Aston University REG/03/53(2)

Quality and Standards Committee

Module Specification

School and Subject Group		School of Engineering and Applied Science, Electronic Engineering		
Module Code		EE401A		
Module Title		Information Theory and Coding and Traffic Theory		
Module Type		Taught		
Date of introduction of new module		2001		
Level		7	Credit Value	10
Programme(s) in which module is available		MSc in Telecommunications Technology MSc in Telecommunications Technology (Distance Learning) MSc in Data Communications Networks MSc in Data Communications Networks (Distance Learning)		
Involvement of Other Schools		None		
Resource Split				
Name of Module Co-ordinator		Sergei K Turitsyn		
Name of Module Advisor		X. Peng		
Related Modules	Pre-requisites	None		
	Co-requisites	None		
	Prohibited Combinations	None		
Minimum and Maximum Intake Sizes		None – None		

Aims of the Module

Information Theory and Coding To provide a basic understanding of the nature of information, the effects of noise in analogue and digital transmission systems and the construction of both source codes and error-detection/correction codes. This module aims to guide the student through the implications and consequences of fundamental theories and laws of information theory and coding theory with reference to the application in modern communication and computer systems. Practical examples such as detection of errors on credit cards and other applications will be discussed.

Traffic Theory To present the principles of traffic and queuing theory, as related to telecommunications and switching.

Students studying this module will understand the basic principles of teletraffic and queuing theory. They will acquire the elementary tools for quantitative performance analysis of telecommunication networks and systems. They will also be able to perform grade of service calculations and analyse the performance of link systems.

Summary of Content

Information Theory and Coding

- The communication process and the nature of information
- Information sources, measurement of information and the entropy function.
- Sources with and without memory.
- Methods of source encoding. Communication channels; their classification and representation.
- Mutual information.
- The Harley and Shannon laws for channel capacity
- Calculations involving signal-to-noise ratios and error-rates in analogue and digital systems.
- The design of error-detecting and error-correcting codes and the calculation of their effects on error-rates.
- Overview of forward-error correction codes used in fibre optics

Traffic Theory

- The behaviour of telephone traffic: Poisson processes. Inter arrival and call-holding times. Traffic variation and busy hour.
- Equations of state: Concept of statistical equilibrium. Erlang distribution. Time and call congestion. Grade of service.
- Link systems: Probability of blocking. Erlang's lost call formula. Route

Queues: Single server queues. State transition diagrams. The M/M/1 queue. Little's law.

Prerequisits: A basic knowledge of engineering mathematics and principles. Some basic knowledge of probability.

Summary of Methods and Frequency of Teaching	**Lectures** 21 hours. **Tutorials** 3 hours.

Summary of Methods of Assessment

Assessment Type	*Status*	*%*	*Requirements*	*Due*
Coursework	Compulsory	20.0	Continuous Assessment.	11 Mar 2010
Formal Examination	Compulsory	80.0	Final Examination. 1.5hr formal examination	22 Mar 2010

Module Outcomes - what the student should gain from successful completion of the module:	Learning and Teaching and Assessment Strategies to enable outcomes to be achieved and demonstrated	
	Learning and Teaching Methods	Assessment Methods
A. Knowledge and Understanding		
the nature of information, the effects of noise in analogue and digital transmission systems and the construction of both source codes and error-detection and error-correction codes the basic principles of teletraffic and queuing theory	Lectures, Tutorials	Coursework, Formal Examination
B. Intellectual Skills		
C. Professional Skills		
apply their knowledge of the principles underlying modern data networks	Lectures, Tutorials	Coursework, Formal Examination
D. Transferable Skills		

Please provide either or both of:

(i) Introductory Learning Resources	

(ii) Core Texts	1. J.G. Proakis, “Digital Communications”, 4th Edition, McGraw-Hill College, 2000 2. S. Gravano, “Introduction to Error Control Codes”, Oxford University Press, 2001 3. J. E. Flood. “Telecommunications, Switching, Traffic and Networks.”, Prentice Hall. 4. Siemer and Tranter, “Systems, Modulation and Noise”, Houghton-Miflin, 1976. 5. D. Bear. “Principles of Telecommunications Traffic Engineering.” Peter Peregrinus. 6. R.L. Brewster, “Telecommunications Technology”, Ellis Horwood 1986 7. J. G. Proakis and M. Salehi. “Communication Systems Engineering”, Prentice-Hall, 1994
Reading Lists	Attached
Specification completed by:	Dr. John A.R. Williams
Date	22-Apr-2009
Date module approved by Teaching Committee(s)	
Date module approved by School Board(s)	