

UNIVERSITY OF WARWICK

Proposal Form for New or Revised Modules (MA1 - version 7 - April 2014)

Approval information	
Approval Type	<input type="checkbox"/> New module <input checked="" type="checkbox"/> Revised module <input type="checkbox"/> Discontinue module
Date of Introduction/Change	October 2017
If new, does this module replace another? If so, enter module code and title:	
If revised/discontinued, please outline the rationale for the changes:	Minor revision as part of the curriculum refresh
Confirmation that affected departments have been consulted:	Changes were made in consultations between the School of Engineering and WMG. Computer Science have been consulted via the CSE Steering Group.

Module Summary	
1. Module Code (if known)	ES335
2. Module Title	Communications Systems
3a. Lead department:	School of Engineering
3b. Teaching Split (if known):	100% Engineering
4. Name of module leader	Yunfei Chen
5. Level	UG: <input type="checkbox"/> Level 4 (Certificate) <input type="checkbox"/> Level 5 (Intermediate) <input checked="" type="checkbox"/> Level 6 (Honours) PG: <input type="checkbox"/> Level 7 (Masters) <input type="checkbox"/> Level 8 (Doctoral) See Guidance Notes for relationship to years of study
6. Credit value(s) (CATS)	15
7. Principal Module Aims	The module aims to study communications techniques that send and receive information reliably and efficiently in wired or wireless systems.
8. Principal Learning Outcomes	By the end of the module the student will be able to:

Module Summary	
	<ul style="list-style-type: none"> • 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 • Understand the main principles of electronic communication and the limiting factors • Design different types of simple filters for reliable detection of communications signals
9. Timetabled Teaching Activities (summary)	This module includes 25 hours of lectures, 5 x 1 hours of seminars, and 1 x 3 hours of laboratory session. Total 33 hours
10. Departmental Web-link	http://www2.warwick.ac.uk/fac/sci/eng/eso/modules/year3/es335
11. Other essential notes	Advice and feedback hours for answering questions on the lecture material (theory and examples) and past examination questions
12. Assessment methods (summary)	80% examined via a 3-hour paper and 20% (10 pages) assessed via a telecommunications assignment.

For use by Strategic Planning and Analytics Office only - Do not fill in this section

Level	JACS3 Code	Teaching Split
		<i>If not provided in 3b above</i>

External Credit Level	Scheme

Module Context				
13. Please list all departments involved in the teaching of this module. If taught by more than one department, please indicate percentage split.				
Engineering 100%.				
14. Availability of module				
Degree Code	Title	Study Year	C/OC/A/B/C	Credits
H634	BEng Electronic Engineering	3	Core	15
H635	MEng Electronic Engineering	3	Core	15
H636	MEng Electronic Engineering with an Intercalated Year	3	Core	15
H637	MEng Electronic Engineering with a Year in Research	3	Core	15
H106	BEng Engineering	3	O	15
H107	MEng Engineering	3	O	15
H109	MEng Engineering with an Intercalated Year	3	O	15
H110	MEng Engineering with a Year in Research	3	O	15
G406	BEng Computer Systems Engineering	3	A	15
G408	MEng Computer Systems Engineering	3	A	15
15. Minimum number of registered students required for module to run				
1 (core)				
16. Pre- and Post-Requisite Modules				
ES183 Engineering Mathematics and Systems Modelling, ES2A9 Engineering Mathematics and Technical Computing				

Module Content and Teaching	
17. Teaching and Learning Activities (<i>totals for module – please see guidance</i>)	
Module duration (weeks)	10
Lectures	25 hours
Seminars	5 x 1 hours
Tutorials	0
Project Supervision	0
Demonstration	0
Practical Class/Workshops	1 x 3 hours
Supervised time in studio/workshop	0
Fieldwork	0

Module Content and Teaching		
External visits	0	
Work based learning	0	
Placement	0	
Year abroad	0	
Other activity <i>(please describe): e.g. distance-learning, intensive weekend teaching etc.</i>	Guided independent learning 117 hours 0	
18. Assessment Method (Standard)		
Type of assessment	Length	% weighting
Written Examinations	3 Hours	80%
Practical Examinations		
Assessed essays/coursework	Telecommunication assignment (10 pages)	20%
18a. Final chronological assessment <i>(please see guidance)</i>	Examination	

19. Methods for providing feedback on assessment.

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

20. Outline Syllabus

Communications history and types. Fourier transform for communications. Analogue modulation methods. Comparison of analogue systems. Random signals. Noise processes.

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.

21. Illustrative Bibliography

- [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

22. Learning outcomes

Successful completion of the module leads to the learning outcomes. The learning outcomes identify the knowledge, skills and attributes developed by the module.

Learning Outcomes should be presented in the format "By the end of the module students should be able to..." using the table at the end of the module approval form:

Resources**23. List any additional requirements and indicate the outcome of any discussions about these.**

None.

Approval

24. Module leader's signature	Dr Yunfei Chen
25. Date of approval	Teaching Policy Committee Chair's Action 31 March 2017
26. Name of Approving Committee (include minute reference if applicable)	School of Engineering and WMG Teaching Policy Committee
27. Chair of Committee's signature	Professor Gillian Cooke
28. Head of Department(s) signature	Professor Nigel Stocks

Examination Information		
A1. Name of examiner (if different from module leader)		
A2. Indicate all available methods of assessment in the table below		
% Examined	% Assessed by other methods	Length of examination paper
80	20 Telecommunications Assignment (10 pages)	3 hours
A3. Will this module be examined together with any other module (sectioned paper)? If so, please give details below.		
No.		
A4. How many papers will the module be examined by?	<input checked="" type="checkbox"/> 1 paper <input type="checkbox"/> 2 papers	
A5. When would you wish the exam take place (e.g. Jan, April, Summer)?	Summer	
A6. Is reading time required?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
A7. Please specify any special exam timetable arrangements.		
None.		
A8. Stationery requirements		
No. of Answer books?	1	
Graph paper?	No.	
Calculator?	Yes.	
Any other special stationery requirements (e.g. Data books, tables etc)?	Engineering Data Book.	
A9. Type of examination paper		
Seen?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Open Book?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Restricted?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

Examination Information**If restricted, please provide
a list of permitted texts:**

LEARNING OUTCOMES		
(By the end of the module the student should be able to....)	Which teaching and learning methods enable students to achieve this learning outcome? (reference activities in section 15)	Which summative assessment method(s) will measure the achievement of this learning outcome? (reference activities in section 16)
Solve communications problems using relevant transforms	Lectures, Seminars, and Laboratory	Unseen Examination and Assignment
Design methods for improving system performance based on required specifications	Lectures, Seminars, and Laboratory	Unseen Examination and Assignment
Apply fundamental communications theories to evaluate the performance of communications systems	Lectures and Seminars	Unseen Examination
Understand the main principles of electronic communication and the limiting factors	Lectures, Seminars, and Laboratory	Unseen Examination and Assignment
Design different types of simple filters for reliable detection of communications signals	Lectures and Seminars	Unseen Examination