

### Study time

Type	Required
Lectures	22 sessions of 1 hour (15%)
Seminars	6 sessions of 1 hour (4%)
Practical classes	1 session of 2 hours (1%)
Private study	120 hours (80%)
Total	150 hours

### Private study description

120 Guided Independent learning

## 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.

Students can register for this module without taking any assessment.

### Assessment group B3

	Weighting	Study time
Online Examination	100%	
2 x 1 hour QMP online tests to be scheduled in same time slot with short break in between		
~Platforms - QMP		

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- Online examination: No Answerbook required
- Students may use a calculator
- Engineering Data Book 8th Edition

## Feedback on assessment

Returned feedback on exam result through electronic publications of relevant materials.  
Cohort level feedback on examinations.

[Past exam papers for ES335](#)

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## Availability

### Post-requisite modules

If you pass this module, you can take:

- ES4F1-15 Radiowave Propagation and Wireless Communications Theory

## Courses

This module is Core for:

- Year 3 of UESA-H63W BEng Electronic Engineering
- Year 4 of UESA-H63V BEng Electronic Engineering with Intercalated Year
- Year 3 of UESA-H63X MEng Electronic Engineering
- UESA-H636 MEng Electronic Engineering with Intercalated Year
  - Year 3 of H636 Electronic Engineering with Intercalated Year
  - Year 4 of H636 Electronic Engineering with Intercalated Year
- Year 3 of UESA-H605 Undergraduate Electrical and Electronic Engineering
- Year 4 of UESA-H60V Undergraduate Electrical and Electronic Engineering (with Intercalated Year)
- Year 3 of UESA-H606 Undergraduate Electrical and Electronic Engineering MEng
- Year 4 of UESA-H607 Undergraduate Electrical and Electronic Engineering with Intercalated Year

This module is Core optional for:

- UESA-H636 MEng Electronic Engineering with Intercalated Year
  - Year 3 of H636 Electronic Engineering with Intercalated Year
  - Year 4 of H636 Electronic Engineering with Intercalated Year
- Year 4 of UESA-H63Y MEng Electronic Engineering with Intercalated Year
- Year 3 of UESA-H115 MEng Engineering with Intercalated Year
- Year 3 of UESA-H11L Undergraduate Engineering (with Intercalated Year)
- UESA-H607 Undergraduate Electrical and Electronic Engineering with Intercalated Year
  - Year 3 of H607 Electrical and Electronic Engineering with Intercalated year
  - Year 4 of H607 Electrical and Electronic Engineering with Intercalated year

This module is Optional for:

- Year 3 of UESA-H113 BEng Engineering
- Year 3 of UESA-H114 MEng Engineering
- Year 4 of UESA-H115 MEng Engineering with Intercalated Year
- UESA-H11L Undergraduate Engineering (with Intercalated Year)
  - Year 3 of H11L Engineering (with Intercalated Year)
  - Year 4 of H11L Engineering (with Intercalated Year)

This module is Option list A for:

- Year 4 of UESA-H111 BEng Engineering with Intercalated Year
- UESA-H112 BSc Engineering
  - Year 3 of H112 Engineering
  - Year 3 of H112 Engineering
- Year 3 of UCSA-G406 Undergraduate Computer Systems Engineering
- Year 3 of UCSA-G408 Undergraduate Computer Systems Engineering
- Year 4 of UCSA-G407 Undergraduate Computer Systems Engineering (with Intercalated Year)
- Year 4 of UCSA-G409 Undergraduate Computer Systems Engineering (with Intercalated Year)