NPTEL Video Course - Electrical Engineering - NOC:Control and Tuning Methods in Switched Mode Power Converter

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Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - DC Power Conversion Systems - Introduction
Lecture 2 - Overview of voltage regulators
Lecture 3 - Switched mode power converter (SMPC)
Lecture 4 - Model Development for MATLAB Simulation
Lecture 5 - Demonstration of MATLAB Simulation
Lecture 6 - Demonstration of MATLAB Simulation (Continued...)
Lecture 7 - Power Stage Design of Basic SMPCs: Summary
Lecture 8 - Fixed Frequency Modulation Techniques
Lecture 9 - Variable Frequency Modulation Techniques
Lecture 10 - Modulation in Discontinuous Conduction Mode (DCM)
Lecture 11 - Synchronizing Simulation and Script files in MATLAB
Lecture 12 - Interactive MATLAB Simulation and Case Studies
Lecture 13 - Converterâ s Objectives and Control Implications
Lecture 14 - Feedforward Control in SMPC
Lecture 15 - Single and Multi Loop Feedback Control Methods
Lecture 16 - Feedback Control of Cascaded SMPCs
Lecture 17 - Combined feedback and feedforward control
Lecture 18 - State feedback control
Lecture 19 - Variable Frequency Control - Understanding Opportunities and Challenges
Lecture 20 - Constant On-time Control Methods
Lecture 21 - Constant Off-time Control Methods
Lecture 22 - Hysteresis Control Methods in SMPCs
Lecture 23 - Stability and Performance Comparison using MATLAB Simulation
Lecture 24 - Light Load Control Methods and Interactive MATLAB Simulation
Lecture 25 - Overview of Modeling Techniques
Lecture 26 - State space averaging and model validation
Lecture 27 - Circuit Averaging Techniques and Equivalent Circuit
Lecture 28 - DC Analysis using Equivalent Circuit Model
Lecture 29 - Derivation of Small-Signal Transfer Functions

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Lecture 30 - Small-Signal Model Validation using MATLAB and Time Domain Correlation
Lecture 31 - Small-signal Modeling with Closed Current Loop
Lecture 32 - Impedance Analysis and Stability
Lecture 33 - Loop Gain Analysis and Understanding Model Limits using MATLAB
Lecture 34 - PID Control Design and Tuning under VMC with MATLAB Case Studies
Lecture 35 - Shaping Output Impedance of a Buck Converter under VMC
Lecture 36 - Design of VMC Boost Converter and MATLAB Design Case Studies
Lecture 37 - Accurate Small-signal Modelling under CMC and Verification using MATLAB
Lecture 38 - Design CMC in a Buck Converter and MATLAB based Model Validation
Lecture 39 - Design of CMC Boost Converter - Output and State Feedback Approaches
Lecture 40 - Loop Interactions in CMC and Design of Average CMC
Lecture 41 - Dynamics of SMPCs and Overview of Model-based Nonlinear Control
Lecture 42 - Dynamics of LTIs and Vector Field with MATLAB Demonstration
Lecture 43 - Geometric Perspectives of Eigenvalues and Eigenvectors in SMPCs
Lecture 44 - Small-signal and Large-signal Model based Nonlinear Control
Lecture 45 - Introduction to Sliding Mode Control in SMPCs
Lecture 46 - Sliding Mode Control Design in a Buck Converter
Lecture 47 - Boundary Control Techniques and Selection of Switching Surfaces
Lecture 48 - Time Optimal Control and Identifying Physical Limits in SMPCs
Lecture 49 - Linking Switching Boundary and PID Controller Structure in SMPCs
Lecture 50 - Large-Signal Controller Tuning in Buck Converter: Objectives and Derivations
Lecture 51 - Large-Signal Controller Tuning in Boost and Buck-Boost Converters
Lecture 52 - Large-Signal Controller Tuning in Fixed- and Variable-Frequency Control
Lecture 53 - Critical Performance Limits in Dynamic Voltage Scaling and Possible Solutions
Lecture 54 - Nonlinear Control vs. Large-Signal Tuning: Comparative Study using MATLAB
Lecture 55 - Small-Signal vs. Large-Signal Tuning: Comparison using MATLAB Simulation
Lecture 56 - Performance Improvement and Size Reduction using Large-Signal based Control
Lecture 57 - Digital Control in High Frequency SMPCs - Introduction and Motivations
Lecture 58 - Overview of Fixed and Variable Frequency Digital Control Architectures
Lecture 59 - Challenges and Opportunities in Digitally Controlled High Frequency SMPCs
Lecture 60 - Course Summary, Key Takeaways, Few Emerging Applications and Future Scopes
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