SNS COLLEGE OF ENGINEERING

An Autonomous Institution

Coimbatore-641 107

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19EC504-ANALOG AND DIGITAL COMMUNICATION

III YEAR/ V SEMESTER

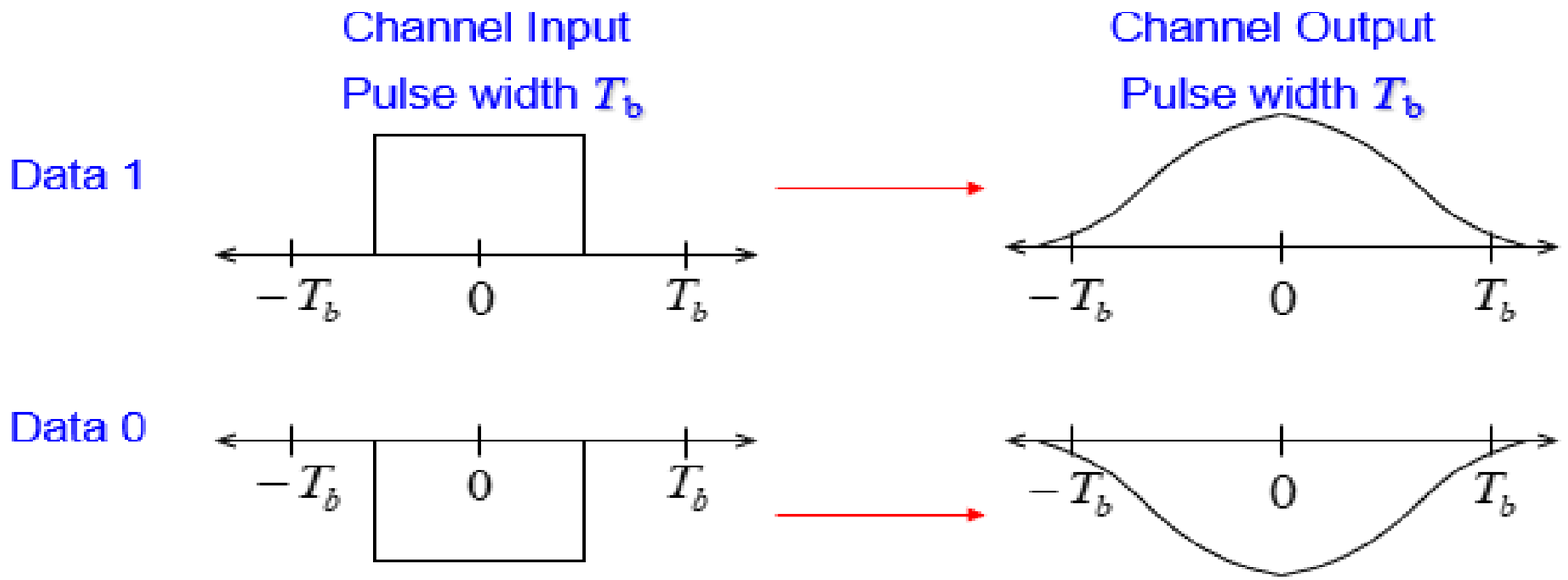
UNIT - III - DIGITAL COMMUNICATION

TOPIC - INTERSYMBOL INTERFERENCE

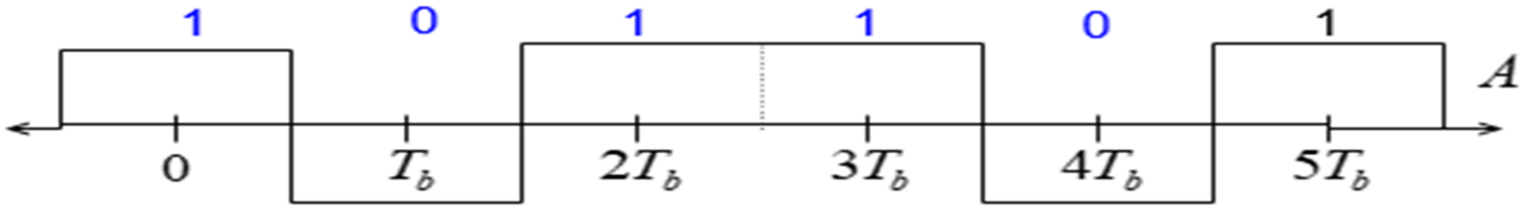
Introduction

- **I**nter**S**ymbol **I**nterference (ISI) is a kind of distortion that occurs when one or more symbols (pulses in digital baseband transmission) interfere with subsequent signals.
- This can cause noise in the signal which can cause the output to be less than ideal.
- ISI occurs when there is multipath propagation and/or nonlinear frequency in the channels.
- These causes can be reduced which can help eliminate ISI from the system to achieve an ideal output.

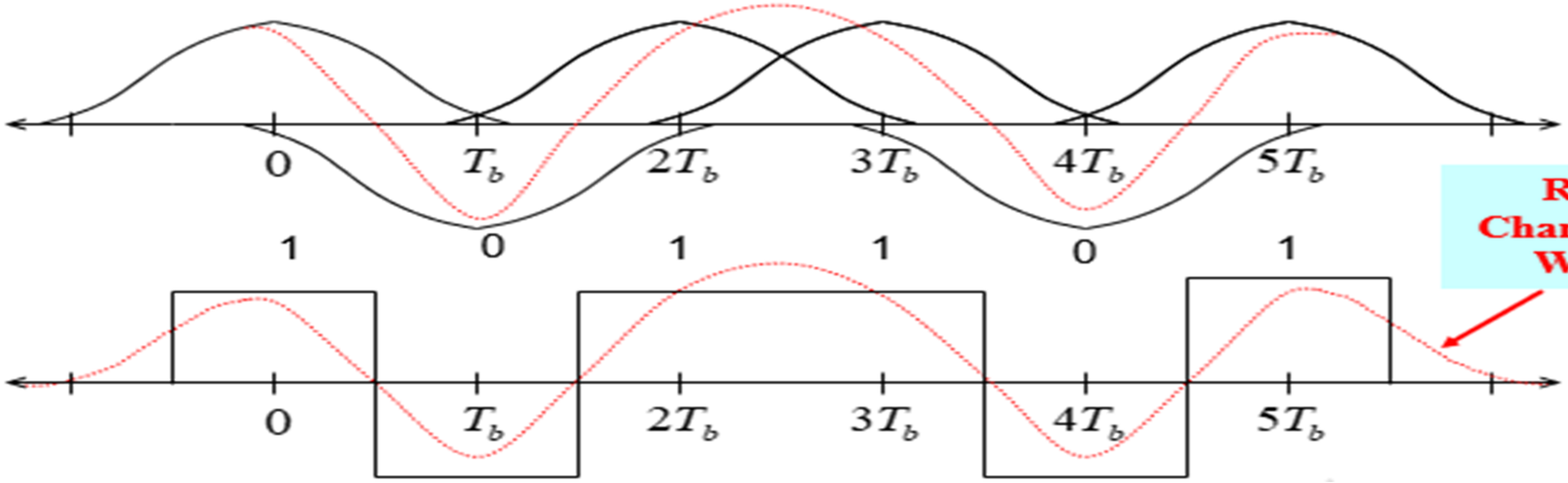
Example: assume polar NRZ line code. The channel outputs are shown as spreaded (width T_b becomes $2T_b$) pulses shown (Spreading due to bandlimited channel characteristics).



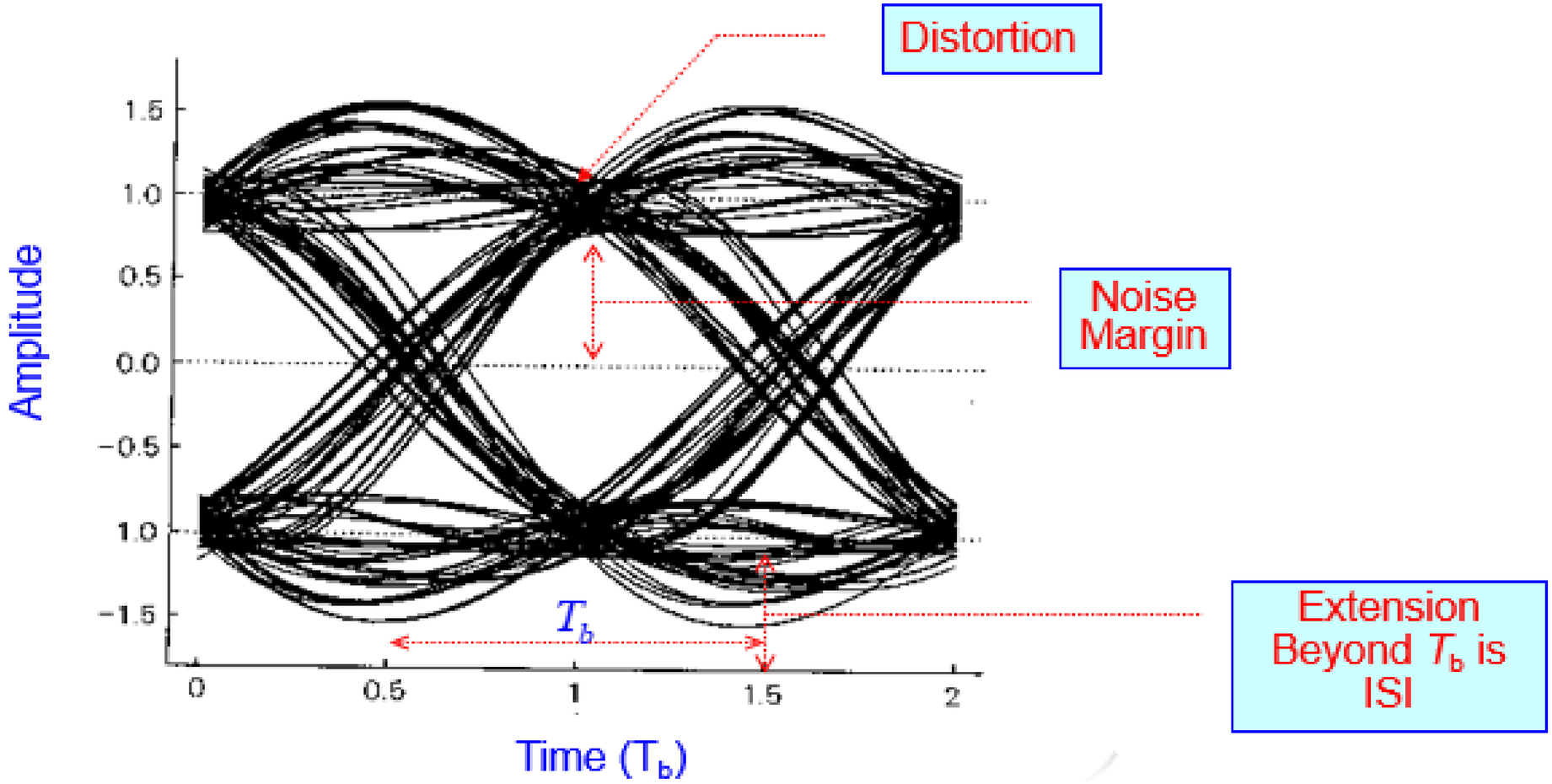
- For the input data stream:



- The channel output is the superposition of each bit's output:



- The amount of ISI can be seen on an oscilloscope using an ***Eye Diagram*** or ***Eye pattern***



- If the rectangular multilevel pulses are filtered improperly as they pass through a communications system, they will spread in time, and the pulse for each symbol may be smeared into adjacent time slots and cause ***Intersymbol Interference***

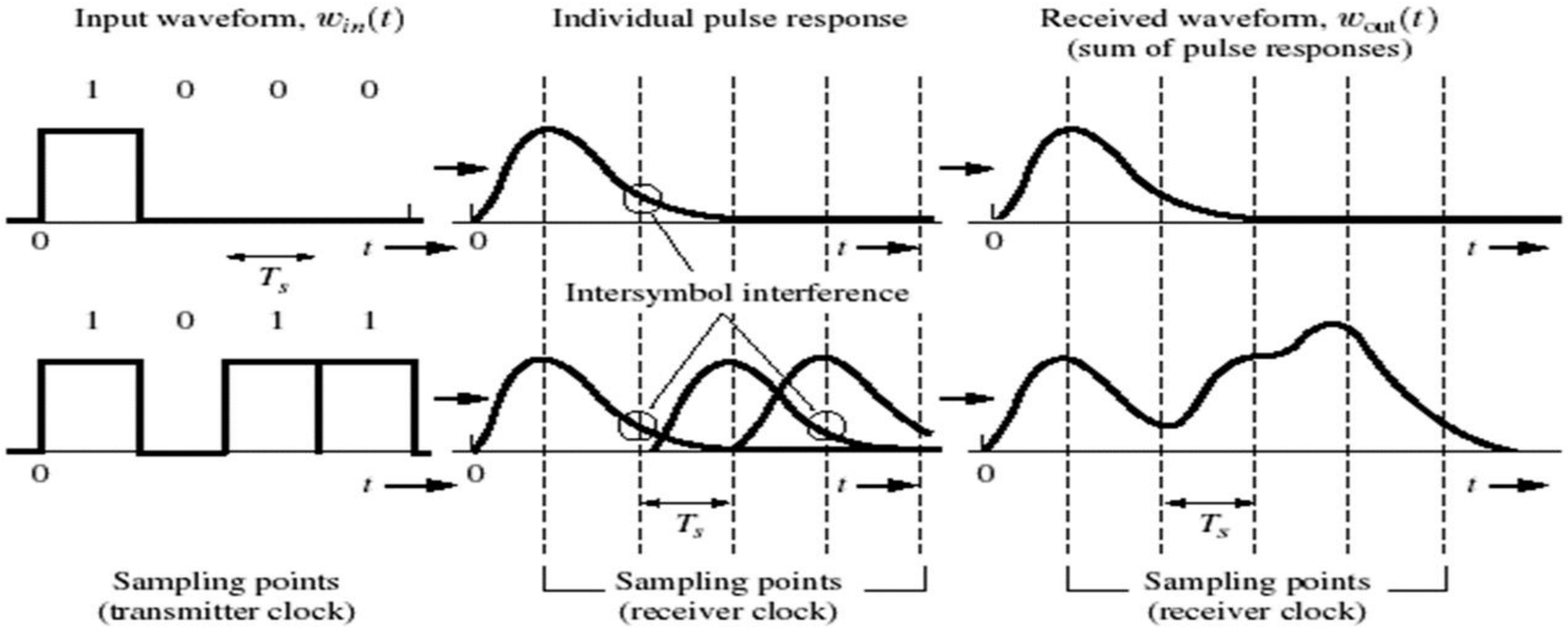


Figure Examples of ISI on received pulses in a binary communication system.

Eliminating ISI

Three strategies for eliminating ISI:

- Use a line code that is absolutely bandlimited.
- Use a line code that is zero during adjacent sample instants.
- Use a filter at the receiver to “undo” the distortion introduced by the channel.

THANK YOU