

**Subject Description**

<u>Subject Title</u>	:	<b>Communication Fundamentals (Compulsory)</b>	
<u>Subject Code</u>	:	EIE331 (for 42070)	
<u>Level of Study</u>	:	3	
<u>Hours Assigned</u>	:	Lecture/Tutorial	28/5 hours
		Laboratory	18 hours
<u>Pre-requisites</u>	:	Mathematics I	(AMA201)
		Mathematics II	(AMA202)
<u>Credits</u>	:	3	

Objectives :

The subject aims to introduce

- (i) measure of information and channel capacity,
- (ii) theory and performance of analogue communication systems,
- (iii) pulse modulation techniques.

At the completion of the subject, the student is equipped with the basic principles of communication engineering. The fundamentals introduced in this subject are necessary for study of higher level subjects in the field of communication engineering.

Keyword Syllabus :

Entropy, channel capacity. Double-sideband suppressed carrier, double-sideband large carrier (AM), single-sideband modulation, vestigial-sideband modulation, FDM. Narrowband FM, wideband FM, phase modulation, generation and demodulation of AM and FM signals. Noise in communication, S/N ratios for AM and FM reception. PAM, quantization and coding, PCM, delta modulation, TDM.

Textbook :

1. A.B. Carlson, P.B. Crilly and J.C. Ruthledge, *Communication Systems*, 4<sup>th</sup> ed., McGraw-Hill, 2002.

References :

1. F.G. Stremler, *Introduction to Communication Systems*, Addison-Wesley, 1990.
2. S. Haykin, *Communication Systems*, 4<sup>th</sup> ed., John Wiley & Sons, 2001.

Method of Assessment :

Coursework	40%
Examination	60%
Total	100%

Note : To pass this subject, students must obtain grade D or above in BOTH the coursework and the examination.

## Detailed Syllabus : Communication Fundamentals (Compulsory)

Topic	Duration in lecture hours
1. Introduction 1.1 Introduction to communication systems. Elements of a basic communication system. Examples of wired and wireless systems.	2
2. Information Theory 2.1 Measure of information. Entropy. 2.2 Conditional, joint and mutual information. Channel capacity.	7
3. Analogue Communications 3.1 Amplitude modulation: double sideband, single sideband and vestigial side band modulation, frequency spectrum and power relationship of the amplitude modulation signal, envelope detector, coherent detector, superheterodyne receiver. 3.2 Angular modulation: phase and frequency modulation, frequency spectrum of the angular modulation signals, discriminator, PLL detector. Stereo FM. 3.3 Noise in analogue modulation: Output S/N ratios in various analogue modulation systems. S/N ratio improvement through pre-emphasis/de-emphasis.	12
4. Pulse Modulation 4.1 Pulse amplitude modulation, quantizing and coding, quantization noise, uniform & non-uniform quantization, pulse code modulation, delta modulation. Comparison of pulse code modulation & delta modulation systems. 4.2 Time division multiplexing: concept of framing and synchronization, TDM-PCM telephone system, comparison of TDM & FDM.	7
<b>Total :</b>	<b>28</b>

Topic	Duration in hours
<u>Laboratory Experiments/Mini Projects</u>	
<u>Experiments</u>	
1. Amplitude Modulation CM069 Amplitude Modulation or CM070A Amplitude Modulation	3
2. Frequency Modulation CM071A Frequency Modulation	3
3. Pulse Modulation CM077A Sampling and Time Division Multiplexing	3
<u>Mini Project</u>	
1. Superheterodyne receiver CM201 Design and Construction of an AM Superheterodyne Radio Receiver	9
<b>Total :</b>	<b>18</b>