

Table of Contents

Based on *Phase-Locked Loops for Wireless Communications* by Donald R. Stephens:

1. **Introduction and History of Phase-Locked Loops**
 - Evolution of PLL technology
 - Wireless communication applications
2. **Analog Phase-Locked Loops**
 - Time-domain analysis
 - Frequency-domain analysis
 - First-, second-, and third-order PLLs
 - Loop filter design
3. **Root-Locus and Frequency Response Analysis**
 - Stability analysis
 - Bandwidth considerations
 - FM demodulation applications
4. **Acquisition and Tracking Performance**
 - Lock acquisition process
 - Capture range and lock range
 - Noise effects on tracking
5. **Digital Signal Processing Foundations**
 - Sampling theory
 - Z-transform techniques
 - Analog-to-digital conversion
6. **Digital Phase-Locked Loops**
 - Discrete-time PLL analysis
 - Stability and dynamic response
 - All-Digital PLL (ADPLL) architectures
7. **Charge-Pump PLLs and Delay-Locked Loops**
 - Charge-pump circuits
 - Frequency dividers and counters
 - Delay-Locked Loops (DLLs)
8. **Dynamic Response and Acquisition in Digital PLLs**
 - Linear and nonlinear behavior
 - Cycle slipping
 - Lock probability analysis
9. **Synchronization in Digital Communications**
 - Carrier recovery techniques
 - Costas loops
 - Timing recovery for BPSK and QPSK systems
10. **Optical Phase-Locked Loops**
 - Laser synchronization
 - Homodyne and heterodyne receivers
 - Optical communication systems
11. **Phase Noise Analysis**
 - Noise sources in PLLs
 - Oscillator phase noise
 - Divider noise
 - Impact on RF and wireless systems

