EEE328
Digital Signal Processing

Ankara University

Faculty of Engineering

Electrical and Electronics Engineering Department

Sampling and Reconstruction of Continuous-Time Signals

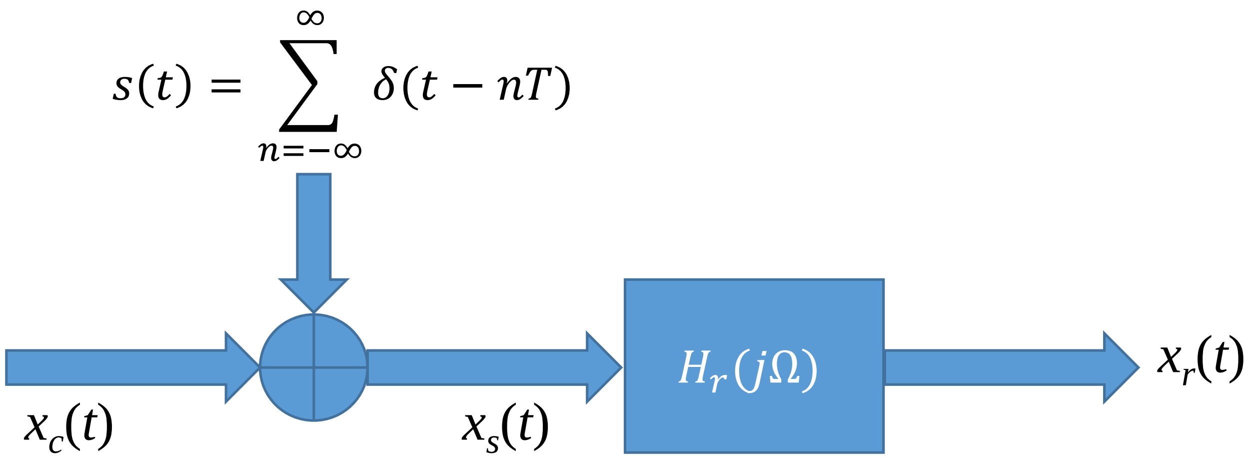
EEE328 Digital Signal Processing

Lecture 10

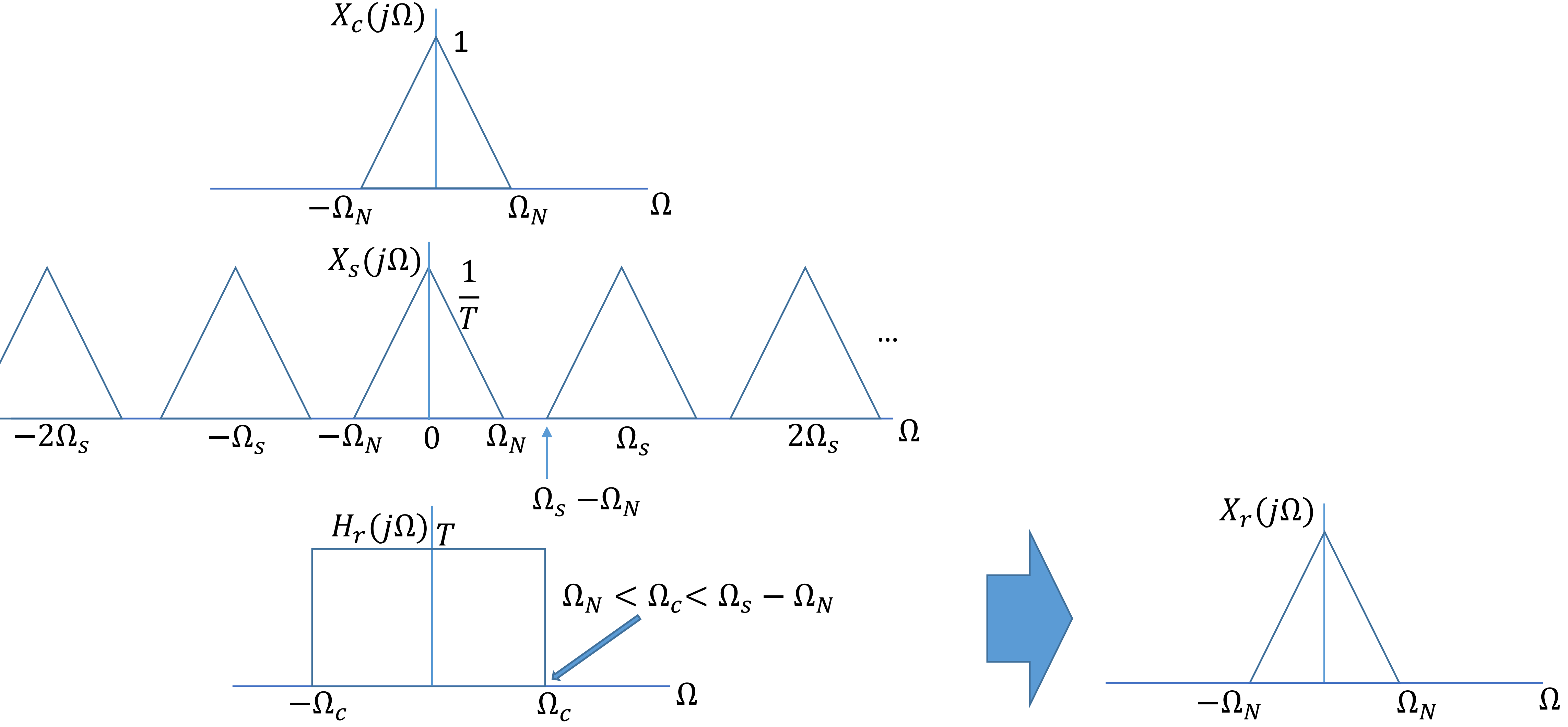
Agenda

- Sampling
- Recovery of Continuous-Time Signal from Its Samples

Recovery of Continuous-Time Signal from Its Samples Using an Ideal Low-Pass Filter



Recovery of Continuous-Time Signal from Its Samples Using an Ideal Low-Pass Filter



Reconstruction of Bandlimited Signal from Its Samples

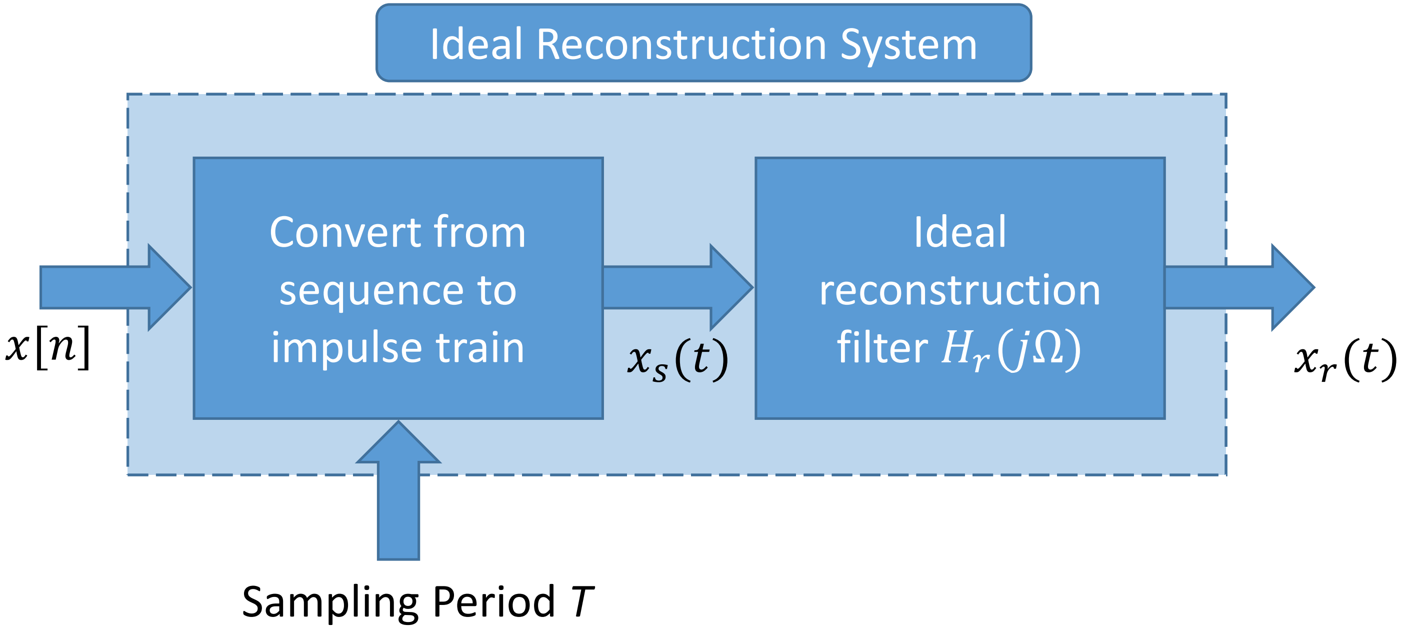
$$x_s(t) = \sum_{n=-\infty}^{\infty} x[n]\delta(t - nT)$$

$$x_r(t) = \sum_{n=-\infty}^{\infty} x[n]h_r(t - nT)$$

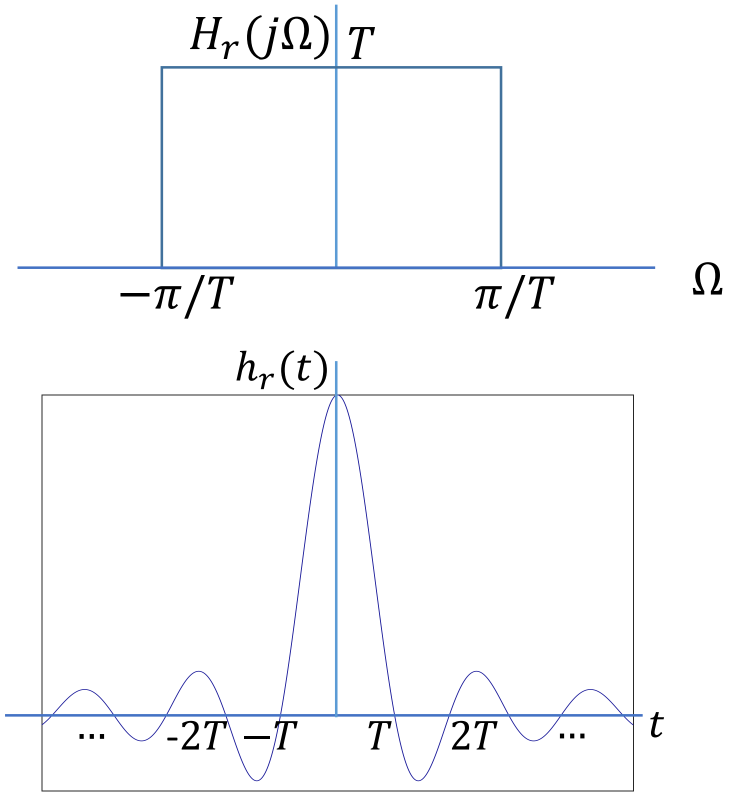
$$h_r(t) = \frac{\sin(\frac{\pi t}{T})}{\pi t/T}$$

$$x_r(t) = \sum_{n=-\infty}^{\infty} x[n]\frac{\sin(\frac{\pi(t - nT)}{T})}{\pi(t - nT)/T}$$

Reconstruction of Bandlimited Signal from Its Samples

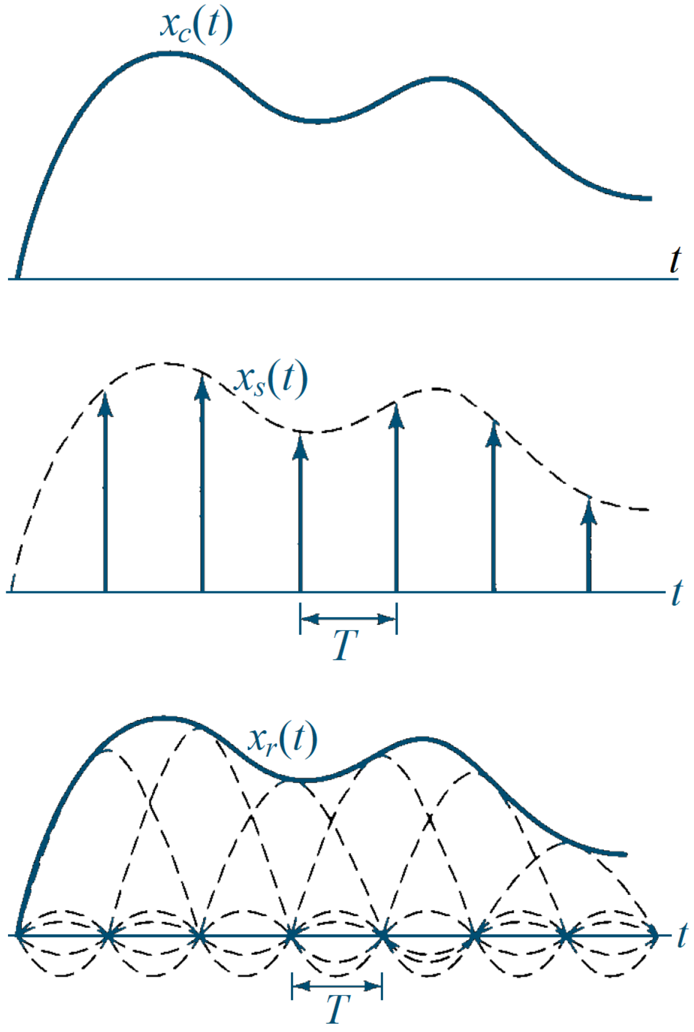


Reconstruction of Bandlimited Signal from Its Samples



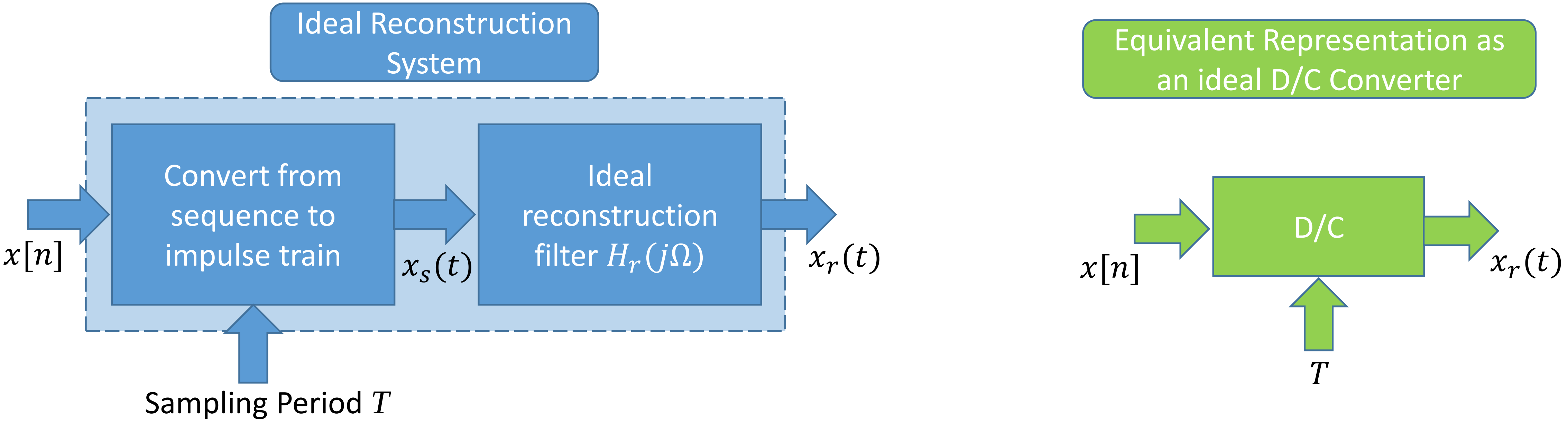
Ideal Low-Pass Filter

Reconstruction of Bandlimited Signal from Its Samples



Ideal Bandlimited Interpolation

Reconstruction of Bandlimited Signal from Its Samples



Reconstruction of Bandlimited Signal from Its Samples

$$X_r(j\Omega) = \frac{1}{T}\sum_{n=-\infty}^{\infty} x[n]H_r(j\Omega)e^{-j\Omega Tn}$$

$$X_r(j\Omega) = H_r(j\Omega)X(e^{j\Omega T})$$

References

- Signals & Systems, Second Edition, A. V. Oppenheim, A. S. Willsky with S. H. Nawab, Prentice Hall, 1997
- Discrete-Time Signal Processing, Second Edition, A. V. Oppenheim, R. W. Schafer with J. R. Buck, Prentice Hall, 1999