

**Massey University
College of Sciences
Paper Outline 2009**

Paper Number and Title: 143.332 Communication Systems

Credits Value: 15 **Semester:** One

Campus: Albany/Auckland **Mode:** Internal

Calendar Prescription:

A study of communication systems and their applications in modern engineering. Topics which are studied include signal design, waveform and line coding, multiplexing, modulation schemes, interference, demodulator structures, detectors and optical fibre communications.

Pre- and Co-requisites:

Students should have a background in electronics, mathematics and statistics. Students are assumed to have a working knowledge of MATLAB.

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Aim:

143.332 Communication Systems is a core paper in the Computer & Electronic Engineering (3rd year) and Electronic & Communication Engineering (3rd year) options of the BE degree. The aim of this course is to introduce the student to the key concepts in communication theory and communication systems and to provide an understanding of the theory and some of the methods used to represent, transmit and process electronic signals in communication systems.

Learning Outcomes:

After successful completion of the course students should develop following skills:

1. Knowledge of classifications of signals, Fourier transform and spectra, and linear time-invariant systems
2. Knowledge of modulation techniques, effects of noise in communication systems and demodulation methods.
3. Understanding of basic waveform coding techniques and multiplexing used in communication systems
4. Understanding of the fundamentals of modern broadband communication systems including multicarrier systems and spread spectrum techniques
5. Understanding of fibre optic transmission and optical sources
6. Skills for designing of basic radio systems and multiplexors.

Assessment:

3 Assignments, a Mid-term test, and a Final examination

Analog and Discrete Baseband, Sampling theorem and signal spectrum, Digital waveform encoding: Pulse Code Modulation, Differential PCM, Delta Modulation, Multiplexing. Pulse Shaping, Intersymbol Interference (ISI).

4. Digital Modulation (F. Alam)

Binary modulation schemes: BPSK, FSK and ASK. Multilevel modulation schemes: QPSK, Non-coherent reception and DPSK, Impact of noise on modulation schemes.

5. Spread Spectrum & Multicarrier Communications (X. Gui)

Direct-Sequence Spread-Spectrum, Frequency-Hopped Spread-Spectrum, CDMA, Orthogonal Frequency Division Multiplexing (OFDM).

6. Optical Communications (A. Punchihewa)

Introduction to optical fibre transmission, LASER & LED.

Student Time Budget:

1.	Assessment-related	
	- Assignments	20
	- Preparation for term tests	7
	- Preparation for final examination	42
2.	Formally Scheduled Learning	
	- Lectures	38
	- Tutorials	10
3.	Non-scheduled Learning	
	- Personal study and reading	40.5
4.	Laboratory work	30
5.	TOTAL	187.5 hours

Timetable:

Day	Time	Hours	Room	Meeting
Tuesday	1000	1hour	OR4	Lecture
Wednesday	1000	1hour	OR9	Lecture
Wednesday	1100	1hour	OR9	Lecture
Thursday	1030	2hour	CE Lab	Lab

Proposed Feedback and Support for Student Learning:

A turnaround of 2-3 weeks from assignment submission to return is expected. Each student will receive individualised written comments on areas of weakness and suggestions for improvement. All staff are expected to be available whenever other commitments allow throughout normal University office hours, and students will be able to access them by email and telephone as well as by personal approach.

Textbook and Other Recommended Reading:

No prescribed text, but the following may be useful:

1. *Modern Digital and Analog Communication Systems*, B. P. Lathi, 3/e, Oxford University Press, 1998.
2. *Communication Systems*, Simon Haykin, 4/e, John Wiley & Sons, 2001.

3. *Introduction to Spread Spectrum Communications*, Roger L Peterson, Rodger E Ziemer, and David Borth, Prentice Hall, 1995.
4. *Optical Fiber Communications*, Gerd Keiser, McGraw-Hill, 3rd edition, 2000.
5. *Understanding Fiber Optics*, Jeff Hecht, Prentice Hall, 4th edition, 2002.
6. *Understanding Lasers - An Entry Level Guide*, Jeff Hecht, IEEE Press, 1992.

Conditions for Aegrotat Pass and Impaired Performance:

If you are prevented by illness, injury or serious crisis from attending an examination (or completing an element of assessment by the due date), or if you consider that your performance has been seriously impaired by such circumstances, you may apply for aegrotat or impaired performance consideration. You must apply on the form available from the Examinations Office, the Student Health Service or the Student Counseling Service.

To qualify for an aegrotat pass on the final examination, you must have attempted at least 40% of the total formal assessment and your performance must be well above the minimum pass standard, so that the examiners can be confident that you would have passed the paper if you had completed the final examination. You may also apply for aegrotat consideration for other compulsory assessment elements (such as Semester Tests) that occur at a fixed time and place if you are prevented by illness, injury or a serious crisis from attending.

Plagiarism:

Massey University, College of Sciences, has taken a firm stance on plagiarism and any form of cheating. Plagiarism is the copying or paraphrasing of another person's work, whether published or unpublished, without clearly acknowledging it. It includes copying the work of other students. Plagiarism will be penalized; it is likely to lead to loss of marks for that item of assessment and may lead to an automatic failing grade for the paper and/or exclusion from reenrolment at the University.

Grievance Procedures:

A student who claims that he/she has sustained academic disadvantage as a result of the actions of a University staff member should use the University Grievance Procedures. Students, whenever practicable, should in the first instance approach the University staff member concerned. If the grievance is unresolved with the staff member concerned, the student should then contact the College of Sciences office on his/her campus for further information on the procedures, or read the procedures in the University Calendar.

Appendix One:

LECTURE OUTLINE:

Topic	Number of lectures
1. Introduction and Review	3
2. Analog Communication	4
3. Baseband Transmission	5
4. Digital Modulation	9
5. Spread Spectrum & Multicarrier Communications	9
6. Optical Communications	6

Appendix Two: Additional Information for the Bachelor of Engineering Programme

This paper is has been designed to contribute to the IPENZ Graduate Capability Profile. The ten graduate attributes and the contributions to meeting them made by completing the requirements of this paper are indicated below.

For more information concerning the requirements for initial academic education for professional engineers please see <http://www.ipenz.org.nz/IPENZ/Forms/pdfs/Initial-Academic-Policy-Prof-Eng-November-2006.pdf>

	Summary of Graduate Attribute	Contribution of this paper			
		Nil	Some	Significant	Major
1.	Apply mathematics & engineering science				X
2.	Model complex engineering systems from first principles.				X
3.	Synthesizes solutions to complex engineering problems (CPE's).			X	
4.	Make effective use of information sources and experiments in solving CPE's.			X	
5.	Understand how to deal with uncertainty and risk in CPE's.		X		
6.	Be able to function effectively in membership and leadership roles in teams.		X		
7.	Communicate effectively in reports, summaries and presentation				X
8.	Demonstrate an understanding of the general responsibilities of engineers.		X		
9.	Apply project and business management systems to CPE's		X		
10	Demonstrate competence in engineering design applied to CPE's in some area of specialisation			X	