COURSE SPECIFICATION FORM

for new course proposals and course amendments

Department/School:	**Mathematics**	**Academic Session:**	**2015-16**
Course Title:	Channels	**Course Value:** (UG courses = unit value, PG courses = notional learning hours)	0.5 unit
Course Code:	MT4410	**Course JACS Code:** (Please contact Data Management for advice)	G100
Availability: (Please state which teaching terms)	Term 1	**Status:**	Optional Condonable
Pre-requisites:	MT2320 recommended; MT2800 recommended	**Co-requisites:**	-
Co-ordinator:	-		
Course Staff:	-		
Aims:	To investigate the problems of data compression and information transmission in both noiseless and noisy environments.		
Learning Outcomes:	1. state and derive a range of information-theoretic equalities and inequalities; 2. explain data-compression techniques for ergodic as well as memoryless sources; 3. explain the asymptotic equipartition property of ergodic sources; 4. understand the proof of the noiseless coding theorem; define and use the concept of channel capacity of a noisy channel; explain the noisy channel coding theorem; 5. understand a range of further applications of the theory. 6. demonstrate a breadth of understanding appropriate for an M-level course.		
Course Content:	Entropy: Definition and mathematical properties of entropy, information and mutual information. Noiseless coding: Memoryless sources: proof of the Kraft inequality for uniquely decipherable codes, proof of the optimality of Huffman codes, typical sequences of a memoryless source, the fixed-length coding theorem. Ergodic sources: entropy rate, the asymptotic equipartition property, the noiseless coding theorem for ergodic sources. Lempel-Ziv coding. Noisy coding: Noisy channels, the noisy channel coding theory, channel capacity. Further topics, such as hash codes, or the information-theoretic approach to cryptography and authentication.		
Teaching & Learning Methods:	The total number of notional learning hours associated with this course are 150. 3 hours of lectures per week over 11 weeks. Total 33 hours. 117 hours of private study, including work on problem sheets and examination preparation. This may include discussions with the course leader if the student wishes.		
Key Bibliography:	Codes and Cryptography – D Welsh (Oxford UP 1988), Library reference 001.5436 WEL Elements of Information Theory – T M Cover and J A Thomas (Wiley 1991), Library Reference 001.539 COV Information Theory, Inference, and Learning Algorithms – D J C MacKay (Cambridge UP 2003), Library Reference 001.539 MAC		
Formative Assessment & Feedback:	Formative assignments in the form of 8 problem sheets. The students will receive feedback as written comments on their attempts.		
Summative Assessment:	**Exam:** 100% Written exam. A two hour paper. **Coursework:**		

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