



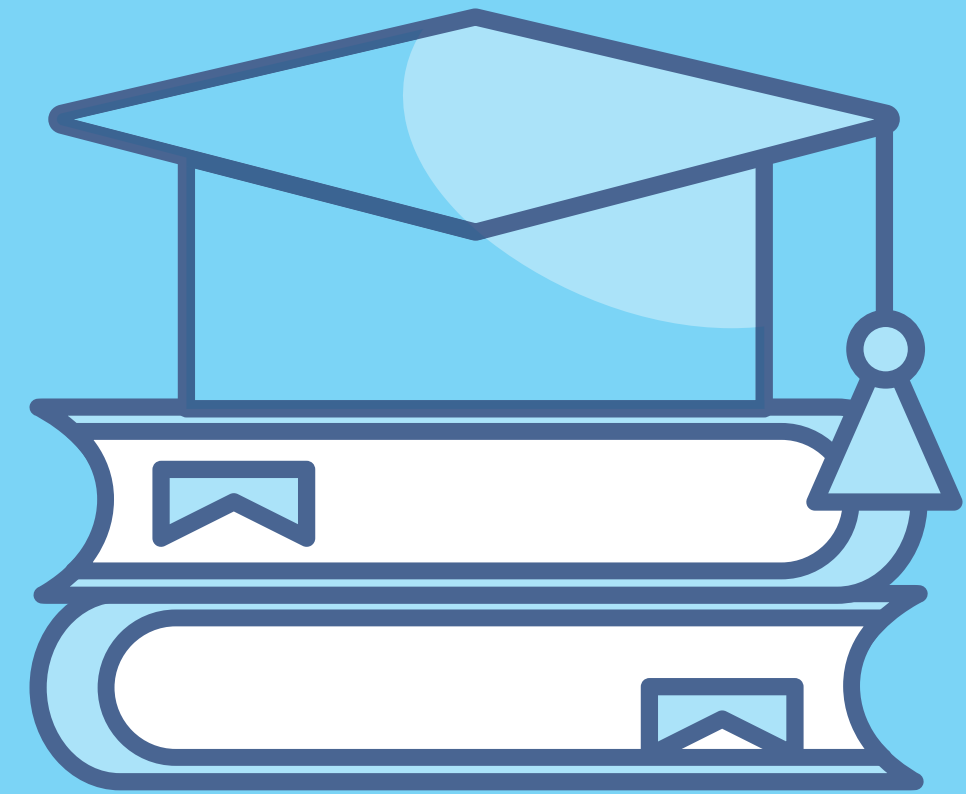
# SPREAD SPECTRUM TECHNIQUES

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MOBILE COMMUNICATION AND NETWORKS (PE-EC701C)  
ELECTRONICS & COMMUNICATION ENGINEERING

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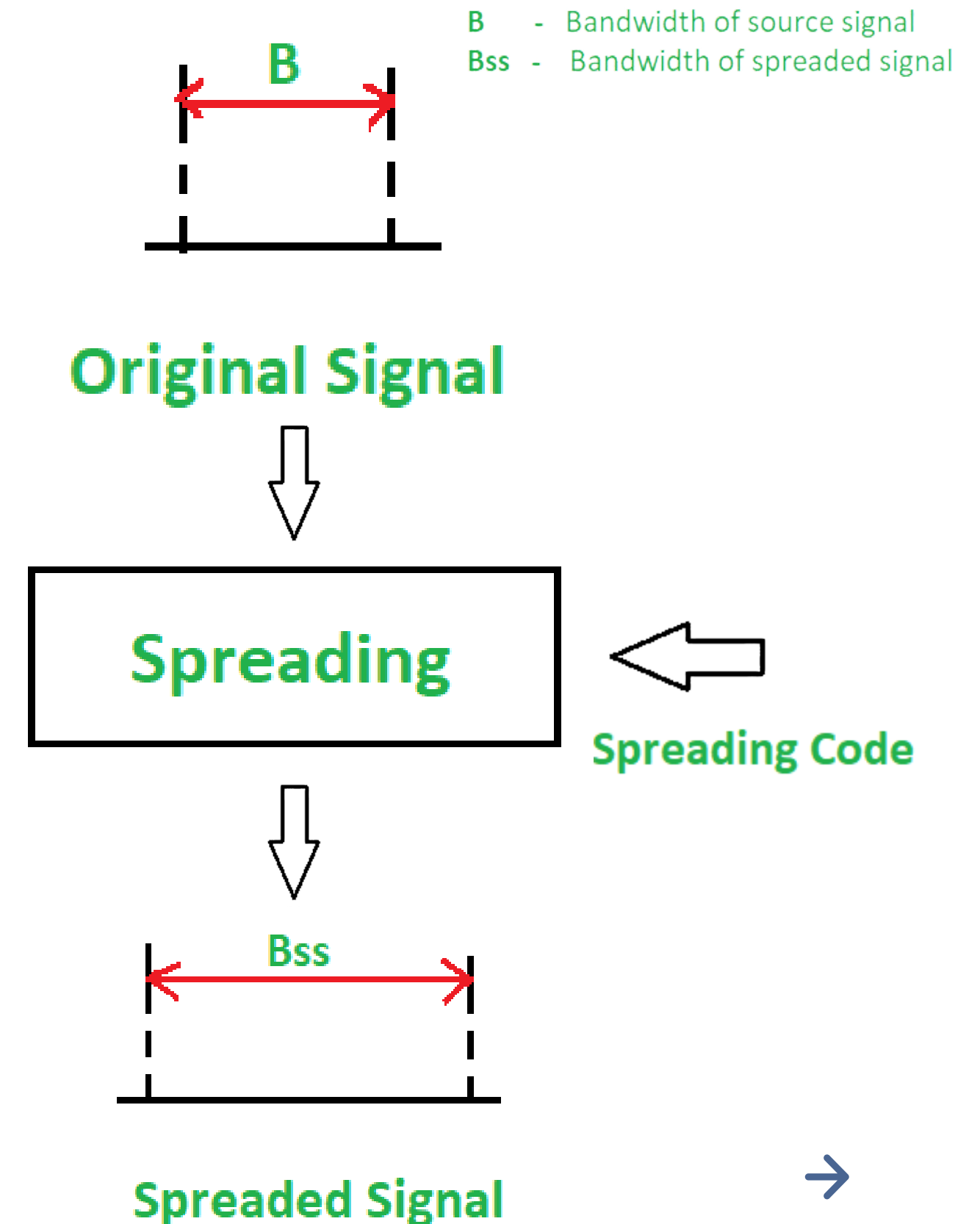
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# Introduction

- **Definition:** Spread spectrum techniques are methods by which a signal generated with a particular bandwidth is deliberately spread in the frequency domain, resulting in a signal with a wider bandwidth.
- **Purpose:** Spread spectrum techniques are used for secure communications, increasing resistance to natural interference, noise, and jamming, preventing detection, limiting power flux density, and enabling multiple-access communications.



# Principles of Spread Spectrum

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**Redundancy:** Spread-spectrum techniques add redundancy by using extended bandwidth to accommodate signals in a protective envelope so that more secure transmission is possible.

**Spreading Process:** The spreading process occurs after the signal is created by the source.

**Conditions:** The spread spectrum is a type of modulation where the modulated signal bandwidth is much larger than the baseband signal bandwidth. A special code (pseudo noise) is used for spectrum spreading and the same code is used to despread the signal at the receiver.



# Characteristics of Spread Spectrum

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- Higher channel capacity.
- Ability to resist multipath propagation.
- Resistance to interception by unauthorized persons.
- Resistance to jamming.
- Immunity to distortion due to multipath propagation.
- Multiple access capabilities



# Types of Spread Spectrum Techniques

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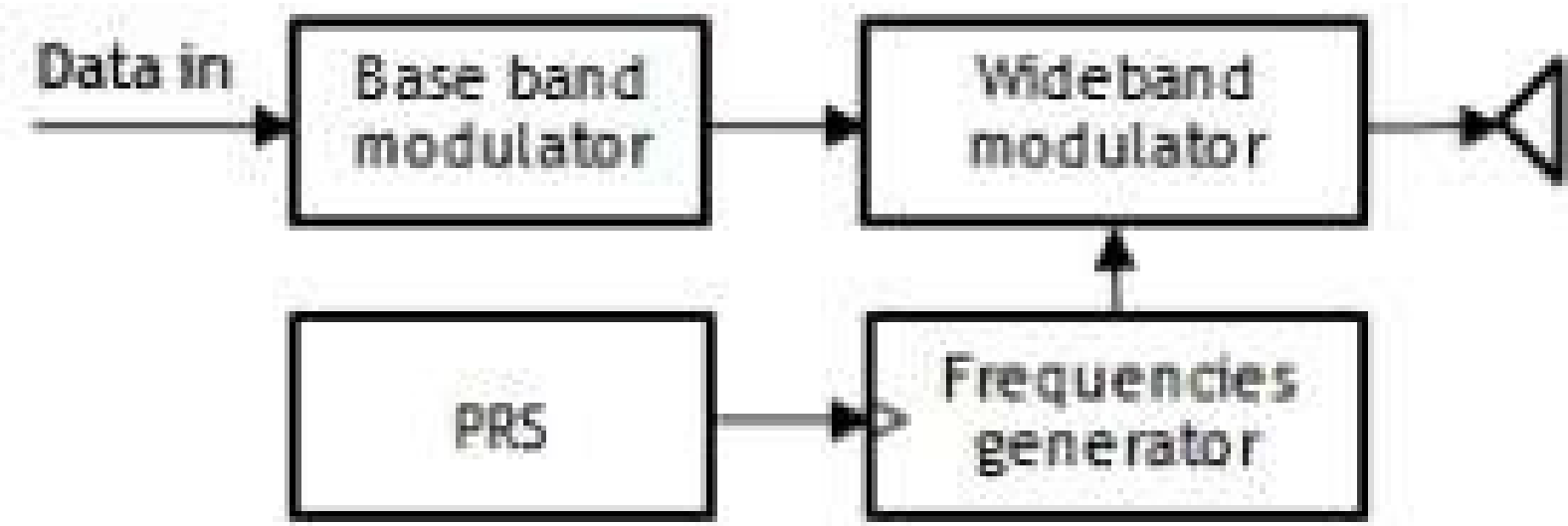
**Frequency Hopping Spread Spectrum (FHSS)**

**Direct Sequence Spread Spectrum (DSSS)**

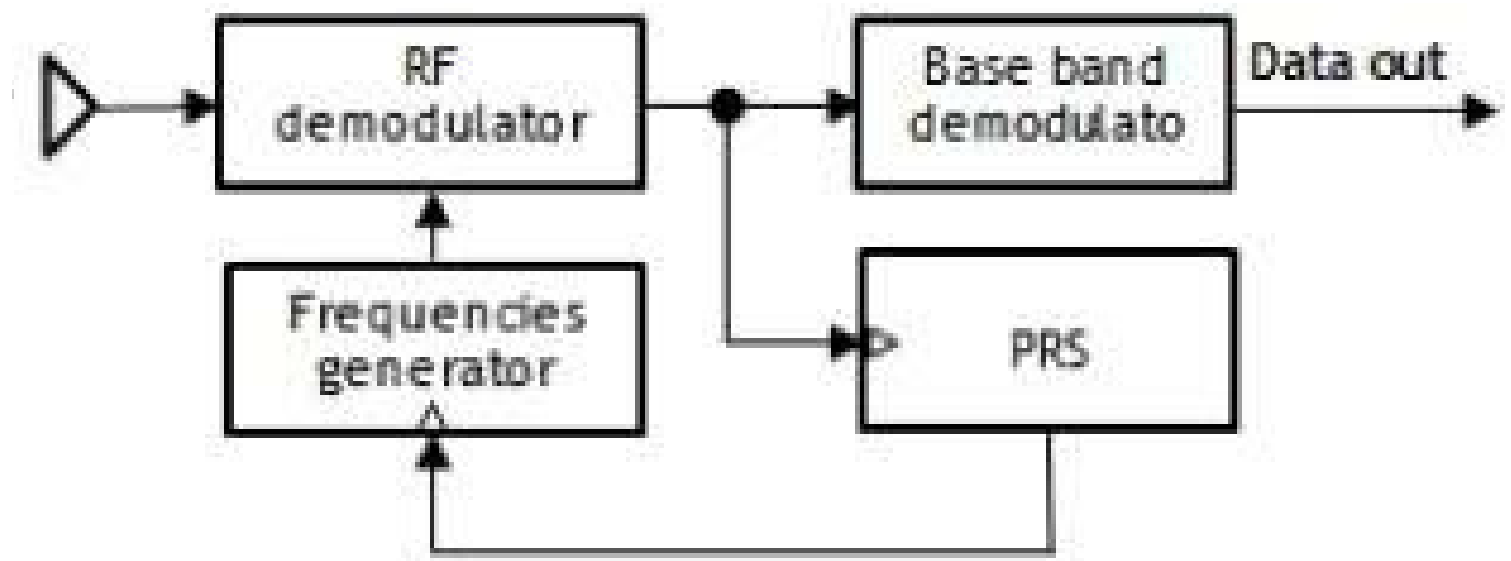


# Frequency Hopping Spread Spectrum (FHSS)

**Definition:** In FHSS, different carrier frequencies are modulated by the source signal. At one moment, the signal modulates one carrier frequency and at subsequent moments, it modulates other carrier frequencies.



FHSS Transmitter

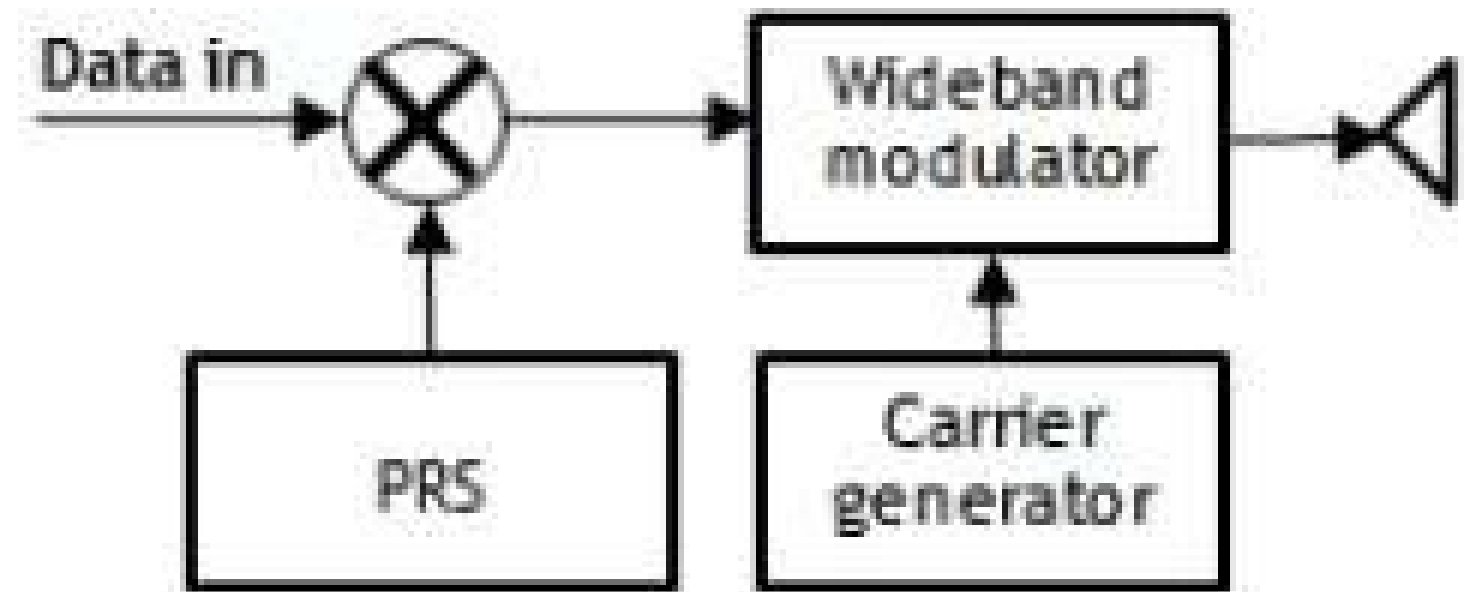


FHSS Receiver

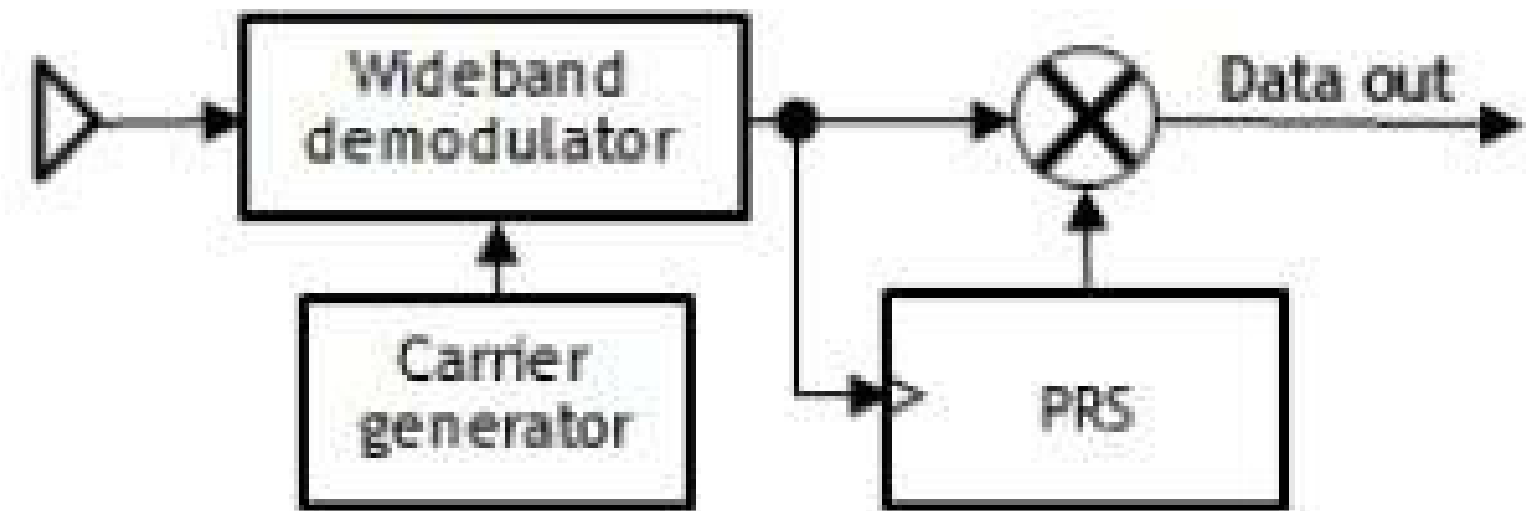


# Direct Sequence Spread Spectrum (DSSS)

**Definition:** In DSSS, the message symbols are modulated by a sequence of complex values known as the spreading sequence. Each element of the spreading sequence, a so-called chip, has a shorter duration than the original message symbols.



DSSS Transmitter



DSSS Receiver





# Conclusion

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- Spread spectrum techniques are used to increase resistance to interference and jamming, and to enable secure communications.
- Two main types of spread spectrum techniques are FHSS and DSSS.
- FHSS involves modulating different carrier frequencies by the source signal, while DSSS involves modulating message symbols by a spreading sequence.





Thank  
you!