ELE 321
Linear System Analysis

Ankara University

Faculty of Engineering

Electrical and Electronics Engineering Department

Properties of Continuous-Time Fourier Series

ELE321 Linear System Analysis

Lecture 9

Agenda

- Linearity
- Time Shifting
- Time Reversal
- Time Scaling
- Multiplication
- Conjugation and Conjugate Symmetry
- Parseval’s Relation for Continuous-Time Periodic Signals

Linearity

- $x(t) \longleftrightarrow a_k$ and $y(t) \longleftrightarrow b_k$
- $z(t) = Ax(t) + By(t) \longleftrightarrow c_k = Aa_k + Bb_k$

Time Shifting

- $x(t) \longleftrightarrow a_k$
- $x(t - t_0) \longleftrightarrow e^{-jk\omega_0 t_0} a_k$

Time Reversal

- $x(t) \longleftrightarrow a_k$
- $x(-t) \longleftrightarrow a_{-k}$

Time Scaling

- $x(t) \longleftrightarrow a_k$
- $x(\alpha t) \longleftrightarrow a_k$

Multiplication

- $x(t) \longleftrightarrow a_k$ and $y(t) \longleftrightarrow b_k$
- $x(t)y(t) \longleftrightarrow c_k = \sum_{l=-\infty}^{\infty} a_l b_{k-l}$

Conjugation and Conjugate Symmetry

- $x(t) \longleftrightarrow a_k$
- $x^*(t) \longleftrightarrow a_{-k}^*$

Parseval's Relation for CT Periodic Signals

- $\frac{1}{T}\int_{-\frac{T}{2}}^{\frac{T}{2}}|x(t)|^2 dt = \sum_{k=-\infty}^{\infty}|a_k|^2$

References

- Signals and Systems, 2nd Edition, Oppenheim, Willsky, Nawab