



Digital Transmission Engineering

Antal poäng: 5.0. **Valfri för:** D4, E4. **Kursansvarig:** John Andersson **Rekommenderade förkunskaper:** Digital kommunikation **Prestationsbedömning:** Tentamen (5 tim) är skriftlig och av problemlösningstyp. **Webbsida** <http://www.it.lth.se>

Målbeskrivning

The course goal is to be able to design a sophisticated transmission system.

Innehåll

Digital transmission sends bits from one place to another or from one time to another. The course focuses on the engineering design of these systems including phase and symbol synchronization, synchronization of networks, wire, cable and radio channels, and distortions that occur in channels. Special attention is given to mobile communication. The student should already know basic modulation (pulse modulation, PSK, FSK) and basic communication theory (elementary signal spaces, Fourier and probabilistic analysis).

Introduction. Review of pulse, PSK and FSK modulation. Basic signal space analysis. Spectrum and error probability.

Simple channels. Guided (coax, wire, fiber) and voice modem channels. Radio propagation and antennas, noise, and detailed link budgets. Space channels.

Difficult channels. Multipath, refraction, reflection; terrestrial link design. Rayleigh and Rician fading channels, diversity and other fading

transmission techniques. Time and frequency dispersion in mobile channels,

statistical characterization of mobile channels, types of mobile channels. Introduction to equalization.

Phase synchronization. The analog phase-lock loop and its responses to transients, noise and signal waveforms. Raised-power, remodulation, and

Costas circuits. Acquisition-mode synchronization. Phase noise. System

design examples with synchronization.

Symbol synchronization. Review of z-transforms and transformations from analog responses. Digital PLLs and their stability. Loops based on

accumulators, zero crossings and early-late gates.

Network synchronization. PN and similar marker sequences, frame

synchronization, and synchronous multiplexing and demultiplexing.

Distribution of clock.

Litteratur

J. B. Anderson, Digital Transmission Engineering, IEEE Press, New York, 1999.
