DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : Adv. Digital Signal Processing - Multirate and wavelets (Electronics and Communication Engineering)

Co-ordinators : Prof. V.M. Gadre

Lecture 1 - Introduction

Lecture 2 - The Haar Wavelet

Lecture 3 - The Haar Multiresolution Analysis

Lecture 4 - Wavelets And Multirate Digital Signal Processing

Lecture 5 - Equivalence - Functions And Sequences

Lecture 6 - The Haar Filter Bank

Lecture 7 - Haar Filter Bank Analysis And Synthesis

Lecture 8 - Relating psi, phi and the Filters

Lecture 9 - Iterating the filter bank from Psi, Phi

Lecture 10 - Z-Domain Analysis Of Multirate Filter Bank

Lecture 11 - Two Channel Filter Bank

Lecture 12 - Perfect Reconstruction - Conjugate Quadrature

Lecture 13 - Conjugate Quadrature Filters - Daubechies Family of MRA

Lecture 14 - Daubechies' Filter Banks - Conjugate Quadrature Filters

Lecture 15 - Time And Frequency Joint Perspective

Lecture 16 - Ideal Time Frequency Behaviour

Lecture 17 - The Uncertainty Principle

Lecture 18 - Time Bandwidth Product Uncertainty

Lecture 19 - Evaluating and Bounding squareroot t.squareroot omega

Lecture 20 - The Time Frequency Plane & its Tilings

Lecture 21 - Short time Fourier Transform & Wavelet Transform in General

Lecture 22 - Reconstruction & Admissibility

Lecture 23 - Admissibility in Detail Discretization of Scale

Lecture 24 - Logarithmic Scale Discretization, Dyadic Discretization

Lecture 25 - The Theorem of (DYADIC) Multiresolution Analysis

Lecture 26 - Proof of the Theorem of (DYADIC) Multiresolution Analysis

Lecture 27 - Introducing Variants of The Multiresolution Analysis Concept

Lecture 28 - JPEG 2000 5/3 FilterBank & Spline MRA

Lecture 29 - Orthogonal Multiresolution Analysis with Splines

Lecture 30 - Building Piecewise Linear Scaling Function, Wavelet

Lecture 31 - The Wave Packet Transform

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Lecture 32 - Nobel Identities & The Haar Wave Packet Transform

Lecture 33 - The Lattice Structure for Orthogonal Filter Banks

Lecture 34 - Constructing the Lattice & its Variants

Lecture 35 - The Lifting Structure & Polyphase Matrices

Lecture 36 - The Polyphase Approach - The Modulation Approach

Lecture 37 - Modulation Analysis and The 3-Band Filter Bank, Applications

Lecture 38 - The Applications *Data Mining, *Face Recognition

Lecture 39 - Proof that a non-zero function can not be both time and band-limited

Lecture 40 - M-Band Filter Banks and Looking Ahead

Lecture 41 - Tutorial -Session 1

Lecture 42 - Student's Presentation

Lecture 43 - Tutorial on Uncertainty Product

Lecture 44 - Tutorial on Two band Filter Bank

Lecture 45 - Tutorial -Frequency Domain Analysis of Two band Filter Bank

Lecture 46 - Zoom in and Zoom out using Wavelet Transform

Lecture 47 - More Thoughts on Wavelets : Zooming In

Lecture 48 - Towards selecting Wavelets through vanishing moments

Lecture 49 - In Search of Scaling Coefficients

Lecture 50 - Wavelet Applications

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NPTEL : Advanced Optical Communication (Electronics and Communication Engineering)

Co-ordinators : Prof. R.K. Shevgaonkar

Lecture 1 - Introduction

Lecture 2 - Basics of Light

Lecture 3 - Ray Model - I

Lecture 4 - Ray Model - II

Lecture 5 - Wave Model - I

Lecture 6 - Wave Model - II

Lecture 7 - Wave Model - III

Lecture 8 - Signal Distortion - I

Lecture 9 - Signal Distortion - II

Lecture 10 - Signal Distortion - III

Lecture 11 - Practical issues in Implementation of Fiber link

Lecture 12 - Optical Sources

Lecture 13 - Light Emitting Diodes - I

Lecture 14 - Light Emitting Diodes - II

Lecture 15 - Laser - I

Lecture 16 - Laser - II

Lecture 17 - Laser - III

Lecture 18 - Laser - IV

Lecture 19 - Laser - V + Photon Detector

Lecture 20 - Photo Diodes and Detector Noise

Lecture 21 - Photo Detector

Lecture 22 - Optical Receivers - I

Lecture 23 - Optical Receivers - II

Lecture 24 - Receiver Sensitivity Degradation

Lecture 25 - Fiber Optic Link Design

Lecture 26 - Wavelength Division Multiplexed Systems

Lecture 27 - EDFA

Lecture 28 - Integrated Optics - I

Lecture 29 - Integrated Optics - II

Lecture 30 - Tutorials - I

Lecture 31 - Tutorials - II

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Lecture 32 - Introduction to Non-Linear Fiber Optics

Lecture 33 - Non-linear Schrodinger Equation

Lecture 34 - Group Velocity Dispersion (GVD)

Lecture 35 - Self Phase Modulation (SPM)

Lecture 36 - Solitonic Communication

Lecture 37 - Raman Amplifier

Lecture 38 - Cross Phase Modulation and four wave mixing

Lecture 39 - Laboratory Experiments - I

Lecture 40 - Laboratory Experiments - II

Lecture 41 - Laboratory Experiments - III

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NPTEL : Advanced VLSI Design (Electronics and Communication Engineering)

Co-ordinators : Prof. A.N. Chandorkar, Prof. D.K. Sharma, Prof. Sachin Patkar, Prof. Virendra Singh

Lecture 1 - Historical Perspective and Future Trends in CMOS VLSI Circuit and System Design - Part I

Lecture 2 - Historical Perspective and Future Trends in CMOS VLSI Circuit and System Design - Part II

Lecture 3 - Logical Effort - A way of Designing Fast CMOS Circuits - Part I

Lecture 4 - Logical Effort - A way of Designing Fast CMOS Circuits - Part II

Lecture 5 - Logical Effort - A way of Designing Fast CMOS Circuits - Part III

Lecture 6 - Power Estimation and Control in CMOS VLSI circuits - Part I

Lecture 7 - Power Estimation and Control in CMOS VLSI circuits - Part II

Lecture 8 - Low Power Design Techniques - Part I

Lecture 9 - Low Power Design Techniques - Part II

Lecture 10 - Arithmetic Implementation Strategies for VLSI - Part I

Lecture 11 - Arithmetic Implementation Strategies for VLSI - Part II

Lecture 12 - Arithmetic Implementation Strategies for VLSI - Part III

Lecture 13 - Arithmetic Implementation Strategies for VLSI - Part IV

Lecture 14 - Interconnect aware design: Impact of scaling, buffer insertion and inductive peaking

Lecture 15 - Interconnect aware design: Low swing and Current mode signaling

Lecture 16 - Interconnect aware design: capacitively coupled interconnects

Lecture 17 - Introduction to Hardware Description Languages

Lecture 18 - Managing concurrency and time in Hardware Description Languages

Lecture 19 - Introduction to VHDL

Lecture 20 - Basic Components in VHDL

Lecture 21 - Structural Description in VHDL

Lecture 22 - Behavioral Description in VHDL

Lecture 23 - Introduction to Verilog

Lecture 24 - FSM + datapath (GCD example)

Lecture 25 - FSM + datapath (Continued...)

Lecture 26 - Single Cycle MMIPS

Lecture 27 - Multicycle MMIPS

Lecture 28 - Multicycle MMIPS Â– FSM

Lecture 29 - Brief Overview of Basic VLSI Design Automation Concepts

Lecture 30 - Netlist and System Partitioning

Lecture 31 - Timing Analysis in the context of Physical Design Automation

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Lecture 32 - Placement algorithm

Lecture 33 - Introduction to VLSI Testing

Lecture 34 - VLSI Test Basics - I

Lecture 35 - VLSI Test Basics - II

Lecture 36 - VLSI Testing: Automatic Test Pattern Generation

Lecture 37 - VLSI Testing: Design for Test (DFT)

Lecture 38 - VLSI Testing: Built-In Self-Test (BIST)

Lecture 39 - VLSI Design Verification: An Introduction

Lecture 40 - VLSI Design Verification: An Introduction

Lecture 41 - VLSI Design Verification: Equivalence/Model Checking

Lecture 42 - VLSI Design Verification: Model Checking

NPTEL : Broadband Networks: Concepts and Technology (Electronics and Communication Engineering)

Co-ordinators : Prof. Abhay Karandikar

Lecture 1 - Introduction to Broadband Networks

Lecture 2 - Qos in Packet Switching and ATM

Lecture 3 - ATM Networks

Lecture 4 - Effective Bandwidth - I

Lecture 5 - Effective Bandwidth - II

Lecture 6 - Traffic Descriptor in ATM

Lecture 7 - Calculus for QOS - I

Lecture 8 - Calculus For Qos - II

Lecture 9 - Packet Scheduling Algorithm Introduction

Lecture 10 - Fluid Fair Queueing and Weighted Fair Queueing

Lecture 11 - Virtual Time In Scheduling

Lecture 12 - Fairness of WFO and SCFO Scheduling Algorithms

Lecture 13 - Rate Proportional Servers

Lecture 14 - Latency Rate Servers - I

Lecture 15 - Latency Rate Servers - II And Delay Bounds

Lecture 16 - QOS In Best Effort Internet

Lecture 17 - TCP Congestion Control

Lecture 18 - Analysis of TCP

Lecture 19 - TCP Throughput

Lecture 20 - Buffer Management

Lecture 21 - IP Addressing Scheme

Lecture 22 - IP Addressing Lookup And Packet Classification

Lecture 23 - IP Over ATM

Lecture 24 - Multiple Label Switching (MPLS)

Lecture 25 - MPLS and Traffic Engineering

Lecture 26 - Optical Network and MPLS

Lecture 27 - Integrated Service Internet (IntServ) and RSVP

Lecture 28 - Differentiated Services Internet

Lecture 29 - Voice over IP

Lecture 30 - RTP

Lecture 31 - Metro Ethernet Access Networks

Lecture 32 - Metro Ethernet Access Networks

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NPTEL : Digital Communication (Electronics and Communication Engineering)

Co-ordinators : Prof. Bikash Kumar Dey

Lecture 1 - Introduction to Digital Communication

Lecture 2 - Sampling

Lecture 3 - Quantization, PCM and Delta Modulation

Lecture 4 - Probability and Random Processes (Part-1)

Lecture 5 - Probability and Random Processes (Part-2)

Lecture 6 - Channels and their Models (Part-1)

Lecture 7 - Channels and their Models (Part-2)

Lecture 8 - Information Theory (Part-1)

Lecture 9 - Information Theory (Part-2)

Lecture 10 - Bandpass Signal Representation (Part-1)

Lecture 11 - Bandpass Signal Representation (Part-2)

Lecture 12 - Digital Modulation Techniques (Part-1)

Lecture 13 - Digital Modulation Techniques (Part-2)

Lecture 14 - Digital Modulation Techniques (Part-3)

Lecture 15 - Digital Modulation Techniques (Part-4)

Lecture 16 - Digital Modulation Techniques (Part-5)

Lecture 17 - Digital Modulation Techniques (Part-6)

Lecture 18 - Digital Modulation Techniques (Part-7)

Lecture 19 - Digital Modulation Techniques (Part-8)

Lecture 20 - Digital Modulation Techniques (Part-9)

Lecture 21 - Digital Modulation Techniques (Part-10)

Lecture 22 - Probability of Error Calculation

Lecture 23 - Calculation of Probability of Error

Lecture 24 - Calculation of Probability of Error

Lecture 25 - Equalizers

Lecture 26 - Source Coding (Part-1)

Lecture 27 - Source Coding (Part-2)

Lecture 28 - Source Coding (Part-3)

Lecture 29 - Source Coding (Part-4)

Lecture 30 - Channel Coding

Lecture 31 - Fundamentals of OFDM

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Lecture 32 - Conclusion

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NPTEL : Information Theory and Coding (Electronics and Communication Engineering)

Co-ordinators : Prof. S.N. Merchant

Lecture 1 - Introduction to Information Theory and Coding

Lecture 2 - Definition of Information Measure and Entropy

Lecture 3 - Extention of An Information Source and Markov Source

Lecture 4 - Adjoint of An Information Source, Joint and Conditional Information Measure

Lecture 5 - Properties of Joint and Conditional Information Measures and A Morkov Source

Lecture 6 - Asymptotic Properties of Entropy and Problem Solving in Entropy

Lecture 7 - Block Code and its Properties

Lecture 8 - Instantaneous Code and Its Properties

Lecture 9 - Kraft-Mcmillan Equality and Compact Codes

Lecture 10 - Shannon's First Theorem

Lecture 11 - Coding Strategies and Introduction to Huffman Coding

Lecture 12 - Huffman Coding and Proof of Its Optamality

Lecture 13 - Competitive Optamality of The Shannon Code

Lecture 14 - Non-Binary Huffman Code and Other Codes

Lecture 15 - Adaptive Huffman Coding - Part-I

Lecture 16 - Adaptive Huffman Coding - Part-II

Lecture 17 - Shannon-Fano-Elias Coding and Introduction to Arithmetic Coding

Lecture 18 - Arithmetic Coding - Part-I

Lecture 19 - Arithmetic Coding - Part-II

Lecture 20 - Introdution to Information Channels

Lecture 21 - Equivocation and Mutual Information

Lecture 22 - Properties of Different Information Channels

Lecture 23 - Reduction of Information Channels

Lecture 24 - Properties of Mutual Information and Introdution to Channel Capacity

Lecture 25 - Calculation of Channel Capacity for Different Information Channels

Lecture 26 - Shannon's Second Theorem

Lecture 27 - Discussion On Error Free Communication Over Noisy Channel

Lecture 28 - Error Free Communication Over A Binary Symmetric Channel and Introdution to Continous Sources and Channels

Lecture 29 - Differential Entropy and Evaluation of Mutual Information for Continuous Sources and Channels

Lecture 30 - Channel Capacity of A BandLimited Continuous Channel

Lecture 31 - Introduction to Rate-Distortion Theory

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Lecture 32 - Definition and Properties of Rate-Distortion Functions

Lecture 33 - Calculation of Rate-Distortion Functions

Lecture 34 - Computational Approach for Calculation of Rate-Distortion Functions

Lecture 35 - Introdution to Quantization

Lecture 36 - Lloyd-Max Quantizer

Lecture 37 - Companded Quantization

Lecture 38 - Variable Length Coding and Problem Solving in Quantizer Design

Lecture 39 - Vector Quantization

Lecture 40 - Transform Coding - Part-I

Lecture 41 - Transform Coding - Part-II

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NPTEL : Transmission Lines and EM Waves (Electronics and Communication Engineering)

Co-ordinators : Prof. R.K. Shevgaonkar

Lecture 1 - Introduction to EM waves and various techniques of communication

Lecture 2 - Equations of Voltage and Current on TX line

Lecture 3 - Propagation constant, Characteristic impedance and reflection coefficient

Lecture 4 - Impedance Transformation

Lecture 5 - Loss-less and Low loss Transmission line and VSWR

Lecture 6 - Power transfer on TX line

Lecture 7 - Smith Chart

Lecture 8 - Admittance Smith Chart

Lecture 9 - Experimental setup for transmission line measurements

Lecture 10 - Applications of transmission lines

Lecture 11 - Applications of transmission lines-II

Lecture 12 - Impedance Matching

Lecture 13 - Lossy Transmission Line

Lecture 14 - Problems on Transmission line

Lecture 15 - Types of transmission line

Lecture 16 - Basics of Vectors

Lecture 17 - Vector calculus

Lecture 18 - Basic laws of Electromagnetics

Lecture 19 - Maxwell\\\'s Equations

Lecture 20 - Boundary conditions at Media Interface

Lecture 21 - Uniform plane wave

Lecture 22 - Propagation of wave

Lecture 23 - Wave polarization

Lecture 24 - Pioncere\\\'s Sphere

Lecture 25 - Wave propagation in conducting medium

Lecture 26 - Wave propagation and phase velocity

Lecture 27 - Power flow and Poynting vector

Lecture 28 - Surface current and power loss in a conductor

Lecture 29 - Plane wave in arbitary direction

Lecture 30 - Plane wave at dielectric interface

Lecture 31 - Reflection and refraction at media interface

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Lecture 32 - Total internal reflection

Lecture 33 - Polarization at media interface

Lecture 34 - Reflection from a conducting boundary

Lecture 35 - Parallel plane waveguide

Lecture 36 - Wave propagation in parallel plane waveguide

Lecture 37 - Analysis of waveguide general approach

Lecture 38 - Rectangular waveguide

Lecture 39 - Modal propagation in rectangular waveguide

Lecture 40 - Surface currents on the waveguide walls

Lecture 41 - Field visualization and Attenuation in waveguide

Lecture 42 - Attenuation in waveguide continued

Lecture 43 - Radiation (Antenna)

Lecture 44 - Solution for potential function

Lecture 45 - Radiation form the Hertz dipole

Lecture 46 - Power radiated by hertz dipole

Lecture 47 - Thin linear antenna

Lecture 48 - Radiation Parameters of antenna

Lecture 49 - Receiving antenna

Lecture 50 - Monopole and Dipole antenna

Lecture 51 - Fourier transform relation between current and radiation pattern

Lecture 52 - Antenna arrays

Lecture 53 - Uniform Linear array

Lecture 54 - Uniform Linear array continued

Lecture 55 - Synthesis of array

Lecture 56 - Binomial array and general array synthesis

Lecture 57 - Problems on uniform plane wave

Lecture 58 - Problems on uniform plane wave in a meduim

Lecture 59 - Problems on waveguides

Lecture 60 - Problems on Antennas and radiation

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NPTEL : CMOS Analog VLSI Design (Electronics and Communication Engineering)

Co-ordinators : Prof. A.N. Chandorkar

Lecture 1 - Introduction to CMOS Analog VLSI Design

Lecture 2 - Introduction to CMOS Analog VLSI Design (Continued...)

Lecture 3 - MOS Fundamentals

Lecture 4 - MOS Fundamentals (Continued...)

Lecture 5 - Basic of MOS Amplifier (Part-1)

Lecture 6 - Basic of MOS Amplifier (Part-2)

Lecture 7 - Basic of MOS Amplifier (Part-3)

Lecture 8 - Cascode Amplifier

Lecture 9 - Types of MOSFET Amplifier

Lecture 10 - Types of MOSFET Amplifier

Lecture 11 - Differential Amplifier

Lecture 12 - Differential Amplifier

Lecture 13 - Current Sources

Lecture 14 - Current Sources

Lecture 15 - Current Sources

Lecture 16 - Frequency Response of Amplifier

Lecture 17 - Basic of CMOS OPAMP

Lecture 18 - OPAMP Design Issues

Lecture 19 - OPAMP Design

Lecture 20 - OPMAP Design

Lecture 21 - Operational Transconductance Amplifier

Lecture 22 - OTA Operation Transconductance Amplifier and Application

Lecture 23 - Fully Differential Amplifier and Noise

Lecture 24 - Noise

Lecture 25 - Noise (Continued...)

Lecture 26 - Layout of Analog Circuit

Lecture 27 - Oscillators

Lecture 28 - Oscillators (Continued...)

Lecture 29 - Oscillators (Continued...)

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NPTEL : Analog Circuits (Electronics and Communication Engineering)

Co-ordinators : Prof. A.N. Chandorkar

Lecture 1 - Introduction to Analog Circuits - An Overview

Lecture 2 - Two Parts of Review of Analog Filter Approximation

Lecture 3 - BJT Small Signal Model

Lecture 4 - BJT Small Signal Model [Continuation from Lecture 3]

Lecture 5 - MOS Circuit Model

Lecture 6 - Biasing of Circuits

Lecture 7 - Amplifiers

Lecture 8 - MOS Amplifiers

Lecture 9 - Cascode Amplifier

Lecture 10 - Frequency Response of Amplifier

Lecture 11 - Frequency Response of Amplifier

Lecture 12 - Frequency Response of Amplifier

Lecture 13 - Frequency Response of Amplifier

Lecture 14 - Differential Amplifier

Lecture 15 - Differential Amplifier

Lecture 16 - Differential Amplifier

Lecture 17 - Feedback Theory

Lecture 18 - Feedback Theory

Lecture 19 - OPAMP Circuits

Lecture 20 - OPAMP Circuits

Lecture 21 - Active RC Filters

Lecture 22 - Active Filters

Lecture 23 - Oscillators

Lecture 24 - Oscillators

Lecture 25 - DAC/ADC

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NPTEL : NOC:Microwave Integrated Circuits (Electronics and Communication Engineering)

Co-ordinators : Prof. Jayanta Mukherjee

Lecture 1 - Introduction

Lecture 2 - Reflection Coefficient, VSWR, Smith Chart

Lecture 3 - Reflection Coefficient, VSWR

Lecture 4 - Smith Chart

Lecture 5 - Application of the Smith Chart

Lecture 6 - Microwave Components

Lecture 7 - Broadband Impedance Matching

Lecture 8 - Multi-section transformer

Lecture 9 - Maximally flat (binomial) transformer, Chebyshev transformer

Lecture 10 - Non-uniform transmission line (Tapers)

Lecture 11 - Scattering Parameters

Lecture 12 - Properties of Scattering Parameters

Lecture 13 - Properties of Scattering Parameters (Continued...)

Lecture 14 - Signal flow graph, ABCD parameters

Lecture 15 - 1 and 2 Port passive Components

Lecture 16 - 3 Port Microwave Components

Lecture 17 - Couplers

Lecture 18 - Coupled Line Couplers

Lecture 19 - Resonators and narrow band filters

Lecture 20 - Narrow-band filters

Lecture 21 - Filter design: Image parameter method, Insertion loss method

Lecture 22 - Filter synthesis, KurodaÂ's Identity

Lecture 23 - Impedance Matching Circuits for Amplifiers

Lecture 24 - Microstrip Matching (Continued...), Masons Rule, Power Gain Equations

Lecture 25 - Amplifier Gain Stability

Lecture 26 - Amplifier Gain Stability (Continued...)

Lecture 27 - Gain Circles

Lecture 28 - Gain Circles (Continued...)

Lecture 29 - Noise

Lecture 30 - Noise Figure Circles (Continued...)

Lecture 31 - DC Bias

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Lecture 32 - Amplifier Classes, Frequency Compensation

Lecture 33 - Linearity

Lecture 34 - Oscillator Design

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NPTEL : NOC:Foundations of Wavelets and Multirate Digital Signal Processing (Electronics and Communication Engineering)

Co-ordinators : Prof. V.M. Gadre

Lecture 1 - Introduction

Lecture 2 - Origin of wavelets

Lecture 3 - Haar wavelet

Lecture 4 - Dyadic wavelet

Lecture 5 - Dilates and translates of Haar wavelet

Lecture 6 - L2 norm of a function

Lecture 7 - Piecewise constant representation of a function

Lecture 8 - Ladder of subspaces

Lecture 9 - Scaling function of Haar wavelet

Lecture 10 - Demonstration: Piecewise constant approximation of functions

Lecture 11 - Vector representation of sequences

Lecture 12 - Properties of norm

Lecture 13 - Parsevals theorem

Lecture 14 - Equivalence of functions and sequences

Lecture 15 - Angle between Functions and their Decomposition

Lecture 16 - Additional Information on Direct-Sum

Lecture 17 - Introduction to filter banks

Lecture 18 - Haar Analysis filter bank in Z-domain

Lecture 19 - Haar Synthesis filter bank in Z-domain

Lecture 20 - Moving from Z-domain to frequency domain

Lecture 21 - Frequency Response of Haar Analysis Low pass Filter bank

Lecture 22 - Frequency Response of Haar Analysis High pass Filter bank

Lecture 23 - Ideal Two-band Filter bank

Lecture 24 - Disqualification of Ideal Filter bank

Lecture 25 - Realizable Two-band Filter bank

Lecture 26 - Demonstration: DWT of images

Lecture 27 - Relating Fourier transform of scaling function to filter bank

Lecture 28 - Fourier transform of scaling function

Lecture 29 - Construction of scaling and wavelet functions from filter bank

Lecture 30 - Demonstration: Constructing scaling and wavelet functions.

Lecture 31 - Conclusive Remarks and Future Prospects

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NPTEL : RF Integrated Circuits (Electronics and Communication Engineering)

Co-ordinators : Dr. Shouribrata Chatterjee

Lecture 1 - RF system basic architectures

Lecture 2 - Transmission media reflection

Lecture 3 - Maximum power transfer

Lecture 4 - Parallel RLC tank

Lecture 5 - Matching

Lecture 6 - Other matching networks

Lecture 7 - Resistors capacitors

Lecture 8 - Inductors

Lecture 9 - Inductors and wires

Lecture 10 - Wires

Lecture 11 - Transmission lines

Lecture 12 - Device review

Lecture 13 - MOS capacitances

Lecture 14 - Bandwidth estimation constants

Lecture 15 - Bandwidth estimation constants (Continued.)

Lecture 16 - Bandwidth estimation using short circuit

Lecture 17 - Bandwidth groupdelay and peaking

Lecture 18 - Shunt series amplifier

Lecture 19 - Shunt series amplifier (Continued.)

Lecture 20 - Various noise sources

Lecture 21 - Noise in a mosfet

Lecture 22 - Motivation first cut design

Lecture 23 - Motivation first cut design (Continued.)

Lecture 24 - Noise other possible topologies

Lecture 25 - Multiplier Fundamentals

Lecture 26 - Mixer non idealties

Lecture 27 - Mixer non idealties (Continued.)

Lecture 28 - A tank based oscillators

Lecture 29 - Phase noise in oscillators

Lecture 30 - Other oscillators topologies

Lecture 31 - Phase locked loop basics

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Lecture 32 - Charge pump

Lecture 33 - Pll dynamics integer

Lecture 34 - Spurious frequencies fractional and synthesis

Lecture 35 - Fractional spurs

Lecture 36 - Delta and sigma modulation

Lecture 37 - Class abc power amplifiers

Lecture 38 - Class bcd power amplifiers

Lecture 39 - Class cd pwm amplifiers

Lecture 40 - Course summary and conclusion

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NPTEL : Communication Engineering (Electronics and Communication Engineering)

Co-ordinators : Prof. Surendra Prasad

Lecture 1 - Introduction to Communication Engineering

Lecture 2 - Communication channel

Lecture 3 - Brief Review of Signal and Systems

Lecture 4 - The Hilbert Transform

Lecture 5 - Analytic Representation of band pass Signals

Lecture 6 - Fundamentals of Analog Signal Transmission

Lecture 7 - Analog Modulation of Carriers

Lecture 8 - Amplitude Modulation

Lecture 9 - Amplitude Modulation

Lecture 10 - Single Sideband Modulation

Lecture 11 - Suppressed Sideband Modulation

Lecture 12 - VSB Modulation - Superhet Receiver

Lecture 13 - Superhet Receiver etc

Lecture 14 - Practical Mixers-Effects of Tonal

Lecture 15 - Angle Modulation

Lecture 16 - Angle Modulation

Lecture 17 - Generation of FM Signals

Lecture 18 - FM Generation and Detection

Lecture 19 - Demodulation of Angle Modulated Signals

Lecture 20 - Demodulation of Angle Modulated Signals

Lecture 21 - Demodulation of Angle Modulated Signals

Lecture 22 - Feedback Demodulators - phase locked loop

Lecture 23 - The Phase Locked Loop

Lecture 24 - Frequency Compressive Feedback Demodulator

Lecture 25 - FM Receivers

Lecture 26 - TV Transmission

Lecture 27 - Review of Probability Theory and Random Process

Lecture 28 - Review of Probability Theory and Random Variables

Lecture 29 - Random Processes

Lecture 30 - Random Processes

Lecture 31 - Random Processes

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Lecture 32 - Gaussian Random Processes

Lecture 33 - Behaviour of Communication System

Lecture 34 - Performance of AM Systems in Noise

Lecture 35 - Noise in AM and Angle Modulation Systems

Lecture 36 - Noise in Phase and Frequency Modulation systems

Lecture 37 - Noise in Angle Modulation

Lecture 38 - Pre emphasis - De emphasis

Lecture 39 - Pulse Modulation Schemes - PWM and PPM

Lecture 40 - Data Modulation

Lecture 41 - Pulse Code Modulation

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NPTEL : Digital Signal Processing (Electronics and Communication Engineering)

Co-ordinators : Prof. S.C. Dutta Roy

Lecture 1 - Digital Signal Processing Introduction

Lecture 2 - Digital Signal Processing Introduction (Continued.)

Lecture 3 - Digital Systems

Lecture 4 - Characterization Description, Testing of Digital Systems

Lecture 5 - LTI Systems Step & Impulse Responses, Convolution

Lecture 6 - Inverse Systems, Stability, FIR & IIR

Lecture 7 - FIR & IIR; Recursive & Non Recursive

Lecture 8 - Discrete Time Fourier Transform

Lecture 9 - Discrete Fourier Transform (DFT)

Lecture 10 - DFT (Continued.)

Lecture 11 - DFT (Continued.) Introduction to Z Transform

Lecture 12 - Z Transform

Lecture 13 - Z Transform (Continued.)

Lecture 14 - Discrete Time Systems in the Frequency Domain

Lecture 15 - Simple Digital Filters

Lecture 16 - All Pass Filters, Com.Filters

Lecture 17 - Linear Phase filters, Complementary Transfer Fn

Lecture 18 - Compensatory Transfer Functions, (Continued.)

Lecture 19 - Test for Stability using All Pass Functions

Lecture 20 - Digital Processing of Continuous Time Signals

Lecture 21 - Problem Solving Session: FT, DFT, & Z Transforms

Lecture 22 - Problem Solving Session: FT, DFT, & Z Transforms

Lecture 23 - Analog Filter Design

Lecture 24 - Analog Chebyshev LPF Design

Lecture 25 - Analog Filter Design (Continued.): Transformations

Lecture 26 - Analog frequency Transformation

Lecture 27 - Problem Solving Session on Discrete Time System

Lecture 28 - Digital Filter Structures

Lecture 29 - IIR Realizations

Lecture 30 - All Pass Realizations

Lecture 31 - Lattice Synthesis (Continued.)

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Lecture 32 - FIR Lattice Synthesis

Lecture 33 - FIR Lattice (Continued.) and Digital Filter Design

Lecture 34 - IIR Filter Design

Lecture 35 - IIR Design by Bilinear Transformation

Lecture 36 - IIR Design Examples

Lecture 37 - Digital to Digital Frequency Transformation

Lecture 38 - FIR Design

Lecture 39 - FIR Digital Filter Design by Windowing

Lecture 40 - FIR Design by Windowing & Frequency Sampling

Lecture 41 - Solving Problems on DSP Structures

Lecture 42 - FIR Design by Frequency Sampling

Lecture 43 - FIR Design by Frequency Sampling (Continued.)

DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : Wireless Communication (Electronics and Communication Engineering)

Co-ordinators : Prof. Ranjan Bose

Lecture 1 - Motivation and Introduction

Lecture 2 - Types of Wireless communication

Lecture 3 - The modern wireless Communication Systems

Lecture 4 - The cellular concept - System Design issues

Lecture 5 - Cell capacity and reuse

Lecture 6 - Interference and System capacity

Lecture 7 - Improving coverage and system capacity

Lecture 8 - Mobile Radio Propagation

Lecture 9 - Mobile Radio Propagation (Continued.)

Lecture 10 - Mobile Radio Propagation (Continued.)

Lecture 11 - Mobile Radio Propagation (Continued.)

Lecture 12 - Mobile Radio Propagation (Continued.)

Lecture 13 - Mobile Radio Propagation (Continued.)

Lecture 14 - Mobile Radio Propagation II

Lecture 15 - Mobile Radio Propagation II (Continued.)

Lecture 16 - Mobile Radio Propagation II (Continued.)

Lecture 17 - Mobile Radio Propagation II (Continued.)

Lecture 18 - Mobile Radio Propagation II (Continued.)

Lecture 19 - Mobile Radio Propagation II (Continued.)

Lecture 20 - Mobile Radio Propagation II (Continued.)

Lecture 21 - Modulation Techniques for Mobile Communication

Lecture 22 - Modulation Techniques (Continued.)

Lecture 23 - Modulation Techniques (Continued.)

Lecture 24 - Modulation Techniques (Continued.)

Lecture 25 - Modulation Techniques (Continued.)

Lecture 26 - Modulation Techniques (Continued.)

Lecture 27 - Modulation Techniques (Continued.)

Lecture 28 - Equalization and Diversity Techniques

Lecture 29 - Equalization and Diversity Techniques (Continued.)

Lecture 30 - Equalization and Diversity Techniques (Continued.)

Lecture 31 - Equalization and Diversity Techniques (Continued.)

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Lecture 32 - Coding Techniques for Mobile Communications

Lecture 33 - Coding Techniques for Mobile Communications (Continued.)

Lecture 34 - Coding Techniques for Mobile Communications (Continued.)

Lecture 35 - Coding Techniques for Mobile Communications (Continued.)

Lecture 36 - Wireless Networks

Lecture 37 - GSM and CDMA

Lecture 38 - GSM and CDMA (Continued.)

NPTEL : Basic Electronics (Electronics and Communication Engineering)

Co-ordinators : Prof. Chitralekha Mahanta

Lecture 1 - Semiconductor materials

Lecture 2 - PN Junction Diodes

Lecture 3 - Diode Equivalent Circuits

Lecture 4 - Diode Rectifier Circuits

Lecture 5 - Zener Diode and Applications

Lecture 6 - Clipping and Clamping Circuits

Lecture 7 - Transistor Operation - Part-1

Lecture 8 - Transistor Operation - Part-2

Lecture 9 - Biasing the BJT - Part-1

Lecture 10 - Biasing the BJT - Part-2

Lecture 11 - BJT Small Signal Analysis

Lecture 12 - BJT Amplifier - Part-1

Lecture 13 - BJT Amplifier - Part-2

Lecture 14 - Frequency Response of BJT Analysis - Part-1

Lecture 15 - Bipolar Junction Transistors

Lecture 16 - Transistor as a Switch

Lecture 17 - MOSFET - Part-1

Lecture 18 - MOSFET - Part-2

Lecture 19 - MOSFET under dc operation

Lecture 20 - Mosfet as an Amplifier

Lecture 21 - Small signal model of MOSFET - Part-1

Lecture 22 - Small signal model of MOSFET - Part-2

Lecture 23 - High Frequency model of mosfet

Lecture 24 - Junction Field Effect Transistor

Lecture 25 - Operational Amplifier Introduction

Lecture 26 - Ideal Op-Amp

Lecture 27 - Op-Amp applications Part-1

Lecture 28 - Op-Amp Applications Part-2

Lecture 29 - Op-Amp Applications Part-3

Lecture 30 - The practical Op-Amp

Lecture 31 - Positive feedback and oscillation

Lecture 32 - Comparator

Lecture 33 - Large Signal Amplifiers

Lecture 34 - Transformer Couple Power Amplifier

Lecture 35 - Class AB Operations of Power Amplifier

Lecture 36 - Power BJTs

Lecture 37 - Regulated Power Supply

Lecture 38 - Four Layered Diode

Lecture 39 - Silicon Control Rectifier

Lecture 40 - SCR Applications

NPTEL : NOC:VLSI Design Verification and Test (Electronics and Communication Engineering)

Co-ordinators : Dr. Santosh Biswas, Jatindra Kumar Deka, Prof.Arnab sarkar

Lecture 1 - Introduction - Part 1

Lecture 2 - Introduction - Part 2

Lecture 3 - Overview of VLSI Design Flow

Lecture 4 - High Level Synthesis Overview - Part 1

Lecture 5 - High Level Synthesis Overview - Part 2

Lecture 6 - Scheduling in HLS - Part 1

Lecture 7 - Scheduling in HLS - Part 2

Lecture 8 - Scheduling in HLS - Part 3

Lecture 9 - Scheduling in HLS - Part 4

Lecture 10 - Scheduling in HLS - Part 5

Lecture 11 - Scheduling in HLS - Part 6

Lecture 12 - Scheduling in HLS - Part 7

Lecture 13 - Resource Sharing and Binding in HLS - Part 1

Lecture 14 - Resource Sharing and Binding in HLS - Part 2

Lecture 15 - Resource Sharing and Binding in HLS - Part 3

Lecture 16 - Resource Sharing and Binding in HLS - Part 4

Lecture 17 - Resource Sharing and Binding in HLS - Part 5

Lecture 18 - Resource Sharing and Binding in HLS - Part 6

Lecture 19 - Resource Sharing and Binding in HLS - Part 7

Lecture 20 - Logic Synthesis - Part 1

Lecture 21 - Logic Synthesis - Part 2

Lecture 22 - Logic Synthesis - Part 3

Lecture 23 - Physical Design - Part 1

Lecture 24 - Physical Design - Part 2

Lecture 25 - Physical Design - Part 3

Lecture 26 - Introduction to formal methods for design verification

Lecture 27 - Temporal Logic: Introduction and Basic Operations on Temporal Logic

Lecture 28 - Syntax and Semantics of CLT

Lecture 29 - Syntax and semantics of CTL (Continued...)

Lecture 30 - Equivalences between CTL Formulas

Lecture 31 - Introduction to Model Checking

Lecture 32 - Model checking Algorithms

Lecture 33 - Model checking Algorithms (Continued...)

Lecture 34 - Model Checking with Fairness

Lecture 35 - Binary Decision Diagram: Introduction and Construction

Lecture 36 - Ordered Binary Decision Diagram (OBDD)

Lecture 37 - Operation On OBDD

Lecture 38 - OBDD for State Transition Systems E

Lecture 39 - Symbolic Model Checking

Lecture 40 - Introduction to Digital VLSI Testing

Lecture 41 - Functional and Structural Testing

Lecture 42 - Fault Equivalence

Lecture 43 - Fault Simulation - I

Lecture 44 - Fault Simulation - II

Lecture 45 - Fault Simulation - III

Lecture 46 - Testability Measures (SCOAP)

Lecture 47 - Introduction to Automatic Test Pattern Generation (ATPG) and ATPG Algebras

Lecture 48 - D-Algorithm - I

Lecture 49 - D-Algorithm - II

Lecture 50 - ATPG for Synchronous Sequential Circuits

Lecture 51 - Scan Chain based Sequential Circuit Testing - I

Lecture 52 - Scan Chain based Sequential Circuit Testing - II

Lecture 53 - BIST - I

Lecture 54 - BIST - II

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NPTEL : NOC:Design of Power Electronic Converters (Electronics and Communication Engineering)

Co-ordinators : Prof. Shabari Nath

Lecture 1 - Introduction

Lecture 2 - Analysis of Buck Converter

Lecture 3 - Choosing L and C

Lecture 4 - Design Example of Buck Converter

Lecture 5 - Analysis of H Bridge

Lecture 6 - Bipolar PWM

Lecture 7 - Unipolar PWM

Lecture 8 - Bipolar vs Unipolar PWM

Lecture 9 - Different types of power diode

Lecture 10 - Diode characteristics

Lecture 11 - Diode Datasheets

Lecture 12 - Diode Datasheet Examples

Lecture 13 - MOSFET

Lecture 14 - Switching characteristics of MOSFET

Lecture 15 - MOSFET Datasheets - I

Lecture 16 - MOSFET Datasheets - II

Lecture 17 - MOSFET Datasheet example

Lecture 18 - IGBT

Lecture 19 - IGBT Datasheets - I

Lecture 20 - IGBT Datasheets - II

Lecture 21 - IGBT Datasheet Example

Lecture 22 - Introduction to Gate Drivers

Lecture 23 - Gate Driver Requirements

Lecture 24 - Optocouplers based Gate Drivers - I

Lecture 25 - Optocouplers based Gate Drivers - II

Lecture 26 - Desat Protection

Lecture 27 - Bootstrapping

Lecture 28 - Pulse Transformer based Gate Drivers

Lecture 29 - Gate Drivers - Few Other Requirements

Lecture 30 - Introduction to Snubbers

Lecture 31 - RC Snubber Analysis - I

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Lecture 32 - RC Snubber Analysis - II : Underdamped Case

Lecture 33 - RC Snubber Analysis - III : Overdamped and Critically Damped Case

Lecture 34 - RC Snubber Design - I

Lecture 35 - RC Snubber Design - II

Lecture 36 - RCD Snubbers - I

Lecture 37 - RCD Snubbers - II

Lecture 38 - Power Loss - I

Lecture 39 - Power Loss - II

Lecture 40 - Thermal Modelling - I

Lecture 41 - Thermal Modelling - II

Lecture 42 - Thermal Modelling - III

Lecture 43 - Choosing Heat Sinks

Lecture 44 - Fundamentals

Lecture 45 - Magnetic Losses

Lecture 46 - Conductors

Lecture 47 - Magnetic Materials

Lecture 48 - Magnetic Core

Lecture 49 - Inductor Design - I

Lecture 50 - Inductor Design - II

Lecture 51 - Transformer Design

Lecture 52 - Inductor Design Example

Lecture 53 - Example of Transformer Design

Lecture 54 - Introduction to EMI

Lecture 55 - EMI Measurements

Lecture 56 - EMI in Power Electronics

Lecture 57 - CM and DM noise

Lecture 58 - Design Solutions of EMI

Lecture 59 - EMI Filter - I

Lecture 60 - EMI Filter - II

Lecture 61 - Sections of Power Converters

Lecture 62 - Capacitors

Lecture 63 - Familiarity with Components - I

Lecture 64 - Familiarity with Components - II

Lecture 65 - PCB - I

Lecture 66 - PCB - II

Lecture 67 - PCB - III

Lecture 68 - Grounds

Lecture 69 - Lab Demo of Hardware Design

Lecture 70 - Tutorial: PCB Designing

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NPTEL : NOC:Operation and Planning of Power Distribution Systems (Electronics and Communication Engineering)

Co-ordinators : Prof. Sanjib Ganguly

Lecture 1 - Power systems: Overview and historical developments

Lecture 2 - Introduction to power delivery systems

Lecture 3 - Introduction to electrical loads

Lecture 4 - Load diversity

Lecture 5 - Different load indices

Lecture 6 - Loss factor

Lecture 7 - Load management

Lecture 8 - Brief overview of power distribution substation

Lecture 9 - Substation bus schemes and primary distribution network topology

Lecture 10 - Voltage drop and power loss computations for typical radial distribution feeders

Lecture 11 - Genaralized expression for voltage drop for radial distribution feeder

Lecture 12 - Derivation of K-constant for voltage drop computation

Lecture 13 - Different reliability indices used in distribution networks

Lecture 14 - Different reliability indices with numerical examples

Lecture 15 - Mathematical concept of reliability

Lecture 16 - Reliability evaluation of multiple units connected to series and/or parallel

Lecture 17 - Numerical problems on reliability evaluation

Lecture 18 - Power quality problems in distribution systems

Lecture 19 - Forward backward load flow approach for power distribution systems

Lecture 20 - Forward backward load flow approach for power distribution systems

Lecture 21 - Reactive power compensation: Basic idea

Lecture 22 - Reactive power compensation: Numerical examples

Lecture 23 - Capacitor placement at distribution feeder: Analytical approach

Lecture 24 - Power distribution system planning: Economic aspects

Lecture 25 - Power distribution system planning: Different models and solution strategies

Lecture 26 - Mono-objective power distribution system planning approach

Lecture 27 - Multi-objective power distribution system planning approach

Lecture 28 - Multi-objective planning incorporating sectionalizing switches and tie-lines

Lecture 29 - Reconfiguration of power distribution networks

Lecture 30 - Distribution networks with the integration of Distributed Generation

Lecture 31 - Concept of microgrids

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Lecture 32 - Wind and solar energy conversion systems

Lecture 33 - Energy storage systems

Lecture 34 - Distribution system automation and smart grid - Part I

Lecture 35 - Distribution system automation and smart grid - Part II

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NPTEL : NOC:Nanophotonics, Plasmonics, and Metamaterials (Electronics and Communication Engineering)

Co-ordinators : Dr. Debabrata Sikdar, Dr. Debabrata Sikdar

Lecture 1 - Introduction to Nanophotonics and Plasmonics

Lecture 2 - Introduction to Metamaterials and Metasurfaces

Lecture 3 - Overview and current status

Lecture 4 - Electromagnetic theory of light

Lecture 5 - Electromagnetic properties of material

Lecture 6 - Electromagnetic waves in dielectric media

Lecture 7 - Polarization of light

Lecture 8 - Reflection and refraction: Fresnel equations

Lecture 9 - Absorption, dispersion and scattering of light

Lecture 10 - Matrix theory of dielectric layered media

Lecture 11 - 1D Photonic crystals

Lecture 12 - Dispersion relation and photonic band structure

Lecture 13 - Real and reciprocal lattices

Lecture 14 - 2D and 3D Photonic crystals

Lecture 15 - Emerging Applications of Photonic Crystals

Lecture 16 - Optical properties of metals

Lecture 17 - Surface Plasmon Polaritons (SPP): Fundamentals

Lecture 18 - Applications of SPPs

Lecture 19 - Localized surface plasmon resonance (LSPR)

Lecture 20 - Plasmonic nanoparticles: Antenna and Waveguides

Lecture 21 - Applications of LSPR

Lecture 22 - Fundamentals of metamaterials

Lecture 23 - Effective medium theories

Lecture 24 - Single and Double-Negative Metamaterials

Lecture 25 - Metamaterial Perfect absorbers

Lecture 26 - Super lens, Hyperbolic Metamaterials and Hyper lens

Lecture 27 - Tunable photonic metamaterial based devices

Lecture 28 - Metasurfaces and Frequency selective surfaces

Lecture 29 - Guided mode resonances (GMR)

Lecture 30 - Applications of metasurfaces and GMR devices

Lecture 31 - Transformation Optics (TO) and Invisibility Cloaks

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Lecture 32 - Carpet cloaking and TO metamaterials

Lecture 33 - Introduction to alternative materials

Lecture 34 - Nanofabrication: Physical and Chemical methods

Lecture 35 - Lithography and Pattern transfer

Lecture 36 - Nanophotonic characterization methods

NPTEL : NOC:Power Electronics Applications in Power Systems (Electronics and Communication Engineering)

Co-ordinators : Prof. Sanjib Ganguly

Lecture 1 - Basic Concepts of active and reactive power

Lecture 2 - Basic Concepts of reactive power compensation

Lecture 3 - Basic mathematical modelling of power transmission systems

Lecture 4 - Derivation of the relation of sending and receiving end voltages and currents - Part A

Lecture 5 - Derivation of the relation of sending and receiving end voltages and currents - Part B

Lecture 6 - Derivations of power flow expressions

Lecture 7 - Numerical example showing determination of power flow

Lecture 8 - Generalized expression for active and reactive power at any point of a long line

Lecture 9 - Mid-point voltage and current for long, lossless transmission lines

Lecture 10 - Plot of mid-point voltage vs line loading

Lecture 11 - Numerical example of mid-point compensation - Part A

Lecture 12 - Numerical example of mid-point compensation - Part B

Lecture 13 - Effect of Mid-point compensation on power flow of transmission lines

Lecture 14 - Thyristor controlled reactor (TCR)

Lecture 15 - Harmonics in TCR and Three-phase TCR configuration

Lecture 16 - Operating Characteristics of TCR

Lecture 17 - Categorization of different types of SVC and Fixed capacitor TCR (FC-TCR)

Lecture 18 - Mechanically Switched Capacitor TCR (MSC-TCR) and Thyrisor Switch Capacitor (TSC)

Lecture 19 - Thyristor Switch Capacitor (TSC)

Lecture 20 - Design of TSC-TCR: Numerical Example

Lecture 21 - SVC in enhancement of steady-state power transmission capacity

Lecture 22 - SVC in enhancement of transient stability of power systems

Lecture 23 - SVC in enhancement of synchronizing power coefficient

Lecture 24 - SVC in and power system oscillation damping

Lecture 25 - SVC in voltage control of power systems: Modelling

Lecture 26 - SVC in voltage control of power systems: Control characteristics

Lecture 27 - SVC in voltage control of power systems: Numerical example

Lecture 28 - Basic operating principle of TCSC

Lecture 29 - Basic mathematical modelling of TCSC - Part 1

Lecture 30 - Basic mathematical modelling of TCSC - Part 2

Lecture 31 - TCSC reactance and hamomics analysis

Lecture 32 - Applications of TCSC in power systems

Lecture 33 - Basic mathematical modelling of STATCOM

Lecture 34 - Applications of STATCOM in power systems

Lecture 35 - Basic mathematical modelling of SSSC

Lecture 36 - Applications of SSSC in power systems

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NPTEL : Signals and Systems (Electronics and Communication Engineering)

Co-ordinators : Prof. K.S. Venkatesh

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

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Lecture 29

Lecture 30

Lecture 31

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Lecture 32

Lecture 33

Lecture 34

Lecture 35

Lecture 36

Lecture 37

Lecture 38

Lecture 39

Lecture 40

Lecture 41

Lecture 42

Lecture 43

Lecture 44

Lecture 45

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NPTEL : Advanced 3G and 4G Wireless Mobile Communications (Electronics and Communication Engineering)

Co-ordinators : Prof. Aditya K. Jagannatham

Lecture 1 - Introduction to 3G/4G Standards

Lecture 2 - Wireless Channel and Fading

Lecture 3 - Rayleigh Fading and BER of Wired Communication

Lecture 4 - BER for Wireless Communication

Lecture 5 - Introduction to Diversity

Lecture 6 - Multi-antenna Maximal Ratio Combiner

Lecture 7 - BER with Diversity

Lecture 8 - Spatial Diversity and Diversity Order

Lecture 9 - Wireless Channel and Delay Spread

Lecture 10 - Coherence Bandwidth of the Wireless Channel

Lecture 11 - ISI and Doppler in Wireless Communications

Lecture 12 - Doppler Spectrum and Jakes Model

Lecture 13 - Introduction to CDMA, Spread Spectrum and LFSR

Lecture 14 - Generation and Properties of PN Sequences

Lecture 15 - Correlation of PN Sequences and Jammer Margin

Lecture 16 - CDMA Advantages and RAKE Receiver

Lecture 17 - Multi-User CDMA Downlink Part I

Lecture 18 - Multi-User CDMA Downlink Part II

Lecture 19 - Multi-User CDMA Uplink and Asynchronous CDMA

Lecture 20 - CDMA Near-Far Problem and Introduction to MIMO

Lecture 21 - MIMO System Model and Zero-Forcing Receiver

Lecture 22 - MIMO MMSE Receiver and Introduction to SVD

Lecture 23 - SVD Based Optimal MIMO Transmission and Capacity

Lecture 24 - SVD Based Optimal MIMO Transmission and Capacity

Lecture 25 - OSTBCs and Introduction to V-BLAST Receiver

Lecture 26 - V-BLAST (Continued) and MIMO Beamforming

Lecture 27 - Introduction to OFDM and Multi-Carrier Modulation

Lecture 28 - IFFT Sampling for OFDM

Lecture 29 - OFDM Schematic and Cyclic Prefix

Lecture 30 - OFDM Based Parallelization and OFDM Example

Lecture 31 - OFDM Example (Continued) and Introduction to MIMO-OFDM

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Lecture 32 - MIMO-OFDM (Continued)

Lecture 33 - Impact of Carrier Frequency Offset (CFO) in OFDM

Lecture 34 - PAPR in OFDM Systems and Introduction to SC-FDMA

Lecture 35 - SC-FDMA (Continued) and Introduction of Wireless Propagation Models

Lecture 36 - Ground Reflection and Okumura Models

Lecture 37 - Hata Model and Log Normal Shadowing

Lecture 38 - Link Budget Analysis

Lecture 39 - Introduction to Teletraffic Theory

Lecture 40 - Cellular Traffic Modeling and Blocking Probability

NPTEL : Digital Switching (Electronics and Communication Engineering)

Co-ordinators : Prof. Yatindra N Singh

Lecture 1 - Digital Switching

Lecture 2 - Digital Switching

Lecture 3 - Digital Switching

Lecture 4 - Digital Switching

Lecture 5 - Digital Switching

Lecture 6 - Digital Switching

Lecture 7 - Digital Switching

Lecture 8 - Digital Switching

Lecture 9 - Digital Switching

Lecture 10 - Digital Switching

Lecture 11 - Digital Switching

Lecture 12 - Digital Switching

Lecture 13 - Digital Switching

Lecture 14 - Digital Switching

Lecture 15 - Digital Switching

Lecture 16 - Digital Switching

Lecture 17 - Digital Switching

Lecture 18 - Digital Switching

Lecture 19 - Digital Switching

Lecture 20 - Digital Switching

Lecture 21 - Digital Switching

Lecture 22 - Digital Switching

Lecture 23 - Digital Switching

Lecture 24 - Digital Switching

Lecture 25 - Digital Switching

Lecture 26 - Digital Switching

Lecture 27 - Digital Switching

Lecture 28 - Digital Switching

Lecture 29 - Digital Switching

Lecture 30 - Digital Switching

Lecture 31 - Digital Switching

Lecture 32 - Digital Switching

Lecture 33 - Digital Switching

Lecture 34 - Digital Switching

Lecture 35 - Digital Switching

Lecture 36 - Digital Switching

Lecture 37 - Digital Switching

NPTEL : NOC:Principles of Modern CDMA-MIMO-OFDM Wireless Communications (Electronics and Communication Engineering)

Co-ordinators : Prof. Aditya K. Jagannatham

Lecture 1 - Evolution of Wireless Communication Technologies

Lecture 2 - Modeling Wireless Channel

Lecture 3 - Wireless Fading Channel Model

Lecture 4 - Fading Channel Distribution

Lecture 5 - Rayleigh Fading Channel

Lecture 6 - Bit Error Rate (BER) Performance

Lecture 7 - Bit Error Rate (BER) of AWGN Channels

Lecture 8 - Bit Error Rate of Rayleigh Fading Wireless Channel

Lecture 9 - Exact BER Expression for Rayleigh Fading Wireless Channel

Lecture 10 - Deep Fade Analysis of Wireless Communication

Lecture 11 - Principle of Diversity

Lecture 12 - Multiple Antenna Diversity

Lecture 13 - Maximal-Ratio Combining

Lecture 14 - BER of Multiple Antenna Wireless Systems

Lecture 15 - Approximate BER for Multiple Antenna Wireless System

Lecture 16 - Examples for BER of Wireless Communication

Lecture 17 - Deep Fade in Multi Antenna Systems

Lecture 18 - Intuition for Deep Fade in Multi-Antenna System

Lecture 19 - Definition of Diversity Order

Lecture 20 - Max Delay Spread

Lecture 21 - RMS Delay Spread

Lecture 22 - Delay Spread and Inter Symbol Interference

Lecture 23 - Coherence Bandwidth of Wireless Channel

Lecture 24 - Mobility and Doppler Effect in Wireless Channels

Lecture 25 - Imapact of Doppler Effect on Wireless Channel

Lecture 26 - Introduction to Code Division Multiple Access (CDMA)

Lecture 27 - Chip Time and Bandwidth Expansion in CDMA

Lecture 28 - Code Generation for CDMA

Lecture 29 - CDMA Codes: Properties of PN Sequences

Lecture 30 - BER of CDMA Systems

Lecture 31 - Analysis of Multi-user CDMA

Lecture 32 - Multipath Diversity in CDMA Systems

Lecture 33 - Near-Far Problem in CDMA

Lecture 34 - Multiple Input Multiple Output (MIMO) Systems

Lecture 35 - Examples of MIMO Systems

Lecture 36 - MIMO Receivers

Lecture 37 - BER Performance of ZF Receiver

Lecture 38 - Transmit Beamforming in MISO Systems

Lecture 39 - Alamouti Code and Space-Time Block Codes

Lecture 40 - BER of Alamouti Coded System

Lecture 41 - Singular Value Decomposition (SVD)

Lecture 42 - SVD in MIMO

Lecture 43 - Capacity of MIMO Wireless Systems

Lecture 44 - SVD based MIMO Transmission

Lecture 45 - Orthogonal Frequency Division Multiplexing (OFDM)

Lecture 46 - Transmission in Multicarrier Systems

Lecture 47 - FFT/IFFT Processing in OFDM

Lecture 48 - Cyclic Prefix in OFDM Systems

Lecture 49 - Schematic Represntation of OFDM Transmitter and Receiver

Lecture 50 - BER Performance of OFDM Systems

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NPTEL : NOC:Probability and Random Variables, Processes for Wireless Communications (Electronics and Communication Engineering)

Co-ordinators : Prof. Aditya K. Jagannatham

Lecture 1 - Basics - Sample Space and Events

Lecture 2 - Axioms of Probability

Lecture 3 - Conditional Probability - Mary-PAM Example

Lecture 4 - Independent Events - Mary-PAM Example

Lecture 5 - Independent Events - Block Transmission Example

Lecture 6 - Independent Events - Multiantenna Fading Example

Lecture 7 - Bayes Theorem and Aposteriori Probabilities

Lecture 8 - Maximum Aposteriori Probability (MAP) Receiver

Lecture 9 - Random Variables, Probability Density Function (PDF)

Lecture 10 - Application: Power of Fading Wireless Channel

Lecture 11 - Mean, Variance of Random Variables

Lecture 12 - Application: Average Delay and RMS Delay Spread of Wireless Channel

Lecture 13 - Transformation of Random Variables and Rayleigh Fading Wireless Channel

Lecture 14 - Gaussian Random Variable and Linear Transformation

Lecture 15 - Special Case: IID Gaussian Random Variables

Lecture 16 - Application: Array Processing and Array Gain with Uniform Linear Arrays

Lecture 17 - Random Processes and Wide Sense Stationarity (WSS)

Lecture 18 - WSS Example Narrowband Wireless Signal with Random Phase

Lecture 19 - Power Spectral Density (PSD) for WSS Random Process

Lecture 20 - PSD Application in Wireless Bandwidth Required for Signal Transmission

Lecture 21 - Transmission of WSS Random Process Through LTI System

Lecture 22 - Special Random Processes Gaussian Process and White Noise AWGN Communication Channel

Lecture 23 - Gaussian Process Through LTI System Example: WGN Through RC Low Pass Fillter Not Started

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NPTEL : NOC:Estimation for Wireless Communications, MIMO, OFDM Cellular and Sensor Networks (Electronics and Communication Engineering)

Co-ordinators : Prof. Aditya K. Jagannatham

Lecture 1 - Basics - Sensor Network and Noisy Observation Model

Lecture 2 - Likelihood Function and Maximum Likelihood (ML) Estimate

Lecture 3 - Properties of Maximum Likelihood (ML) Estimate Â– Mean and Unbiasedness

Lecture 4 - Properties of Maximum Likelihood (ML) Estimate Â– Variance and Spread Around Mean

Lecture 5 - Reliability of the Maximum Likelihood (ML) Estimate Â– Number of Samples Required

Lecture 6 - Estimation of Complex Parameters Â– Symmetric Zero Mean Complex Gaussian Noise

Lecture 7 - Wireless Fading Channel Estimation Â– Pilot Symbols and Likelihood Function

Lecture 8 - Wireless Fading Channel Estimation Â– Pilot Training based Maximum Likelihood ML Estimate

Lecture 9 - Wireless Fading Channel Estimation Â– Mean and Variance of Pilot Training Based Maximum Likelihood

Lecture 10 - Example Â– Wireless Fading Channel Estimation for Downlink Mobile Communication

Lecture 11 - Cramer Rao Bound (CRB) for Parameter Estimation

Lecture 12 - Cramer Rao Bound CRB Example Â– Wireless Sensor Network

Lecture 13 - Vector Parameter Estimation Â– System Model for Multi Antenna Downlink Channel Estimation

Lecture 14 - Likelihood Function and Least Squares Cost Function for Vector Parameter Estimation

Lecture 15 - Least Squares Cost Function for Vector Parameter Estimation Vector Derivative Gradient

Lecture 16 - Least Squares Solution Maximum Likelihood ML Estimate Pseudo Inverse

Lecture 17 - Properties of Least Squares Estimate Â– Mean Covariance and Distribution

Lecture 18 - Least Squares Multi Antenna Downlink Maximum Likelihood Channel Estimation

Lecture 19 - Multiple Input Multiple Output MIMO Channel Estimation Â– Least Squares Maximum Likelihood ML

Lecture 20 - Example Â– Least Squares Multiple Input Multiple Output MIMO Channel Estimation

Lecture 21 - Channel Equalization and Inter Symbol Interference ISI Model

Lecture 22 - Least Squares based Zero Forcing Channel Equalizer

Lecture 23 - Example of ISI Channel and Least Squares based Zero Forcing

Lecture 24 - Equalization and Approximation Error for Zero Forcing Channel Equalizer

Lecture 25 - Example Equalization and Approximation Error for Zero Forcing Channel Equalizer

Lecture 26 - Introduction to Orthogonal Frequency Division Multiplexing OFDM Â– Cyclic Prefix CP and Circular Convolution

Lecture 27 - Introduction to Orthogonal Frequency Division Multiplexing OFDM Â– FFT at Receiver and Flat Fading

Lecture 28 - Channel Estimation Across Each Subcarrier in Orthogonal Frequency Division Multiplexing OFDM

Lecture 29 - Example Orthogonal Frequency Division Mulltiplexing OFDM Â– Transmission of Samples with Cyclic Prefix

Lecture 30 - Example Orthogonal Frequency Division Mulltiplexing OFDM Â– FFT at Receiver and Channel Estimation

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Lecture 31 - Comb Type Pilot CTP Based Orthogonal Frequency Division Multiplexing OFDM Channel Estimation

Lecture 32 - Comb Type Pilot CTP Based Orthogonal Frequency Division Multiplexing OFDM Channel Estimation

Lecture 33 - Example Comb Type Pilot CTP Based Orthogonal Frequency Division Multiplexing OFDM Channel

Lecture 34 - Frequency Domain Equalization FDE for Inter Symbol Interference ISI Removal in Wireless System

Lecture 35 - Example Frequency Domain Equalization FDE for Inter Symbol Interference ISI Removal in Wireless Channels

Lecture 36 - Example Frequency Domain Equalization FDE for Inter Symbol Interference ISI Removal in Wireless Channels

Lecture 37 - Introduction to Sequential Estimation Â– Application in Wireless Channel Estimation

Lecture 38 - Sequential Estimation of Wireless Channel Coefficient Â– Estimate and Variance Update Equation

Lecture 39 - Example Sequential Estimation of Wireless Channel Coefficient

DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : NOC:Error Control Coding - An Introduction to Convolutional Codes (Electronics and Communication Engineering)

Co-ordinators : Dr. Adrish Banerjee

Lecture 1 - Introduction to Error Coding - I

Lecture 2 - Introduction to Error Coding - II

Lecture 3 - Introduction to Error Control Coding - III

Lecture 4 - Introduction to Convolutional Codes - I: Encoding

Lecture 5 - Introduction to Convolutional Codes - II: State Diagram, Trellis Diagram

Lecture 6 - Convolutional Codes: Classification, Realization

Lecture 7 - Convolutional Codes:Distance Properties

Lecture 8 - Decoding of Convolutional Codes - I: Viterbi Algorithm

Lecture 9 - Decoding of Convolutional Codes - II: BCJR Algorithm

Lecture 10 - Problem Solving Session - I

Lecture 11 - Problem Solving Session - II

Lecture 12 - Performance Bounds for Convolutional Codes

Lecture 13 - Turbo Codes

Lecture 14 - Turbo Decoding

Lecture 15 - Convergence of Turbo Codes

Lecture 16 - Applications of Convolutional Codes

Lecture 17 - Problem Solving Sessions - III

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NPTEL : NOC:Error Control Coding - An Introduction to Linear Block code (Electronics and Communication Engineering)

Co-ordinators : Dr. Adrish Banerjee

Lecture 1 - Introduction to Error Control Coding - I

Lecture 2 - Introduction to Error Control Coding - II

Lecture 3 - Introduction to Error Control Coding - III

Lecture 4 - Introduction to Linear Block Codes, Generator Matrix and Parity Check Matrix

Lecture 5 - Syndrome, Error Correction and Error Detection

Lecture 6 - Problem Solving Session - I

Lecture 7 - Decoding of Linear Block Codes

Lecture 8 - Distance Properties of Linear Block Codes - I

Lecture 9 - Distance Properties of Linear Block Codes - II

Lecture 10 - Problem Solving Session - II

Lecture 11 - Some Simple Linear Block Codes - I

Lecture 12 - Some Simple Linear Block Codes - II: Reed Muller Codes

Lecture 13 - Bounds on the Size of a Code

Lecture 14 - Problem Solving Session - III

Lecture 15 - Low Density Parity Check Codes

Lecture 16 - Decoding of Low Density Parity Check Codes - I

Lecture 17 - Decoding of Low Density Parity Check Codes - II: Belief Propagation Algorithm

Lecture 18 - Applications of Linear Block Codes

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DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : NOC:Bayesian, MMSE Estimation for Wireless Communications MIMO, OFDM Cellular and Sensor Networks (Electronics and Communication Engineering)

Co-ordinators : Prof. Aditya K. Jagannatham

Lecture 1 - Basics Â– Introduction to Bayesian Minimum Mean Squared Error

Lecture 2 - Optimal Bayesian Minimum Mean Squared Error (MMSE) Estimate

Lecture 3 - Derivation of Minimum Mean Squared Error MMSE Estimate for Gaussian Parameter Â– Part I

Lecture 4 - Derivation of Minimum Mean Squared Error MMSE Estimate for Gaussian Parameter Â– Part II

Lecture 5 - Derivation of Minimum Mean Squared Error (MMSE) Estimate for Gaussian Parameter Â– Non-Zero Mean and Vector Parameter / Observation

Lecture 6 - Minimum Mean Squared Error MMSE Estimation Application Â– Wireless Sensor Network

Lecture 7 - Simplification and Example of Minimum Mean Squared Error MMSE Estimate for Wireless Sensor Networks

Lecture 8 - Minimum Mean Squared Error MMSE Estimation Application Â– Wireless Fading Channel Estimation

Lecture 9 - Simplification and Example of Minimum Mean Squared Error MMSE Estimate for Wireless Fading Channel

Lecture 10 - Minimum Mean Squared Error MMSE for Wireless Sensor Network WSN Â– Derivation and Example

Lecture 11 - Reliability of Minimum Mean Squared Error MMSE Estimate Â– Part I

Lecture 12 - Reliability of Minimum Mean Squared Error MMSE Estimate Â– Part II

Lecture 13 - Minimum Mean Squared Error MMSE for Wireless Fading Channel Estimation Â– Derivation

Lecture 14 - Minimum Mean Squared Error (MMSE) for Wireless Fading Channel Estimation Â– Example and Properties of Complex Channel Coefficient Estimate

Lecture 15 - Linear Minimum Mean Squared Error LMMSE Estimate Derivation Â– Part I

Lecture 16 - Linear Minimum Mean Squared Error LMMSE Estimate Derivation Â– Part II

Lecture 17 - Vector Parameter Estimation Â– System Model for Multi-Antenna Downlink Channel Estimation

Lecture 18 - Linear Minimum Mean Squared Error LMMSE Estimate for Multi Antenna Downlink Wireless Channel - Part I

Lecture 19 - Linear Minimum Mean Squared Error LMMSE Estimate for Multi Antenna Downlink Wireless Channel - Part II

Lecture 20 - Example of Linear Minimum Mean Squared Error LMMSE Estimation for Multi Antenna Downlink Wireless Channel

Lecture 21 - Derivation and Example of Error Covariance of Multi Antenna LMMSE Channel Estimation

Lecture 22 - System Model for Multiple Input Multiple Output MIMO Downlink Wireless Channel Estimation

Lecture 23 - Channel/ Noise Statistics for Multiple-Input Multiple-Output (MIMO) Downlink Wireless Channel Estimation

Lecture 24 - LMMSE/ MMSE Estimation for Multiple-Input Multiple-Output(MIMO) Downlink Wireless Channel Estimation

Lecture 25 - Example of LMMSE/ MMSE Estimation for Multiple-Input Multiple-Output (MIMO) Downlink Wireless Channel Estimation

Lecture 26 - Introduction and system model for equalization

Lecture 27 - Linear Minimum Mean Square Error (LMMSE) Channel Equalization

Lecture 28 - Error for LMMSE Channel Equalizer and Example of LMMSE Channel Equalization

Lecture 29 - Example of Linear Minimum Mean Square Error (LMMSE) Channel Equalization

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Lecture 30 - Introduction and system model for OFDM

Lecture 31 - System model for OFDMl, IFFT/ FFT Operations

Lecture 32 - LMMSE Estimation for OFDM

Lecture 33 - Estimate and Error variance of LMMSE Estimate

Lecture 34 - Example of OFDM

Lecture 35 - Example of LMMSE estimate and Error variance for OFDM

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NPTEL : NOC:Optical communications (Electronics and Communication Engineering)

Co-ordinators : Dr. Pradeep Kumar K

Lecture 1 - Overview of Fiber-optic communications

Lecture 2 - Optical Transmitter - I

Lecture 3 - Optical Transmitter - I (Continued...)

Lecture 4 - Optical Transmitter - II

Lecture 5 - Optical Transmitter - II (Continued...)

Lecture 6 - Intensity modulation

Lecture 7 - Review of Signals and Representations - I

Lecture 8 - Review of Signals and Representations - II

Lecture 9 - Digital Modulation - I

Lecture 10 - Review of Signals and Representations - III

Lecture 11 - Review of Signals and Representations - IV

Lecture 12 - Digital Modulation - II

Lecture 13 - Digital Modulation - II (Continued...)

Lecture 14 - Digital Modulation - III

Lecture 15 - Optical receivers - I

Lecture 16 - Optical receivers - II

Lecture 17 - Optical Modulator : Physical Structure

Lecture 18 - Propagation of Electromagnetic wave

Lecture 19 - Review of EM Theory

Lecture 20 - Reflection of Waves

Lecture 21 - Optical fiber - I

Lecture 22 - Optical fiber - II

Lecture 23 - Modes in Optical fiber - I

Lecture 24 - Modes in Optical fiber - I (Continued...)

Lecture 25 - Modes in Optical fiber - II

Lecture 26 - Dispersion in Fibers

Lecture 27 - Dispersion in Fibers (Continued...)

Lecture 28 - Wrapping up fiber parameters

Lecture 29 - System Design - I

Lecture 30 - Passive WDM components - I

Lecture 31 - Passive WDM components - II

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Lecture 32 - Detection of light

Lecture 33 - Detection of light (Continued...)

Lecture 34 - Response time and Noise in Detectors

Lecture 35 - Noise in photodiodes - I Edit Lesson

Lecture 36 - Noise in photodiodes - II

Lecture 37 - Light sources - I

Lecture 38 - Light sources - II Edit Lesson

Lecture 39 - Semiconductor laser diodes

Lecture 40 - Optical communication:Pulse shape and BW

Lecture 41 - Power spectral density

Lecture 42 - Power spectral density (Continued...)

Lecture 43 - Advantage of coherent receiver

Lecture 44 - Dispersion induced limitations

Lecture 45 - Optical amplifiers - I

Lecture 46 - Optical amplifiers - II

Lecture 47 - Noise in optical amplifiers

Lecture 48 - Noise in optical amplifiers (Continued...)

Lecture 49 - ASE induced limitations

Lecture 50 - Determining BER in OOK system

Lecture 51 - BER determination

Lecture 52 - Eye diagram and Higher modulation techniques Edit Lesson

Lecture 53 - Higher modulation techniques (Continued...)

Lecture 54 - Optical OFDM

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NPTEL : NOC:Digital Switching-I (Electronics and Communication Engineering)

Co-ordinators : Prof. Yatindra N Singh

Lecture 1 - Introduction to Telephony and Networks

Lecture 2 - Strowger Automatic Exchange

Lecture 3 - Crossbar Switching

Lecture 4 - Logic Circuit for Crosspoint Operation

Lecture 5 - Introduction to Multistage Interconnection Networks

Lecture 6 - Blocking probability of crossbar switches

Lecture 7 - Call congestion and time congestio

Lecture 8 - Clos network

Lecture 9 - Lee's approximation

Lecture 10 - Karnaugh's approximation

Lecture 11 - Time switch

Lecture 12 - Time switch and Clos network

Lecture 13 - TST switch, Strictly Non-blocking network, Rearrangeably non-blocking network

Lecture 14 - Paull's Matrix

Lecture 15 - f-way multicasting

Lecture 16 - Strictly sense non blocking multicasting switch

Lecture 17 - Rearrangeably non blocking networks

Lecture 18 - Slepian Duguid theorem, Paull's theorem

Lecture 19 - Paull's matrix for rearrangeabbly non blocking networks

Lecture 20 - Recursive construction; Crosspoint complexity for rearrangebly and strictly non-blocking networks

Lecture 21 - Cantor network

Lecture 22 - Wide-sense non blocking network

Lecture 23 - Example of wide -sense non-blocking switch

Lecture 24 - Packet Switching

Lecture 25 - Buffering strategies

Lecture 26 - Output Queued Switch

Lecture 27 - Input Queued Switch

Lecture 28 - Banyan Network, Delta Network

Lecture 29 - Shufflenet as Delta network

Lecture 30 - Performance analysis of crossbar and delta network

Lecture 31 - Properties of Delta Network

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Lecture 32 - Buffered and Unbuffered Delta network

Lecture 33 - Analysis of Buffered Delta Network - 1 of 3

Lecture 34 - Analysis of Buffered Delta Network - 2 of 3

Lecture 35 - Analysis of Buffered Delta Network - 3 of 3

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NPTEL : NOC:An Introduction to Information Theory (Electronics and Communication Engineering)

Co-ordinators : Dr. Adrish Banerjee

Lecture 1 - Introduction

Lecture 2 - Measure of Information

Lecture 3 - Information Inequalities

Lecture 4 - Problem solving session - I

Lecture 5 - Block to Variable Length Coding - I : Prefix-free code

Lecture 6 - Block to Variable Length Coding - II : Bounds on Optimal Code Length

Lecture 7 - Block to Variable Length Coding - III : Huffman Coding

Lecture 8 - Variable to block length coding

Lecture 9 - The asymptotic equipartition property

Lecture 10 - Block to block coding of DMS

Lecture 11 - Problem solving session - II

Lecture 12 - Universal Source Coding - I : Lempel-Ziv Algorithm-LZ77

Lecture 13 - Universal source coding - II : Lempel-Ziv Welch Algorithm (LZW)

Lecture 14 - Coding of sources with memory

Lecture 15 - Channel Capacity

Lecture 16 - Joint typical sequences

Lecture 17 - Noisy channel coding theorem

Lecture 18 - Differential entropy

Lecture 19 - Gaussian channel

Lecture 20 - Parallel Gaussian channel

Lecture 21 - Problem solving session - III

Lecture 22 - Rate distortion theory

Lecture 23 - Blahut-Arimoto Algorithm

Lecture 24 - Problem solving session - IV

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NPTEL : NOC:5G Wireless Standard Design (Electronics and Communication Engineering)

Co-ordinators : Prof. Rohit Budhiraja

Lecture 1 - Course Introduction

Lecture 2 - Key 5G Technologies - Adaptive Modulation and Coding (AMC)

Lecture 3 - Key 5G Technologies - Hybrid automatic repeat request (HARQ)

Lecture 4 - Key 5G Technologies - Orthogonal frequency division multiplexing (OFDM)

Lecture 5 - 5G Numerology

Lecture 6 - 5G frame structure

Lecture 7 - 5G physical downlink shared channel (PDSCH) transmit chain- CRC generation

Lecture 8 - 5G PDSCH transmit chain - code block segmentation â€“ Part I

Lecture 9 - 5G PDSCH transmit chain - LDPC coding

Lecture 10 - 5G PDSCH transmit chain - code block segmentation â€“ Part II

Lecture 11 - 5G PDSCH transmit chain - rate matching â€“ Part I

Lecture 12 - 5G PDSCH transmit chain - rate matching â€“ Part II

Lecture 13 - 5G PDSCH transmit chain - interleaving and concatenation

Lecture 14 - 5G PDSCH transmit chain - scrambling and modulation

Lecture 15 - 5G PDSCH transmit chain - recap

Lecture 16 - 5G PDSCH receive chain - Part I

Lecture 17 - 5G PDSCH receive chain - Part II

Lecture 18 - 5G PDSCH - map receiver design - Part I

Lecture 19 - 5G PDSCH - map receiver design - Part II

Lecture 20 - 5G baseband - RF conversion

Lecture 21 - Indigenous 5G network architecture

Lecture 22 - 5G physical downlink control channel (PDCCH) transmit chain - introduction

Lecture 23 - 5G PDCCH transmit chain - CRC and segmentation

Lecture 24 - 5G PDCCH transmit chain - Polar encoding

Lecture 25 - 5G PDCCH transmit chain - CRC interleaver

Lecture 26 - 5G PDCCH transmit chain - sub-block interleaver

Lecture 27 - 5G PDCCH transmit chain - rate matching

Lecture 28 - 5G PDCCH transmit chain - control resource set (CORESET) design â€“ Part I

Lecture 29 - 5G PDCCH transmit chain - CORESET design â€“ Part II

Lecture 30 - 5G PDCCH transmit chain - CORESET design â€“ Part III

Lecture 31 - 5G PDCCH transmit chain - CORESET design â€“ Part IV

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Lecture 32 - 5G physical uplink control channel (PUCCH) - Part I

Lecture 33 - 5G physical uplink control channel (PUCCH) - Part II

Lecture 34 - Multiple input multiple output (MIMO) transceiver chain - Part I

Lecture 35 - MIMO transceiver chain - Part II

Lecture 36 - MIMO transceiver chain - Part III

Lecture 37 - MIMO transceiver chain - Part IV

Lecture 38 - MIMO transceiver chain - Part V

Lecture 39 - MIMO transceiver chain - Part VI

Lecture 40 - MIMO transceiver chain - Part VII

Lecture 41 - 5G demodulation reference signal (DM-RS) design - Part I

Lecture 42 - 5G DM-RS design - Part II

Lecture 43 - 5G DM-RS design - Part III

Lecture 44 - 5G DM-RS design - Part IV

Lecture 45 - 5G sounding reference signal (SRS) design - Part I

Lecture 46 - 5G SRS design - Part II

Lecture 47 - 5G SRS design - Part III

Lecture 48 - 5G SRS design - Part IV

Lecture 49 - 5G SRS design - Part V

Lecture 50 - 5G channel state estimation reference signal (CSI-RS) - Part I

Lecture 51 - 5G CSI-RS - Part II

Lecture 52 - 5G MIMO transceiver chain - Part I

Lecture 53 - 5G MIMO transceiver chain - Part II

Lecture 54 - 5G MIMO codebook design - Part I

Lecture 55 - 5G MIMO codebook design - Part II

Lecture 56

Lecture 57

Lecture 58

Lecture 59

Lecture 60

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NPTEL : Adaptive Signal Processing (Electronics and Communication Engineering)

Co-ordinators : Prof. Mrityunjoy Chakraborty

Lecture 1 - Introduction to Adaptive Filters

Lecture 2 - Introduction to Stochastic Processes

Lecture 3 - Stochastic Processes

Lecture 4 - Correlation Structure

Lecture 5 - FIR Wiener Filter (Real)

Lecture 6 - Steepest Descent Technique

Lecture 7 - LMS Algorithm

Lecture 8 - Convergence Analysis

Lecture 9 - Convergence Analysis (Mean Square)

Lecture 10 - Convergence Analysis (Mean Square)

Lecture 11 - Misadjustment and Excess MSE

Lecture 12 - Misadjustment and Excess MSE

Lecture 13 - Sign LMS Algorithm

Lecture 14 - Block LMS Algorithm

Lecture 15 - Fast Implementation of Block LMS Algorithm

Lecture 16 - Fast Implementation of Block LMS Algorithm

Lecture 17 - Vector Space Treatment to Random Variables

Lecture 18 - Vector Space Treatment to Random Variables

Lecture 19 - Orthogonalization and Orthogonal Projection

Lecture 20 - Orthogonal Decomposition of Signal Subspaces

Lecture 21 - Introduction to Linear Prediction

Lecture 22 - Lattice Filter

Lecture 23 - Lattice Recursions

Lecture 24 - Lattice as Optimal Filter

Lecture 25 - Linear Prediction and Autoregressive Modeling

Lecture 26 - Gradient Adaptive Lattice

Lecture 27 - Gradient Adaptive Lattice

Lecture 28 - Introduction to Recursive Least Squares

Lecture 29 - RLS Approach to Adaptive Filters

Lecture 30 - RLS Adaptive Lattice

Lecture 31 - RLS Lattice Recursions

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Lecture 32 - RLS Lattice Recursions

Lecture 33 - RLS Lattice Algorithm

Lecture 34 - RLS Using QR Decomposition

Lecture 35 - Givens Rotation

Lecture 36 - Givens Rotation and QR Decomposition

Lecture 37 - Systolic Implementation

Lecture 38 - Systolic Implementation

Lecture 39 - Singular Value Decomposition

Lecture 40 - Singular Value Decomposition

Lecture 41 - Singular Value Decomposition

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NPTEL : Digital Computer Organization (Electronics and Communication Engineering)

Co-ordinators : Prof. P.K. Biswas

Lecture 1 - Introduction to Digital Computer Organization

Lecture 2 - CPU Design - I

Lecture 3 - CPU Design - II

Lecture 4 - CPU Design Tirning and Control

Lecture 5 - Micro programmed Control - I

Lecture 6 - Micro programmed Control - II

Lecture 7 - Pipeline Concept - I

Lecture 8 - Pipeline Concept - II

Lecture 9 - Pipeline Concept - III

Lecture 10 - Pipeline CPU - I

Lecture 11 - Pipeline CPU - II

Lecture 12 - Pipeline CPU - III

Lecture 13 - Memory Organization - I

Lecture 14 - Memory Organization - II

Lecture 15 - Memory Organization - III

Lecture 16 - Memory Organization - IV

Lecture 17 - Memory Organization - V

Lecture 18 - Cache Memory Architecture

Lecture 19 - Cache Memory Architecture RAM Architecture

Lecture 20 - RAM Architecture

Lecture 21 - DAM Architecture-1

Lecture 22 - DAM Architecture Buffer Cache

Lecture 23 - Buffer Cache

Lecture 24 - Secondary Storage Organization - I

Lecture 25 - Secondary Storage Organization - II

Lecture 26 - Secondary Storage Organization - III

Lecture 27 - I/O Subsystem Organization

Lecture 28 - Error Detection and Correction

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NPTEL : Digital Image Processing (Electronics and Communication Engineering)

Co-ordinators : Prof. P.K. Biswas

Lecture 1 - Introduction

Lecture 2 - Image Digitization - I

Lecture 3 - Image Digitization - II

Lecture 4 - Pixels Relationships - I

Lecture 5 - Pixels Relationships - II

Lecture 6 - Basic Transformations

Lecture 7 - Camera Model and Imaging Geometry

Lecture 8 - Camera Calibration and Stereo Imaging

Lecture 9 - Interpolation and Resampling

Lecture 10 - Image Interpolation - II

Lecture 11 - Image Interpolation - I

Lecture 12 - Image Transformation - II

Lecture 13 - Fourier Transformation - I

Lecture 14 - Fourier Transformation - II

Lecture 15 - Discrete Cosine Transform

Lecture 16 - K-L Transform

Lecture 17 - Image Enhancement

Lecture 18 - Image Enhancement

Lecture 19 - Image Enhancement

Lecture 20 - Image Enhancement

Lecture 21 - Image Enhancement Frequency

Lecture 22 - Image Restoration - I

Lecture 23 - Image Restoration - II

Lecture 24 - Image Restoration - III

Lecture 25 - Image Registration

Lecture 26 - Colour Image Processing - I

Lecture 27 - Colour Image Processing - II

Lecture 28 - Colour Image Processing - III

Lecture 29 - Image Segmentation - I

Lecture 30 - Image Segmentation - II

Lecture 31 - Image Segmentation - III

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Lecture 32 - Image Segmentation - IV

Lecture 33 - Mathematical Morphology - I

Lecture 34 - Mathematical Morphology - II

Lecture 35 - Mathematical Morphology - III

Lecture 36 - Mathematical Morphology - IV

Lecture 37 - Object Representation and Description - I

Lecture 38 - Object Representation and Description - II

Lecture 39 - Object Representation and Description - III

Lecture 40 - Object Recognition

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NPTEL : Digital Systems Design (Electronics and Communication Engineering)

Co-ordinators : Prof. D. Roychoudhury

Lecture 1 - Introduction to Digital Systems Design

Lecture 2 - Introduction

Lecture 3 - Digital Logic - I

Lecture 4 - Digital Logic - II

Lecture 5 - Digital Logic - III

Lecture 6 - Boolean Algebra

Lecture 7 - Boolean Algebra

Lecture 8 - Boolean Function Minimization

Lecture 9 - Boolean Function Minimization

Lecture 10 - Boolean Function Minimization

Lecture 11 - Hazzard Covers by K - Map

Lecture 12 - Combinational Circuit Design

Lecture 13 - Design of ADDER Circuits

Lecture 14 - Design of Subtractor Circuits

Lecture 15 - Digital of Common Digital Elements

Lecture 16 - Design of Complex Combinational Circuits

Lecture 17 - Design of Combinational Circuits

Lecture 18 - Combinational Logic Problem Design

Lecture 19 - Combinational Logic Design

Lecture 20 - Logic Design with PLA

Lecture 21 - Synchronous Sequential Circuit Design

Lecture 22 - Design of Sequential Modules

Lecture 23 - Design of Registers and Counter

Lecture 24 - Finite State Machine Design

Lecture 25 - Finite State Machine Design and Optimization

Lecture 26 - Programmable Logic Devices

Lecture 27 - Programmable Logic Devices

Lecture 28 - Programmable Logic Devices

Lecture 29 - Design of Arithmetic Circuits

Lecture 30 - Design of Arithmetic Circuits

Lecture 31 - Design of Memory Circuits

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Lecture 32 - Algorithmic State Machines Chart

Lecture 33 - Design of Computer Instruction Set and the CPU

Lecture 34 - Design of Computer Instruction Set and the CPU

Lecture 35 - Design of Computer Instruction Set and the CPU

Lecture 36 - Design of Computer Instruction Set and the CPU

Lecture 37 - Design of Computer Instruction Set and the CPU

Lecture 38 - Design of Computer Instruction Set and the CPU

Lecture 39 - Design of a Micro Programmed CPU

Lecture 40 - Digital System Design Current State of the Art

NPTEL : Digital Voice and Picture Communication (Electronics and Communication Engineering)

Co-ordinators : Prof. Somnath Sengupta

Lecture 1 - Introduction

Lecture 2 - Speech Production Model

Lecture 3 - Speech Coding : Objectives and Requirements

Lecture 4 - Quantizers for Speech Signal

Lecture 5 - mew - Law and Optimum Quantizer

Lecture 6 - Adaptive Quantizer

Lecture 7 - Differential Quantization

Lecture 8 - LDM and ADM

Lecture 9 - Differential PCM and Adaptive Prediction

Lecture 10 - Linear Prediction of Speech

Lecture 11 - Computational Aspects of LPC parameters

Lecture 12 - Cholesky Decomposition

Lecture 13 - Lattice Formulation of LPC Coefficient

Lecture 14 - Linear Predictive Synthesizer

Lecture 15 - LPC Vocoder

Lecture 16 - Introduction to Image and Video Coding

Lecture 17 - Lossy Image Compression : DCT

Lecture 18 - DCT Quantization and Limitations

Lecture 19 - Theory of Wavelets

Lecture 20 - Discrete Wavelet Transforms

Lecture 21 - DWT on the Images and its Encoding

Lecture 22 - Embedded Zero Tree Wavelet Encoding

Lecture 23 - Video Coding : Basic Building Blocks

Lecture 24 - Motion Estimate Techniques

Lecture 25 - Fast Motion Estimation Techniques

Lecture 26 - Video Coding Standards

Lecture 27 - Advanced Coding Aspects

Lecture 28 - Audio Coding: Basic Concepts

Lecture 29 - Audio Coding AC - 3

Lecture 30 - AC -3 Decoder

Lecture 31 - MPEG - 1 Audio Coding

Lecture 32 - Introduction to VoIP

Lecture 33 - VoIP Signaling : H.323 Protocol

Lecture 34 - H.323 Call Controls and Enhancements

Lecture 35 - Interworking with PSTN Limitations and Solution

Lecture 36 - Multiplexing Schemes

Lecture 37 - H.323:Multiplexing:Header Compression and BW

Lecture 38 - ISDN Video Conferencing

Lecture 39 - Video Conferencing : SIP Protocol

Lecture 40 - 4G Multimedia Conferencing

DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : MEMS and Microsystems (Electronics and Communication Engineering)

Co-ordinators : Prof. Santiram Kal

Lecture 1 - Introduction to MEMS & Microsystems

Lecture 2 - Introduction to Microsensors

Lecture 3 - Evaluation of MEMS, Microsensors, Market Survey

Lecture 4 - Application of MEMS

Lecture 5 - MEMS Materials

Lecture 6 - MEMS Materials Properties

Lecture 7 - MEMS Materials Properties (Continued...)

Lecture 8 - Microelectronic Technology for MEMS - II

Lecture 9 - Microelectronic Technology for MEMS - III

Lecture 10 - Micromachining Technology for MEMS

Lecture 11 - Micromachining Process

Lecture 12 - Etch Stop Techniques and Microstructure

Lecture 13 - Surface and Quartz Micromachining

Lecture 14 - Fabrication of Micromachined Microstructure

Lecture 15 - Microstereolithography

Lecture 16 - MEMS Microsensors Thermal

Lecture 17 - Micromachined Microsensors Mechanical

Lecture 18 - MEMS Pressure and Flow Sensor

Lecture 19 - Micromachined Flow Sensors

Lecture 20 - MEMS Inertial Sensors

Lecture 21 - Micromachined Microaccelerometers for MEMS

Lecture 22 - MEMS Accelerometers for Avionics

Lecture 23 - Temperature Drift and Damping Analysis

Lecture 24 - Piezoresistive Accelerometer Technology

Lecture 25 - MEMS Capacitive Accelerometer

Lecture 26 - MEMS Capacitive Accelerometer Process

Lecture 27 - MEMS Gyro Sensor

Lecture 28 - MEMS for Space Application

Lecture 29 - Polymer MEMS & Carbon Nano Tubes CNT

Lecture 30 - Wafer Bonding & Packaging of MEMS

Lecture 31 - Interface Electronics for MEMS

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Lecture 32 - MEMS for Biomedical Applications (Bio-MEMS)

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NPTEL : Neural Networks and Applications (Electronics and Communication Engineering)

Co-ordinators : Prof. Somnath Sengupta

Lecture 1 - Introduction to Artificial Neural Networks

Lecture 2 - Artificial Neuron Model and Linear Regression

Lecture 3 - Gradient Descent Algorithm

Lecture 4 - Nonlinear Activation Units and Learning Mechanisms

Lecture 5 - Learning Mechanisms-Hebbian, Competitive, Boltzmann

Lecture 6 - Associative memory

Lecture 7 - Associative Memory Model

Lecture 8 - Condition for Perfect Recall in Associative Memory

Lecture 9 - Statistical Aspects of Learning

Lecture 10 - V.C. Dimensions: Typical Examples

Lecture 11 - Importance of V.C. Dimensions Structural Risk Minimization

Lecture 12 - Single-Layer Perceptions

Lecture 13 - Unconstrained Optimization: Gauss-Newton's Method

Lecture 14 - Linear Least Squares Filters

Lecture 15 - Least Mean Squares Algorithm

Lecture 16 - Perceptron Convergence Theorem

Lecture 17 - Bayes Classifier & Perceptron: An Analogy

Lecture 18 - Bayes Classifier for Gaussian Distribution

Lecture 19 - Back Propagation Algorithm

Lecture 20 - Practical Consideration in Back Propagation Algorithm

Lecture 21 - Solution of Non-Linearly Separable Problems Using MLP

Lecture 22 - Heuristics For Back-Propagation

Lecture 23 - Multi-Class Classification Using Multi-layered Perceptrons

Lecture 24 - Radial Basis Function Networks: Cover's Theorem

Lecture 25 - Radial Basis Function Networks: Separability & Interpolation

Lecture 26 - Posed Surface Reconstruction

Lecture 27 - Solution of Regularization Equation: Greens Function

Lecture 28 - Use of Greens Function in Regularization Networks

Lecture 29 - Regularization Networks and Generalized RBF

Lecture 30 - Comparison Between MLP and RBF

Lecture 31 - Learning Mechanisms in RBF

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Lecture 32 - Introduction to Principal Components and Analysis

Lecture 33 - Dimensionality reduction Using PCA

Lecture 34 - Hebbian-Based Principal Component Analysis

Lecture 35 - Introduction to Self Organizing Maps

Lecture 36 - Cooperative and Adaptive Processes in SOM

Lecture 37 - Vector-Quantization Using SOM

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NPTEL : Probability and Random Processes (Electronics and Communication Engineering)

Co-ordinators : Prof. Mrityunjoy Chakraborty

Lecture 1 - Introduction to the Theory of Probability

Lecture 2 - Axioms of Probability

Lecture 3 - Axioms of Probability (Continued.)

Lecture 4 - Introduction to Random Variables

Lecture 5 - Probability Distributions and Density Functions

Lecture 6 - Conditional Distribution and Density Functions

Lecture 7 - Function of a Random Variable

Lecture 8 - Function of a Random Variable (Continued.)

Lecture 9 - Mean and Variance of a Random Variable

Lecture 10 - Moments

Lecture 11 - Characteristic Function

Lecture 12 - Two Random Variables

Lecture 13 - Function of Two Random Variables

Lecture 14 - Function of Two Random Variables (Continued.)

Lecture 15 - Correlation Covariance and Related Innver

Lecture 16 - Vector Space of Random Variables

Lecture 17 - Joint Moments

Lecture 18 - Joint Characteristic Functions

Lecture 19 - Joint Conditional Densities

Lecture 20 - Joint Conditional Densities (Continued.)

Lecture 21 - Sequences of Random Variables

Lecture 22 - Sequences of Random Variables (Continued.)

Lecture 23 - Correlation Matrices and their Properties

Lecture 24 - Correlation Matrices and their Properties

Lecture 25 - Conditional Densities of Random Vectors

Lecture 26 - Characteristic Functions and Normality

Lecture 27 - Tchebycheff Inequality and Estimation of an Unknown Parameter

Lecture 28 - Central Limit Theorem

Lecture 29 - Introduction to Stochastic Process

Lecture 30 - Stationary Processes

Lecture 31 - Cyclostationary Processes

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Lecture 32 - System with Random Process at Input

Lecture 33 - Ergodic Processes

Lecture 34 - Introduction to Spectral Analysis

Lecture 35 - Spectral Analysis (Continued.)

Lecture 36 - Spectrum Estimation - Non Parametric Methods

Lecture 37 - Spectrum Estimation - Parametric Methods

Lecture 38 - Autoregressive Modeling and Linear Prediction

Lecture 39 - Linear Mean Square Estimation - Wiener (FIR)

Lecture 40 - Adaptive Filtering - LMS Algorithm

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NPTEL : Pattern Recognition and Application (Electronics and Communication Engineering)

Co-ordinators : Prof. P.K. Biswas

Lecture 1 - Introduction

Lecture 2 - Feature Extraction - I

Lecture 3 - Feature Extraction - II

Lecture 4 - Feature Extraction - III

Lecture 5 - Bayes Decision Theory

Lecture 6 - Bayes Decision Theory (Continued.)

Lecture 7 - Normal Density and Discriminant Function

Lecture 8 - Normal Density and Discriminant Function (Continued.)

Lecture 9 - Bayes Decision Theory - Binary Features

Lecture 10 - Maximum Likelihood Estimation

Lecture 11 - Probability Density Estimation

Lecture 12 - Probability Density Estimation (Continued.)

Lecture 13 - Probability Density Estimation (Continued.)

Lecture 14 - Probability Density Estimation (Continued.)

Lecture 15 - Probability Density Estimation (Continued.)

Lecture 16 - Dimensionality Problem

Lecture 17 - Multiple Discriminant Analysis

Lecture 18 - Multiple Discriminant Analysis (Tutorial)

Lecture 19 - Multiple Discriminant Analysis (Tutorial)

Lecture 20 - Perceptron Criterion

Lecture 21 - Perceptron Criterion (Continued.)

Lecture 22 - MSE Criterion

Lecture 23 - Linear Discriminator (Tutorial)

Lecture 24 - Neural Networks for Pattern Recognition

Lecture 25 - Neural Networks for Pattern Recognition (Continued.)

Lecture 26 - Neural Networks for Pattern Recognition (Continued.)

Lecture 27 - RBF Neural Network

Lecture 28 - RBF Neural Network (Continued.)

Lecture 29 - Support Vector Machine

Lecture 30 - Hyperbox Classifier

Lecture 31 - Hyperbox Classifier (Continued.)

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Lecture 32 - Fuzzy Min Max Neural Network for Pattern Recognition

Lecture 33 - Reflex Fuzzy Min Max Neural Network

Lecture 34 - Unsupervised Learning - Clustering

Lecture 35 - Clustering (Continued.)

Lecture 36 - Clustering using minimal spanning tree

Lecture 37 - Temporal Pattern recognition

Lecture 38 - Hidden Markov Model

Lecture 39 - Hidden Markov Model (Continued.)

Lecture 40 - Hidden Markov Model (Continued.)

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NPTEL : NOC:Basic Tools of Microwave Engineering (Electronics and Communication Engineering)

Co-ordinators : Dr. Amitabha Bhattacharya

Lecture 1 - Challenges of Microwave Design

Lecture 2 - Introduction to the 1st tool : Smith Chart

Lecture 3 - Measurement of Unknown Impedance

Lecture 4 - Application of Smith Chart for finding unknown impedance in laboratory

Lecture 5 - Problem Solving using Smith Chart

Lecture 6 - Need of Impedance Matching at Microwave Frequency

Lecture 7 - Lumped Element Based Impedance Matching Network Design by Smith Chart

Lecture 8 - Distributed Impedance Matching Design by Smith Chart

Lecture 9 - Broadband Impedance Matching Network Design

Lecture 10 - Tutorial 2: Impedance Matching Network Design by Smith Chart

Lecture 11 - Voltage and Current at Microwave Frequency

Lecture 12 - Scattering Parameter : the Second Tool

Lecture 13 - Properties of Scattering Parameter

Lecture 14 - Network Analyser

Lecture 15 - Tutorial 3: Problem Solving on Equivalent Voltage and Current in Waveguide and on scattering parameters

Lecture 16 - Radiation between S-Parameters and Transmission Parameters

Lecture 17 - Scattering Parameters of Coupler and Magic Tee

Lecture 18 - Signal Flow Graph

Lecture 19 - Understanding Network Analyser Calibration with the help of Signal Flow Graph

Lecture 20 - Tutorial 4: Problem Solving Related to S-Parameters and Signal Flow Graph

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NPTEL : NOC:Basic Building Blocks of Microwave Engineering (Electronics and Communication Engineering)

Co-ordinators : Dr. Amitabha Bhattacharya

Lecture 1 - Concept of Mode

Lecture 2 - Mathematical Model of Modes

Lecture 3 - Mathematical Model of TEM Mode

Lecture 4 - Mathematical Model of TE and TM Mode and Impedance Concept

Lecture 5 - Losses Associated with Microwave Transmission

Lecture 6 - Coaxial Line

Lecture 7 - Rectangular Waveguide

Lecture 8 - Circular Waveguide

Lecture 9 - Planar Transmission Line

Lecture 10 - Coaxial Connectors

Lecture 11 - 3 Port Microwave Power Divider/Combiner - Part I

Lecture 12 - 3 Port Microwave Power Divider/Combiner - Part II

Lecture 13 - 4 Port Microwave Power Divider/Combiner

Lecture 14 - Microwave Resonator

Lecture 15 - Microwave Attenuuators

Lecture 16 - Microwave Detector and Switching Diodes

Lecture 17 - Microwave Tubes : Part I Edit Lesson

Lecture 18 - Microwave Tubes : Part II and Amplifiers

Lecture 19 - Microwave Solid State Diode Oscillator and Amplifier

Lecture 20 - Microwave Transistors

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NPTEL : NOC:Satellite Communication Systems (Electronics and Communication Engineering)

Co-ordinators : Prof. Kalyankumar Bandyopadhyay

Lecture 1 - Introduction

Lecture 2 - Orbit - 1

Lecture 3 - Orbit - 2

Lecture 4 - Orbit - 3

Lecture 5 - Orbit - 4

Lecture 6 - Space Segment - 1

Lecture 7 - Space Segment - 2

Lecture 8 - Space Segment - 3

Lecture 9 - Space Segment - 4

Lecture 10 - Space Segment - 5

Lecture 11 - Link Budget - 1

Lecture 12 - Link Budget - 2

Lecture 13 - Link Budget - 3

Lecture 14 - Link Budget - 4

Lecture 15 - Link Budget - 5

Lecture 16 - Link Budget - 6

Lecture 17 - Link Budget - 7

Lecture 18 - Link Budget - 8

Lecture 19 - Propagation - 1

Lecture 20 - Propagation - 2

Lecture 21 - Propagation - 3

Lecture 22 - Ground Segment - 1

Lecture 23 - Ground Segment - 2

Lecture 24 - Ground Segment - 3

Lecture 25 - Ground Segment - 4

Lecture 26 - Multiple Access - 1

Lecture 27 - Multiple Access - 2

Lecture 28 - Multiple Access - 3

Lecture 29 - Multiple Access - 4

Lecture 30 - Multiple Access - 5

Lecture 31 - Nonlinearity - I

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Lecture 32 - Nonlinearity - II

Lecture 33 - Nonlinearity - III

Lecture 34 - Synchronisation - I

Lecture 35 - Synchronisation - II

Lecture 36 - Effect on Higher Layer - I

Lecture 37 - Effect on Higher Layer - II

Lecture 38 - Effect on Higher Layer - III

Lecture 39 - Satellite Navigation - I

Lecture 40 - Satellite Navigation - II

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NPTEL : NOC:Fundamentals of MIMO Wireless Communication (Electronics and Communication Engineering)

Co-ordinators : Prof. Suvra Sekhar Das

Lecture 1 - Evolution of Wireless Communication Systems 1G - 5G

Lecture 2 - Elements of Wireless Communication System

Lecture 3 - Overview of MIMO Communication Systems

Lecture 4 - Layered View of Transmitter and Receiver : Introduction to the Channel

Lecture 5 - Wireless Channel Models - I

Lecture 6 - Large Scale Propagation Models Path Loss

Lecture 7 - Large Scale Propagation Models Path Loss and Shadowing

Lecture 8 - Small Scale Propagation Multipath Model

Lecture 9 - Small Scale Propagation Frequency Flat Fading

Lecture 10 - Small Scale Propagation Envelope Distribution

Lecture 11 - Small Scale Propagation Received Signal Correlation

Lecture 12 - Small Scale Propagation Received Signal Correlation (Continued...)

Lecture 13 - Coherence Time

Lecture 14 - Doppler Spectrum

Lecture 15 - Frequency Selective Fading

Lecture 16 - Frequency Selective Fading - II

Lecture 17 - FSF-Coherence Bandwidth, Delay Doppeler Characteristics

Lecture 18 - Spatial Channel Characteristics - I

Lecture 19 - Expression of MIMO Channel

Lecture 20 - MIMO Channel Characteristics

Lecture 21 - Statistical Properties of H

Lecture 22 - Important Results from Linear Algebra

Lecture 23 - Spatial Diversity

Lecture 24 - Selection Combining

Lecture 25 - Maximal Ratio Combining

Lecture 26 - Problem of Error in MRC

Lecture 27 - Diversity Gain and Transmit MRC

Lecture 28 - Transmit Diversity without Channel known at Tx

Lecture 29 - MIMO Transmit Diversity - 1

Lecture 30 - MIMO Diversity - 2

Lecture 31 - Fundamentals of Information Theory - I

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Lecture 32 - Fundamentals of Information Theory - II

Lecture 33 - Fundamentals of Information Theory - III

Lecture 34 - Fundamentals of Information Theory - IV

Lecture 35 - Capacity of Deterministic MIMO Channels

Lecture 36 - Capacity of Channel Unknown at Transmitter

Lecture 37 - Capacity of Channel Known of Transmitter

Lecture 38 - More on MIMO Channel Capacity

Lecture 39 - Capacity of Random Channel

Lecture 40 - MIMO in Practice

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NPTEL : NOC:Audio System Engineering (Electronics and Communication Engineering)

Co-ordinators : Prof. S. Dasmandal

Lecture 1 - Introduction

Lecture 2 - Fundamentals of Linear Vibrations Edit Lesson

Lecture 3 - Damped Oscillation and Forced Oscillation

Lecture 4 - Equivalent Electrical Circuits for Oscillation

Lecture 5 - Tutorial I

Lecture 6 - Acoustic Wave Equation

Lecture 7 - Acoustic Wave Equation (Continued...)

Lecture 8 - Acoustic Wave Equation (Continued...)

Lecture 9 - Spherical Waves Propagation

Lecture 10 - Perception at Sound

Lecture 11 - Sound Transmission

Lecture 12 - Sound Transmission (Continued...)

Lecture 13 - The Acoustic Environment

Lecture 14 - Room Acoustics - I

Lecture 15 - Room Acoustics - II

Lecture 16 - Large Room Acoustics and Small Room Acoustics

Lecture 17 - Large Room Acoustics and Small Room Acoustics (Continued...)

Lecture 18 - Auditorium Acoustics

Lecture 19 - Transduction - I

Lecture 20 - Transduction - II

Lecture 21 - Transduction - III

Lecture 22 - Microphone - I

Lecture 23 - Microphone Sensitivity

Lecture 24 - Loudspeaker

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NPTEL : NOC:Discrete Time Signal Processing (Electronics and Communication Engineering)

Co-ordinators : Prof. Mrityunjoy Chakraborty

Lecture 1 - Introduction

Lecture 2 - Discrete Time Signals and Systems

Lecture 3 - Linear, Shift Invariant Systems

Lecture 4 - Properties of Discrete Convolution Causal and Stable Systems

Lecture 5 - Graphical Evaluation of Discrete Convolutions

Lecture 6 - Discrete Time Fourier Transform

Lecture 7 - Properties of DTFT

Lecture 8 - Dirac Comb and Sampling Analog Signals

Lecture 9 - Relation between DTFT and Analog Fourier Transform

Lecture 10 - Nyquist Interpolation Formula

Lecture 11 - Rational Systems

Lecture 12 - Properties of Rational Systems

Lecture 13 - Introduction to Z-transform

Lecture 14 - Properties of Z-transform

Lecture 15 - Properties of z-transform

Lecture 16 - Inverse z-transform

Lecture 17 - Introduction to DFT

Lecture 18 - Properties of DFT

Lecture 19 - Introduction to Interpretation of Circular Convolution

Lecture 20 - Graphically Interpretation of Circular Convolution

Lecture 21 - Zero Padding and Linear convolution Via DFT

Lecture 22 - Decimation and DFT of Decimated Sequences

Lecture 23 - Expension and Interpolation of Sequences

Lecture 24 - Factor-of-M Polyphase Decomposition of Sequences

Lecture 25 - Nobel Identifies

Lecture 26 - Efficient Decimator and Interpolator Structure

Lecture 27 - Linear Phase Filters

Lecture 28 - Properties of Linear Phase Filters

Lecture 29 - Structures for IIR Filters

Lecture 30 - Structures for FIR Filters

Lecture 31 - Analog LTI Systems, Fourier and Laplace Transforms

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Lecture 32 - Pole, Zero and Stability of of Analog Filters

Lecture 33 - Analog Filter Design Example Butterworth Lowpass Filter

Lecture 34 - IIR Filter Design by Implus Invariance Method

Lecture 35 - Design Filter Design from Analog Proptotype Filters by s-z Transformations

Lecture 36 - Bilinear Transformation

Lecture 37 - FIR Filter Design by Window

Lecture 38 - FFT: Decimation in Time

Lecture 39 - Complexity Analysis of FFT

Lecture 40 - Bit Reversal and FFT

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NPTEL : NOC:Digital Image Processing (Electronics and Communication Engineering)

Co-ordinators : Prof. P.K. Biswas

Lecture 1 - Introduction to Digital Image Processing

Lecture 2 - Application of Digital Image Processing

Lecture 3 - Image Digitalization, Sampling Quantization and Display

Lecture 4 - Signal Reconstruction from Samples: Convolution Concept

Lecture 5 - Signal Reconstruction from Image

Lecture 6 - Quantizer Design

Lecture 7 - Relationship between Pixels

Lecture 8 - Relationship of Adjacency and Connected Components Labeling

Lecture 9 - Application of Distance Measures

Lecture 10 - Basic Transform

Lecture 11 - Image Formation - I

Lecture 12 - Image Formation - II

Lecture 13 - Image Geometry - I

Lecture 14 - Image Geometry - II

Lecture 15 - Stereo Imaging Model - II

Lecture 16 - Interpolation and Resampling

Lecture 17 - Interpolation Techniques

Lecture 18 - Interpolation with examples - I

Lecture 19 - Interpolation with Examples - II

Lecture 20 - Image Transformation - I Edit Lesson

Lecture 21 - Image Transformation - 2

Lecture 22 - Separable Transformation

Lecture 23 - Basis Images

Lecture 24 - Fourier Transformation

Lecture 25 - Properties of FT

Lecture 26 - FT Result Display - 2

Lecture 27 - Rotation Invariance Property

Lecture 28 - DCT and Walsh Transform

Lecture 29 - Handmard Transformation

Lecture 30 - Histogram Equalization and Specifications - I

Lecture 31 - KL-transform-2

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Lecture 32 - Image Enhancement: Point Processing Techniques

Lecture 33 - Contrast Stretching Operation

Lecture 34 - Histogram Equalization and Specification - I

Lecture 35 - Histogram Equalization and Specification - II

Lecture 36 - Histogram Implementation - I

Lecture 37 - Histogram Implementation - II

Lecture 38 - Image Enhancement : Mask Processing Techniques - I

Lecture 39 - Image Enhancement : Mask Processing Techniques - II

Lecture 40 - Image Enhancement : Mask Processing Techniques - III

Lecture 41 - Frequency Domain Processing Techniques

Lecture 42 - Image Restoration Techniques - I

Lecture 43 - Image Restoration Techniques - II

Lecture 44 - Estimation of Degradation Model and Restoration Techniques - I

Lecture 45 - Estimation of Degradation Model and Restoration Techniques - II

Lecture 46 - Other Restoration Techniques - I

Lecture 47 - Other Restoration Techniques - II

Lecture 48 - Image Registration - I

Lecture 49 - Image Registration - II

Lecture 50 - Colour Image Processing : Colour Fundamentals

Lecture 51 - Colour Model

Lecture 52 - Conversion of one color model to another - I

Lecture 53 - Conversion of one color model to another - II

Lecture 54 - Pseudo color image processing

Lecture 55 - Full color image processing

Lecture 56 - Different Approaches for Image Segmentation

Lecture 57 - Image Segmentation : Global Processing (Hough Transform)

Lecture 58 - Region based Segmentation Operation. Thresholding Techniques

Lecture 59 - Region Splitting and Merging Technique Edit Lesson

NPTEL : NOC:Spread Spectrum Communications and Jamming (Electronics and Communication Engineering)

Co-ordinators : Prof. Debarati Sen

Lecture 1 - Introduction to Spread Spectrum Communication

Lecture 2 - Direct Sequence Spread Spectrum System

Lecture 3 - Performance Analysis of DSSS

Lecture 4 - Concept of Jamming Margin

Lecture 5 - Frequency Hopping Spread Spectrum System

Lecture 6 - Tutorial-1

Lecture 7 - Slow and Fast Frequency Hopping

Lecture 8 - Hybrid Spread Spectrum System and Time Hopped SSS

Lecture 9 - Spread Sequences and Waveforms

Lecture 10 - Generation Mechanism of ML Sequence

Lecture 11 - Properties of Spread Spectrum Sequences

Lecture 12 - Tutorial-2

Lecture 13 - Power Spectral Density of ML Sequence

Lecture 14 - Walsh Hadamard Code and Properties

Lecture 15 - Generation Mechanism and Properties of OVSF and Barker Codes

Lecture 16 - Generation Mechanism and Properties of Gold and Kasami Codes

Lecture 17 - Performance Analysis of DSSS in Presence of Tone Jamming

Lecture 18 - Performance Analysis During Generation Tone Jamming

Lecture 19 - Performance Analysis in Presence of Gaussian Interference

Lecture 20 - Performance Analysis of a Quaternary System

Lecture 21 - Despreading with Matched Filter

Lecture 22 - Noncoherent Systems

Lecture 23 - Tutorial - III

Lecture 24 - Galois Field Mathematics

Lecture 25 - Galois Field Mathematics (Continued...)

Lecture 26 - Galois Field Mathematics (Continued...)

Lecture 27 - Polynomials over Binary Field

Lecture 28 - Long Nonlinear Sequence Generation

Lecture 29 - Rejection of Narrowband Interference

Lecture 30 - Narrow Band Interference Cancellation by Transform Domain Processing

Lecture 31 - PN Code Acquisition Fundamentals

Lecture 32 - Performance Analysis of PN Code Acquisition System - Part I

Lecture 33 - Performance Analysis of PN Code Acquisition System - Part II

Lecture 34 - Tutorial - IV

Lecture 35 - Rapid Acquisition Using Matched Filter - Part I

Lecture 36 - Rapid Acquisition Using Matched Filter - Part II

Lecture 37 - Active Search Acquisition for FFH/MFSK Signals

Lecture 38 - Active Search Code Acquisiton for FFH/MFSK Analysis

Lecture 39 - Detection Probability Analysis of Code Acquisition for FFH / MFSK

Lecture 40 - Tutorial - V

Lecture 41 - DSSS Tracking

Lecture 42 - FHSS Synchronization Method - I

Lecture 43 - FHSS Synchronization Method - II

Lecture 44 - FHSS Synchronization Method - III

Lecture 45 - FHSS Tracking

Lecture 46 - Tutorial - VI

Lecture 47 - Concept of Fading for Wireless Communications

Lecture 48 - Diversity for Fading Channels

Lecture 49 - Rake Receiver

Lecture 50 - Performance Analysis of Rake Receiver

Lecture 51 - Spread Spectrum Multiple Access

Lecture 52 - Tutorial - VII

Lecture 53 - Introduction to CDMA

Lecture 54 - Interference Handling Mechanism in CDMA Networks

Lecture 55 - Interference Handling by Soft Handover

Lecture 56 - Interference Handling by Smart Antenna

Lecture 57 - Multiuser Detection and Interference Cancellation

Lecture 58 - Tutorial - VIII

Lecture 59 - Multiuser Detection - Part I

Lecture 60 - Multiuser Detection - Part II

Lecture 61 - MUD - Probability of Error

Lecture 62 - IS95 and CDMA - Part I

Lecture 63 - IS95 and CDMA - Part II

Lecture 64 - Tutorial - IX

Lecture 65 - WCDMA and UMTS - Part I

Lecture 66 - WCDMA and UMTS - Part II

Lecture 67 - LPI Communications

Lecture 68 - Radiometer

Lecture 69 - Interceptor Detectors

NPTEL : NOC:Digital VLSI Testing (Electronics and Communication Engineering)

Co-ordinators : Prof. Santanu Chattopadhyay

Lecture 1 - Introduction

Lecture 2 - Introduction (Continued...)

Lecture 3 - Introduction (Continued...)

Lecture 4 - Introduction (Continued...)

Lecture 5 - DFT

Lecture 6 - DFT (Continued...)

Lecture 7 - DFT (Continued...)

Lecture 8 - DFT (Continued...)

Lecture 9 - DFT (Continued...)

Lecture 10 - DFT (Continued...)

Lecture 11 - Logic and Fault Simulation

Lecture 12 - Logic and Fault Simulation (Continued...)

Lecture 13 - Logic and Fault Simulation (Continued...)

Lecture 14 - Logic and Fault Simulation (Continued...)

Lecture 15 - Logic and Fault Simulation (Continued...)

Lecture 16 - Logic and Fault Simulation (Continued...)

Lecture 17 - Test Generation

Lecture 18 - Test Generation (Continued...)

Lecture 19 - Test Generation (Continued...)

Lecture 20 - Test Generation (Continued...)

Lecture 21 - Test Generation (Continued...)

Lecture 22 - Test Generation (Continued...)

Lecture 23 - Test Generation (Continued...)

Lecture 24 - Logic BIST

Lecture 25 - Logic BIST (Continued...)

Lecture 26 - Logic BIST (Continued...)

Lecture 27 - Logic BIST (Continued...)

Lecture 28 - Test Compression

Lecture 29 - Test Compression (Continued...)

Lecture 30 - Test Compression (Continued...)

Lecture 31 - Test Compression (Continued...)

Lecture 32 - Low Power Testing

Lecture 33 - Low Power Testing (Continued...)

Lecture 34 - Low Power Testing (Continued...)

Lecture 35 - Low Power Testing (Continued...)

Lecture 36 - Low Power Testing (Continued...)

Lecture 37 - Thermal Aware Testing

Lecture 38 - Thermal Aware Testing (Continued...)

Lecture 39 - Thermal Aware Testing (Continued...)

Lecture 40 - Boundary Scan

Lecture 41 - Boundary Scan (Continued...)

Lecture 42 - Boundary Scan (Continued...)

Lecture 43 - Boundary Scan (Continued...)

Lecture 44 - Boundary Scan (Continued...)

Lecture 45 - System/Network - On - Chip Test

Lecture 46 - System/Network - On - Chip Test (Continued...)

Lecture 47 - System/Network - On - Chip Test (Continued...)

Lecture 48 - System/Network - On - Chip Test (Continued...)

Lecture 49 - System/Network - On - Chip Test (Continued...)

Lecture 50 - System/Network - On - Chip Test (Continued...)

Lecture 51 - System/Network - On - Chip Test (Continued...)

Lecture 52 - System/Network - On - Chip Test (Continued...)

Lecture 53 - System/Network - On - Chip Test (Continued...)

Lecture 54 - System/Network - On - Chip Test (Continued...)

Lecture 55 - System/Network - On - Chip Test (Continued...)

Lecture 56 - System/Network - On - Chip Test (Continued...)

Lecture 57 - Memory Testing

Lecture 58 - Memory Testing (Continued...)

Lecture 59 - Memory Testing (Continued...)

Lecture 60 - Memory Testing (Continued...)

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NPTEL : NOC:Design Principles of RF and Microwave Filters and Amplifiers (Electronics and Communication Engineering)

Co-ordinators : Prof. Amitabha Bhattacharya

Lecture 1 - Image Impedance based RF filter design

Lecture 2 - Concept of Image impedance and Propagation Constant

Lecture 3 - Symmetrical lossless network description for filter design

Lecture 4 - Constant k prototype filter design

Lecture 5 - m-derived prototype filter design

Lecture 6 - Introduction to Insertion loss based Microwave Filter Design

Lecture 7 - Prototype low pass filter design

Lecture 8 - Filter transformation

Lecture 9 - Microwave Filter implementation

Lecture 10 - Tutorial an Insertion Loss based Microwave Filter design

Lecture 11 - Gain Definitions of Microwave Amplifiers

Lecture 12 - Stability Analysis of Microwave Amplifiers

Lecture 13 - Conditional stability enforcement for Microwave Amplifier

Lecture 14 - Amplifier design of maximising transducer gain

Lecture 15 - Amplifier design for specified gain

Lecture 16 - Amplifier design for specified noise performance

Lecture 17 - Broadband Amplifier Design

Lecture 18 - Quantitative Characterisation of Nonlinearity for Large Signal Amplifier

Lecture 19 - Quantitative Characterisation of Nonlinearity for Large Signal Amplifier (Continued...)

Lecture 20 - Measurement of Nonlinearity

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NPTEL : NOC:Millimeter Wave Technology (Electronics and Communication Engineering)

Co-ordinators : Prof. Mrinal Kanti Mandal

Lecture 1 - Introduction to Millimeter-Wave Technology

Lecture 2 - Introduction to Millimeter-Wave Technology (Continued...)

Lecture 3 - Introduction to Millimeter-Wave Technology (Continued...)

Lecture 4 - Introduction to Millimeter-Wave Technology (Continued...)

Lecture 5 - Introduction to Millimeter-Wave Technology (Continued...)

Lecture 6 - Guiding Structures

Lecture 7 - Guiding Structures (Continued...)

Lecture 8 - Guiding Structures (Continued...)

Lecture 9 - Guiding Structures (Continued...)

Lecture 10 - Guiding Structures (Continued...)

Lecture 11 - Guiding Structures (Continued...)

Lecture 12 - Guiding Structures (Continued...)

Lecture 13 - Guiding Structures (Continued...)

Lecture 14 - Guiding Structures (Continued...)

Lecture 15 - Guiding Structures (Continued...)

Lecture 16 - Antennas at MM-Wave Frequencies

Lecture 17 - Antennas at MM-Wave Frequencies (Continued...)

Lecture 18 - Antennas at MM-Wave Frequencies (Continued...)

Lecture 19 - Antennas at MM-Wave Frequencies (Continued...)

Lecture 20 - Antennas at MM-WaveFrequencies (Continued...)

Lecture 21 - Passive Components

Lecture 22 - Passive Components (Continued...)

Lecture 23 - Passive Components (Continued...)

Lecture 24 - Passive Components (Continued...)

Lecture 25 - Passive Components (Continued...)

Lecture 26 - Active Devices

Lecture 27 - Active Devices (Continued...)

Lecture 28 - Active Devices (Continued...)

Lecture 29 - Active Devices (Continued...)

Lecture 30 - Active Devices (Continued...)

Lecture 31 - Noise and Link Budget

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Lecture 32 - Noise and Link Budget (Continued...)

Lecture 33 - Noise and Link Budget (Continued...)

Lecture 34 - Noise and Link Budget (Continued...)

Lecture 35 - Noise and Link Budget (Continued...)

Lecture 36 - Millimeter-Wave Systems

Lecture 37 - Millimeter-Wave Systems (Continued...)

Lecture 38 - Millimeter-Wave Systems (Continued...)

Lecture 39 - Millimeter-Wave Systems (Continued...)

Lecture 40 - Millimeter-Wave Systems (Continued...)

DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : NOC:Power System Analysis (Electronics and Communication Engineering)

Co-ordinators : Prof. Debapriya Das

Lecture 1 - Structure of Power Systems and Few other Aspects - I

Lecture 2 - Structure of Power Systems and Few other Aspects - II

Lecture 3 - Structure of Power Systems and Few other Aspects - III

Lecture 4 - Resistance and Inductance

Lecture 5 - Resistance and Inductance (Continued...)

Lecture 6 - Resistance and Inductance (Continued...)

Lecture 7 - Resistance and Inductance (Continued...)

Lecture 8 - Resistance and Inductance (Continued...)

Lecture 9 - Resistance and Inductance (Continued...)

Lecture 10 - Resistance and Inductance (Continued...)

Lecture 11 - Capacitance of Transmisson Lines

Lecture 12 - Capacitance of Transmisson Lines (Continued...)

Lecture 13 - Capacitance of Transmisson Lines (Continued...)

Lecture 14 - Capacitance of Transmisson Lines (Continued...)

Lecture 15 - Power System Components and per-unit system

Lecture 16 - Power System Components and per-unit system (Continued...)

Lecture 17 - Power System Components and per-unit system (Continued...)

Lecture 18 - Power System Components and per-unit system (Continued...)

Lecture 19 - Power System Components and per-unit system (Continued...)

Lecture 20 - Power System Components and per-unit system (Continued...)

Lecture 21 - Characteristic and performance of transmission lines

Lecture 22 - Characteristic and performance of transmission lines (Continued...)

Lecture 23 - Characteristic and performance of transmission lines (Continued...)

Lecture 24 - Characteristic and performance of transmission lines (Continued...)

Lecture 25 - Characteristic and performance of transmission lines (Continued...)

Lecture 26 - Load flow studies

Lecture 27 - Load flow studies (Continued...)

Lecture 28 - Load flow studies (Continued...)

Lecture 29 - Load flow studies (Continued...)

Lecture 30 - Load flow studies (Continued...)

Lecture 31

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Lecture 32

Lecture 33

Lecture 34

Lecture 35

Lecture 36 - Load flow studies (Continued...)

Lecture 37 - Optimal system operation

Lecture 38 - Optimal system operation (Continued...)

Lecture 39 - Optimal system operation (Continued...)

Lecture 40 - Optimal system operation (Continued...)

Lecture 41 - Optimal system operation (Continued...)

Lecture 42 - Optimal system operation (Continued...)

Lecture 43 - Optimal system operation (Continued...)

Lecture 44 - Optimal system operation (Continued...)

Lecture 45 - Three phase fault studies

Lecture 46 - Three phase fault studies (Continued...)

Lecture 47 - Three phase fault studies (Continued...)

Lecture 48 - Three phase fault studies (Continued...)

Lecture 49 - Symmetrical components

Lecture 50 - Symmetrical components (Continued...)

Lecture 51 - Symmetrical components (Continued...)

Lecture 52 - Symmetrical components (Continued...)

Lecture 53 - Symmetrical components (Continued...)

Lecture 54 - Symmetrical components (Continued...)

Lecture 55 - Power system stability>

Lecture 56 - Power system stability (Continued...)

Lecture 57 - Power system stability (Continued...)

Lecture 58 - Power system stability (Continued...)

Lecture 59 - Power system stability (Continued...)

Lecture 60 - Power system stability (Continued...)

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NPTEL : NOC:Analog Communication (Electronics and Communication Engineering)

Co-ordinators : Prof. Goutam Das

Lecture 1 - Fourier Series

Lecture 2 - Fourier Series (Continued...)

Lecture 3 - Fourier Series (Continued...)

Lecture 4 - Fourier Series (Continued...)

Lecture 5 - Fourier Series (Continued...)

Lecture 6 - Fourier Series (Continued...)

Lecture 7 - Fourier Series (Continued...)

Lecture 8 - Fourier Transform

Lecture 9 - Fourier Transform (Continued...)

Lecture 10 - Fourier Transform (Continued...)

Lecture 11 - Fourier Transform (Continued...)

Lecture 12 - Energy Spectral Density

Lecture 13 - Power Spectral Density

Lecture 14 - PSD of Random Signal

Lecture 15 - Amplitude Modulation

Lecture 16 - Amplitude Modulation (Continued...)

Lecture 17 - Amplitude Modulation (Continued...)

Lecture 18 - Amplitude Modulation (Continued...)

Lecture 19 - SSB - SC

Lecture 20 - SSB - SC (Continued...)

Lecture 21 - VSB-SC

Lecture 22 - VSB-SC (Continued...)

Lecture 23 - Effect of Carrier Synchronization

Lecture 24 - Comparison of Different Modulation Technique

Lecture 25 - PLL

Lecture 26 - PLL (Continued...)

Lecture 27 - PLL (Continued...)

Lecture 28 - PLL (Continued...) and LTI

Lecture 29 - Dispersion

Lecture 30 - Channel Nonlinearities and Multipath Effects

Lecture 31 - Probability Theory

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Lecture 32 - Probability Theory (Continued...)

Lecture 33 - Probability Theory (Continued...)

Lecture 34 - Probability Theory (Continued...)

Lecture 35 - Probability Theory (Continued...)

Lecture 36 - Probability Theory (Continued...)

Lecture 37 - Probability Theory (Continued...)

Lecture 38 - Random Process

Lecture 39 - Random Process (Continued...)

Lecture 40 - Random Process (Continued...)

Lecture 41 - Random Process (Continued...)

Lecture 42 - Random Process (Continued...)

Lecture 43 - Random Process (Continued...)

Lecture 44 - Noise Analysis - DSB-SC

Lecture 45 - Noise Analysis - AM

Lecture 46 - Noise Analysis - SSB-SC

Lecture 47 - Frequency Modulation

Lecture 48 - Frequency Modulation (Continued...)

Lecture 49 - Frequency Modulation (Continued...)

Lecture 50 - Frequency Modulation (Continued...)

Lecture 51 - Frequency Modulation (Continued...)

Lecture 52 - Frequency Modulation (Continued...)

Lecture 53 - FM Noise Analysis

Lecture 54 - FM Noise Analysis (Continued...)

Lecture 55 - FM Noise Analysis (Continued...)>

Lecture 56 - Sampling Theorem

Lecture 57 - Sampling Theorem (Continued...)

Lecture 58 - FDM Vs TDM

Lecture 59 - Flat Top Vs Natural Sampling

Lecture 60 - Pulse Coded Modulation

NPTEL : NOC:Modern Digital Communication Techniques (Electronics and Communication Engineering)

Co-ordinators : Prof. Suvra Sekhar Das

Lecture 1 - Introduction of Digital Communication System

Lecture 2 - Introduction of Digital Communication System (Continued...)

Lecture 3 - Introduction of Digital Communication System (Continued...)

Lecture 4 - Introduction of Digital Communication System (Continued...)

Lecture 5 - Introduction of Digital Communication System (Continued...)

Lecture 6 - Source Coding

Lecture 7 - Source Coding (Continued...)

Lecture 8 - Source Coding (Continued...)

Lecture 9 - Source Coding (Continued...)

Lecture 10 - Source Coding (Continued...)

Lecture 11 - Source Coding (Continued...)

Lecture 12 - Source Coding (Continued...)

Lecture 13 - Source Coding (Continued...)

Lecture 14 - Source Coding (Continued...)

Lecture 15 - Analog to Digital Conversion

Lecture 16 - Analog to Digital Conversion (Continued...)

Lecture 17 - Characterization of Signals and Systems

Lecture 18 - Characterization of Signals and Systems (Continued...)

Lecture 19 - Characterization of Signals and Systems (Continued...)

Lecture 20 - Characterization of Signals and Systems (Continued...)

Lecture 21 - Characterization of Signals and Systems (Continued...)

Lecture 22 - Characterization of Signals and Systems (Continued...)

Lecture 23 - Characterization of Signals and Systems (Continued...)

Lecture 24 - Memoryless Modulation

Lecture 25 - Memoryless Modulation (Continued...)

Lecture 26 - Memoryless Modulation (Continued...)

Lecture 27 - Memoryless Modulation (Continued...)

Lecture 28 - Memoryless Modulation (Continued...)

Lecture 29 - Memoryless Modulation (Continued...)

Lecture 30 - Memoryless Modulation (Continued...)

Lecture 31 - Memoryless Modulation (Continued...)

Lecture 32 - Memoryless Modulation (Continued...)

Lecture 33 - With Memory Modulation

Lecture 34 - With Memory Modulation (Continued...)

Lecture 35 - With Memory Modulation (Continued...)

Lecture 36 - With Memory Modulation (Continued...)

Lecture 37 - With Memory Modulation (Continued...)

Lecture 38 - With Memory Modulation (Continued...)

Lecture 39 - With Memory Modulation (Continued...)

Lecture 40 - Optimum Receivers for AWGN

Lecture 41 - Optimum Receivers for AWGN (Continued...)

Lecture 42 - Optimum Receivers for AWGN (Continued...)

Lecture 43 - Optimum Receivers for AWGN (Continued...)

Lecture 44 - Optimum Receivers for AWGN (Continued...)

Lecture 45 - Optimum Receivers for AWGN (Continued...)

Lecture 46 - Performance of Digital Modulation Techniques

Lecture 47 - Performance of Digital Modulation Techniques (Continued...)

Lecture 48 - Performance of Digital Modulation Techniques (Continued...)

Lecture 49 - Performance of Digital Modulation Techniques (Continued...)

Lecture 50 - Performance of Digital Modulation Techniques (Continued...)

Lecture 51 - Performance of Digital Modulation Techniques (Continued...)

Lecture 52 - Performance of Digital Modulation Techniques (Continued...)

Lecture 53 - Channel Estimation and Equalization

Lecture 54 - Channel Estimation and Equalization (Continued...)

Lecture 55 - Channel Estimation and Equalization (Continued...)>

Lecture 56 - Channel Estimation and Equalization (Continued...)

Lecture 57 - Synchronization Techniques

Lecture 58 - Synchronization Techniques (Continued...)

Lecture 59 - Synchronization Techniques (Continued...)

Lecture 60 - Synchronization Techniques (Continued...)

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NPTEL : NOC:Digital Speech Processing (Electronics and Communication Engineering)

Co-ordinators : Prof. Shyamal Kumar Das Mandal

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16 - Human Auditory System

Lecture 17

Lecture 18

Lecture 19 - Time Domain Methods in Speech Processing

Lecture 20

Lecture 21 - Introduction to Liner Prediction

Lecture 22 - Autocorrelation Method of LPC analysis

Lecture 23 - Autocorrelation Method of LPC analysis (Continued...)

Lecture 24 - Lattice Formulations of Linear Prediction

Lecture 25 - Lattice Formulations of Linear Prediction (Continued...)

Lecture 26

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31 - Segmental and Supra-segmental features of speech signal

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Lecture 32 - Cepstral Transform Coefficients (CC) Parameters extraction

Lecture 33 - Mel Frequency Cepstral Coefficients

Lecture 34 - MFCC features vector

Lecture 35 - Fundamental Frequency (F0) Detection of speech signal

Lecture 36 - Frequency Domain Fundamental Frequency Detection Algorithms

Lecture 37 - Text to Speech Synthesis

Lecture 38 - Text to Speech Synthesis (Continued...)

Lecture 39 - Automatic Speech Recognition

Lecture 40 - Statistical Modeling of Automatic Speech Recognition

Lecture 41 - Speech based Technology Development for e-learning

Lecture 42 - Prosody Modeling

Lecture 43 - Fundamental frequency countur modeling

Lecture 44 - Fundamental frequency contour modeling (Continued...)

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NPTEL : NOC:Analog Circuits and Systems through SPICE Simulation (Electronics and Communication Engineering)

Co-ordinators : Prof. Mrigank Sharad

Lecture 1 - Basic Analog Design Part I

Lecture 2 - Basic Analog Design Part I (Continued...)

Lecture 3 - Basic Analog Design Part II

Lecture 4 - Basic Analog Design Part II (Continued...)

Lecture 5 - Basic Analog Design Part III

Lecture 6 - Basic Analog Design Part III (Continued...)

Lecture 7 - Basic Analog Design Part III (Continued...)

Lecture 8 - Basic Analog Design Part III (Continued...)

Lecture 9 - Basic Analog Design Part III (Continued...)

Lecture 10 - Basic Analog Design Part III (Continued...)

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31

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Lecture 32

Lecture 33

Lecture 34

Lecture 35

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Lecture 40

Lecture 41

Lecture 42

Lecture 43

Lecture 44

Lecture 45

Lecture 46

Lecture 47

Lecture 48

Lecture 49

Lecture 50

Lecture 51

Lecture 52

Lecture 53

Lecture 54

Lecture 55

Lecture 56

Lecture 57

Lecture 58

NPTEL : NOC:Communication Networks (Electronics and Communication Engineering)

Co-ordinators : Prof. Goutam Das

Lecture 1 - Introduction to Communication Networks

Lecture 2 - Introduction to Communication Networks (Continued...)

Lecture 3 - Introduction to Communication Networks (Continued...)

Lecture 4 - Circuit Switch Networks

Lecture 5 - Space switch Artitechture

Lecture 6 - Space switch Architecture (Continued...)

Lecture 7 - Space Switch Architecture (Continued...)

Lecture 8 - Space Switch Architecture (Continued...)

Lecture 9 - Space Switch Architecture (Continued...)

Lecture 10 - Time Switch

Lecture 11 - Space Time Switch

Lecture 12 - Space Time Switch (Continued...)

Lecture 13 - Synchronisation

Lecture 14 - Synchronisation (Continued...)

Lecture 15 - Introduction to Queuing Theory

Lecture 16 - Arrival and Service Process

Lecture 17 - Poisson Process

Lecture 18 - poisson process (Continued...)

Lecture 19 - Memorylessness

Lecture 20 - Little's Theorem

Lecture 21 - Little's Theorem (Continued...)

Lecture 22 - D T M C

Lecture 23 - D T M C (Continued...)

Lecture 24 - D T M C To C T M C

Lecture 25 - C T M C

Lecture 26 - M/M/1 Queue

Lecture 27 - M/M/m And M/M/m/m System

Lecture 28 - Introduction to Data Networks

Lecture 29 - Introduction to Data Networks (Continued...)

Lecture 30 - Introduction to Data Networks (Continued...)

Lecture 31 - Layered Architecture

Lecture 32 - Layered Architecture (Continued...)

Lecture 33 - Broadband Access - Dail Up/ADSL

Lecture 34 - Broadband Access - DSL, Aloha

Lecture 35 - Aloha/Slotted Aloha

Lecture 36 - Slotted Aloha

Lecture 37 - Slotted Aloha (Continued...)

Lecture 38 - Slotted Aloha- Stability Analysis

Lecture 39 - Slotted Aloha- Stability Analysis (Continued...)

Lecture 40 - Stabilized Slotted Aloha-bayesian Estimation

Lecture 41 - Binary Back- off Algorithm

Lecture 42 - Effect of Physical Media

Lecture 43 - PON and Ethernet MAC

Lecture 44 - PON and Ethernet MAC (Continued...)

Lecture 45 - CSMA/CD

Lecture 46 - CSMA/CA

Lecture 47 - CSMA/CA (Continued...)

Lecture 48 - CSMA/CA (Continued...)

Lecture 49 - CSMA/CA (Continued...)

Lecture 50 - Learning Bridges

Lecture 51 - Learning Bridges (Continued...)

Lecture 52 - Distributed Spanning Tree

Lecture 53 - Distributed Spanning Tree (Continued...)

Lecture 54 - Internet Protocol

Lecture 55 - Internet Protocol (Continued...)

Lecture 56 - Subnet and ARP

Lecture 57 - ARP and DHCP

Lecture 58 - DHCP and Routing

NPTEL : NOC:Signal Processing Techniques and its Applications (Electronics and Communication Engineering)

Co-ordinators : Prof. Shyamal Kumar Das Mandal

Lecture 1 - Introduction

Lecture 2 - Signal and its Types

Lecture 3 - Characteristics of a Signal

Lecture 4 - Digitization of Signal

Lecture 5 - Digitization of Signal (Continued...)

Lecture 6 - Concept of Frequency in Continuous-time and Discrete-time Signal

Lecture 7 - Tutorial 1

Lecture 8 - Discrete Time Signal

Lecture 9 - Discrete Time System

Lecture 10 - D.T.S (L.T.I System)

Lecture 11 - Linear Time-Invariant Systems (Continued...)

Lecture 12 - Correlation

Lecture 13 - Tutorial 02

Lecture 14 - Z-Transform

Lecture 15 - Z-Transform Properties

Lecture 16 - Pole and Zero in Z-Transform

Lecture 17 - Inverse Z-Transform

Lecture 18 - Frequency-Domain Representation of Discrete Signals and L.T.I Systems

Lecture 19 - Discrete Fourier Transform (DFT)

Lecture 20 - Discrete Fourier Transform Linear Transform View

Lecture 21 - Discrete Fourier Transform Linear Transform View (Continued...)

Lecture 22 - Properties of Discrete Fourier Transform

Lecture 23 - Properties of Discrete Fourier Transform (Continued...)

Lecture 24 - Properties of Discrete Fourier Transform (Continued...)

Lecture 25 - Properties of Discrete Fourier Transform (Continued...)

Lecture 26 - Linear Filtering

Lecture 27 - Tutorial 5

Lecture 28 - Two Dimensional Discrete Fourier Transform

Lecture 29 - Discrete Cosine Transform

Lecture 30 - Frequency analysis of long signal using DFT

Lecture 31 - Short-Time Fourier Transform (STFT)

Lecture 32 - STFT Synthesis

Lecture 33 - Fast Fourier Transform (FFT) Algorithms

Lecture 34 - Fast Fourier Transform (FFT) Algorithms (Continued...)

Lecture 35 - Radix-2 FFT Algorithms

Lecture 36 - Radix-2 FFT Algorithms (Continued...)

Lecture 37 - Spectrum and spectrogram

Lecture 38 - Digital Filter

Lecture 39 - FIR Filter

Lecture 40 - Linear Symmetric and Anti-symmetric filter

Lecture 41 - FIR Filter Design

Lecture 42 - Frequency Sampling Method

Lecture 43 - Design Optimum equiripple Linear-Phase FIR Filters (optimization methods)

Lecture 44 - Infinite Impulse Response (IIR) Filters

Lecture 45 - Traditional Analog Filter Design

Lecture 46 - Chebyshev filter Design Method

Lecture 47 - Analogue filter to digital filter transformation

Lecture 48 - Linear Prediction and Optimum Linear Filters

Lecture 49 - Autocorrelation Method for Linear Prediction

Lecture 50 - Covariance Method for Linear Prediction

Lecture 51 - Lattice Formulations of Linear Prediction

Lecture 52 - Lattice Formulations of Linear Prediction (Continued....)

Lecture 53 - Introduction to Multirate Signal Processing

Lecture 54 - Analysis of Decimation and Interpolation

Lecture 55 - Fractional Rate Conversion

Lecture 56 - Implementations of Decimator and Interpolator

Lecture 57 - Sample Rate Conversion by Stages

Lecture 58 - Power Spectrum Estimation

Lecture 59 - Power Spectrum Estimation (Continued...)

Lecture 60 - Tutorial 6: Tutorial for Final Examination

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NPTEL : Analog IC Design (Electronics and Communication Engineering)

Co-ordinators : Dr. Nagendra Krishnapura

Lecture 1 - Course introduction; Negative feedback control

Lecture 2 - Negative feedback amplifier

Lecture 3 - Step response, sinusoidal steady state response

Lecture 4 - Loop gain and unity loop gain frequency; Opamp

Lecture 5 - Opamp realization using controlled sources; Delay in the loop

Lecture 6 - Negative feedback amplifier with ideal delay-small delays

Lecture 7 - Negative feedback amplifier with ideal delay-large delays

Lecture 8 - Negative feedback amplifier with parasitic poles and zeros

Lecture 9 - Negative feedback amplifier with parasitic poles and zeros; Nyquist criterion

Lecture 10 - Nyquist criterion; Phase margin

Lecture 11 - Phase margin

Lecture 12 - Single stage opamp realization

Lecture 13 - Two stage miller compensated opamp

Lecture 14 - Two stage miller compensated opamp

Lecture 15 - Two and three stage miller compensated opamps; Feedforward compensated opamp

Lecture 16 - Feedforward compensated opamp

Lecture 17 - Feedforward compensated opamp

Lecture 18 - Feedforward compensated opamp; typical opamp data sheet

Lecture 19 - Opamp offset and CMRR; Transimpedance amplifier using an opamp

Lecture 20 - Components available in a CMOS process

Lecture 21 - MOS transistors-basics

Lecture 22 - MOS transistors-parasitics, mismatch

Lecture 23 - MOS transistors-mismatch, speed

Lecture 24 - Noise in resistors

Lecture 25 - Noise in MOS transistors; Input and output referred noise

Lecture 26 - Noise scaling; Basic amplifier stages-Common source, common gate

Lecture 27 - Basic amplifier stages-Common drain; Frequency response of amplifiers

Lecture 28 - Common source amplifier frequency response; Differential amplifier

Lecture 29 - Differential and common mode half circuits; Differential pair with active load

Lecture 30 - Differential pair with current mirror load

Lecture 31 - Single stage opamp characteristics

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Lecture 32 - Opamp with single and dual supplies; Single stage opamp tradeoffs

Lecture 33 - Telescopic cascode opamp

Lecture 34 - Telescopic cascode opamp; Folded cascode opamp

Lecture 35 - Folded cascode opamp

Lecture 36 - Two stage opamp

Lecture 37 - Two stage opamp; Three stage and triple cascode opamps

Lecture 38 - Common mode rejection ratio; Example

Lecture 39 - Fully differential circuits

Lecture 40 - Fully differential single stage opamp

Lecture 41 - Common mode feedback

Lecture 42 - Fully differential single stage opamp

Lecture 43 - Fully differential two stage opamp; Fully differential versus pseudo-differential

Lecture 44 - Circuit simulators and analyses

Lecture 45 - Phase locked loop as frequency multiplier

Lecture 46 - Phase domain model

Lecture 47 - Type I PLL transfer function and reference feedthrough

Lecture 48 - Type II PLL

Lecture 49 - Type II PLL transfer functions; Implementation

Lecture 50 - Type II PLL-extra poles; Random noise in a PLL

Lecture 51 - Oscillator phase noise

Lecture 52 - PLL phase noise; LC and ring Oscillators

Lecture 53 - Generating PTAT and constant MOS gm bias currents

Lecture 54 - Reducing supply sensitivity; Bandgap voltage reference

Lecture 55 - Fractional bandgap reference; Low dropout regulator

Lecture 56 - Low dropout regulators; Continuous-time active filters

Lecture 57 - Continuous-time active filters

Lecture 58 - Continuous-time active filters

Lecture 59 - Discrete-time active filters

Lecture 60 - Transistor sizing in practice; Course summary

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NPTEL : Coding Theory (Electronics and Communication Engineering)

Co-ordinators : Dr. Andrew Thangaraj

Lecture 1 - Introduction to Linear Block Codes

Lecture 2 - Properties of Linear Block Codes

Lecture 3 - Dual of Linear Block Codes

Lecture 4 - Minimum Distance of Codes

Lecture 5 - Operations on Codes

Lecture 6 - Bounds on Code Parameters

Lecture 7 - Optimal Decoders

Lecture 8 - Syndrome Decoder, Basics of Finite Fields

Lecture 9 - Constructions of Finite Fields

Lecture 10 - Computations in Finite Fields

Lecture 11 - Codes over Finite Fields, Minimal Polynomials

Lecture 12 - BCH Codes

Lecture 13 - BCH and RS Codes I

Lecture 14 - BCH and RS Codes II

Lecture 15 - Decoding BCH Codes

Lecture 16 - Decoding RS Codes

Lecture 17 - Coded Modulation and Soft Decision Decoding

Lecture 18 - Optimal Decoders for BPSK and AWGN

Lecture 19 - Bitwise Map Decoder for BPSK over AWGN

Lecture 20 - Bitwise Map Decoder from the Dual Code

Lecture 21 - Simulating Coded Modulation

Lecture 22 - Union Bound, Introduction to LDPC Codes

Lecture 23 - LDPC Codes

Lecture 24 - Message Passing, Density Evolution Analysis

Lecture 25 - Thresholds of LDPC Codes

Lecture 26 - Irregular LDPC Codes

Lecture 27 - Optimized Irregular LDPC Codes, Soft Message Passing Decoders

Lecture 28 - Density Evolution for Soft Message Passing Decoding of LDPC Codes

Lecture 29 - LDPC Codes in Practice

Lecture 30 - Introduction to Convolutional Codes

Lecture 31 - Viterbi Decoding of Convolutional Codes

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Lecture 32 - Union Bound, Recursive Convolutional Encoders

Lecture 33 - Convolutional Codes in Practice

Lecture 34 - BCJR Decoder

Lecture 35 - BCJR & Max-Log-MAP Decoder, Introduction to Turbo Codes

Lecture 36 - Turbo Decoder

Lecture 37 - Turbo Codes in Practice

Lecture 38 - Modern Codes

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NPTEL : Semiconductor Device Modeling (Electronics and Communication Engineering)

Co-ordinators : Prof. S. Karmalkar

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31

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Lecture 32

Lecture 33

Lecture 34

Lecture 35

Lecture 36

Lecture 37

Lecture 38

Lecture 39

Lecture 40

Lecture 41

Lecture 42

Lecture 43

Lecture 44

Lecture 45

Lecture 46

Lecture 47

Lecture 48

Lecture 49

Lecture 50

Lecture 51

Lecture 52

Lecture 53

Lecture 54

Lecture 55

Lecture 56

Lecture 57

NPTEL : VLSI Data Conversion Circuits (Electronics and Communication Engineering)

Co-ordinators : Dr. Shanthi Pavan

Lecture 1 - Introduction to Data Conversion

Lecture 2 - Sampling-1

Lecture 3 - Sampling-2

Lecture 4 - Nonidealities in Samples

Lecture 5 - Noise due to Sampling

Lecture 6 - Distortion in a Sampling Switch

Lecture 7 - Gate Boosted Switches-1

Lecture 8 - Gate Boosted Switches-2

Lecture 9 - Charge Injection

Lecture 10 - S/H Characterization-1

Lecture 11 - S/H Characterization-2

Lecture 12 - FFTs and Leakage

Lecture 13 - Spectral Windows-1

Lecture 14 - Spectral Windows-2

Lecture 15 - ADC/DAC Definition

Lecture 16 - Quantization Noise-1

Lecture 17 - Quantization Noise-2

Lecture 18 - Over Sampling and Noise Shaping

Lecture 19 - Delta-Sigma Modulation-1

Lecture 20 - Delta-Sigma Modulation-2

Lecture 21 - Linearized Analysis

Lecture 22 - Stability of Delta Sigma Modulators

Lecture 23 - High Order DSMs

Lecture 24 - NTF Design and Tradeoffs

Lecture 25 - Single bit Modulators

Lecture 26 - Loop Filter Architectures

Lecture 27 - Continous-time Delta Sigma Modulation

Lecture 28 - Implicit Antialiasing

Lecture 29 - Modulators with NRZ and Impulsive DACs

Lecture 30 - High Order CTDSMs

Lecture 31 - CTDM Design

Lecture 32 - Excess Loop Delay (ELD)

Lecture 33 - ELD Compensation

Lecture 34 - Effect of Clock Jitter on CTDSMs-1

Lecture 35 - Effect of Clock Jitter on CTDSMs-2

Lecture 36 - Dynamic Range Scaling

Lecture 37 - Simulation of CTDSMs

Lecture 38 - Integrator Design-1

Lecture 39 - Integrator Design-2

Lecture 40 - Flash ADC Design

Lecture 41 - Latches and Metastability

Lecture 42 - Offset in a Latch-1

Lecture 43 - Offset in a Latch-2 Auto Zeroing

Lecture 44 - Auto Zeroing-2

Lecture 45 - Auto Zeroing-3

Lecture 46 - Auto Zeroing in flash ADCs

Lecture 47 - Flash ADCs Case Study

Lecture 48 - Flash ADC Case Study

Lecture 49 - Flash ADC in a Delta Sigma Loop

Lecture 50 - DAC Basics

Lecture 51 - Binary and Themometer DACs

Lecture 52 - Segmented DACs

Lecture 53 - Optimal DAC Segmentation

Lecture 54 - DAC Nonlinearities

Lecture 55 - Current Steering DACs-1

Lecture 56 - Current Steering DACs-2

Lecture 57 - DAC Mismatches in DSMs

Lecture 58 - Calibration and Randomization

Lecture 59 - Dynamic Element Matching-1

Lecture 60 - Dynamic Element Matching-2

NPTEL : Digital Circuits and Systems (Electronics and Communication Engineering)

Co-ordinators : Prof. S. Srinivasan

Lecture 1 - Introduction To Digital Circuits

Lecture 2 - Introduction To Digital Circuits

Lecture 3 - Combinational Logic Basics

Lecture 4 - Combinational Circuits

Lecture 5 - Logic Simplification

Lecture 6 - Karnaugh Maps And Implicants

Lecture 7 - Logic Minimization Using Karnaugh Maps

Lecture 8 - Karnaugh Map Minimization Using Maxterms

Lecture 9 - Code Converters

Lecture 10 - Parity Generators And Display Decoder

Lecture 11 - Arithmetic Circuits

Lecture 12 - Carry Look Ahead Adders

Lecture 13 - Subtractors

Lecture 14 - 2?'S Complement Subtractor and BCD Adder

Lecture 15 - Array Multiplier

Lecture 16 - Introduction to Sequential Circuits

Lecture 17 - S-R, J-K and D Flip Flops

Lecture 18 - J-K and T Flip Flops

Lecture 19 - Triggering Mechanisms of Flip Flops and Counters

Lecture 20 - Up/Down Counters

Lecture 21 - Shift Registers

Lecture 22 - Application of shift Registers

Lecture 23 - State Machines

Lecture 24 - Design of Synchronous Sequential Circuits

Lecture 25 - Design using J-K Flip Flop

Lecture 26 - Mealy and Moore Circuits

Lecture 27 - Pattern Detector

Lecture 28 - MSI and LSI Based Design

Lecture 29 - Multiplexer Based Design

Lecture 30 - Encoders and Decoders

Lecture 31 - Programmable Logic Devices

Lecture 32 - Design using Programmable Logic Devices

Lecture 33 - Design using Programmable Logic Devices (Continued)

Lecture 34 - MSI and LSI based Implementation of Sequential Circuits

Lecture 35 - MSI and LSI based Implementation of Sequential Circuits (Continued)

Lecture 36 - Design of circuits using MSI sequential blocks

Lecture 37 - System Design Example

Lecture 38 - System Design Example (Continued)

Lecture 39 - System Design using the concept of controllers

Lecture 40 - System Design using the concept of controllers (Continued)

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NPTEL : Electronics for Analog Signal Processing - I (Electronics and Communication Engineering)

Co-ordinators : Prof. K. Radhakrishna Rao

Lecture 1 - Introduction

Lecture 2 - Diode

Lecture 3 - Diode characteristics

Lecture 4 - Rectifier

Lecture 5 - Voltage Multiplier

Lecture 6 - Full Wave Rectifier and Peak Detector

Lecture 7 - Diode as a GATE

Lecture 8 - Analog GATE

Lecture 9 - Small Signal Analysis of Diode Circuit

Lecture 10 - Zener Regulator and Voltage Regulator

Lecture 11 - Varactor Diode

Lecture 12 - Amplifiers

Lecture 13 - Cascading of Amplifiers

Lecture 14 - Cascading of Amplifiers

Lecture 15 - h and g Parameters

Lecture 16 - Two Port Analysis

Lecture 17 - Amplifier Applications

Lecture 18 - Frequency Limitations Of An Amplifier

Lecture 19 - Distortion In Amplifiers

Lecture 20 - Bipolar Junction Transistor

Lecture 21 - Transistor (BJT) Inverter

Lecture 22 - Transistor Biasing

Lecture 23 - Stable Way of Biasing

Lecture 24 - Common Emitter Amplifiers

Lecture 25 - Transistor Biasing Using Single Supply

Lecture 26 - Metal Oxide Semiconductor

Lecture 27 - Construction of a MOSFET

Lecture 28 - Varieties of MOSFETS and JFETS

Lecture 29 - Characteristics of MOSFET

Lecture 30 - Cascading Amplifiers

Lecture 31 - Cascading (Direct Coupling)

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Lecture 32 - The Differential Amplifiers

Lecture 33 - BJT Differential Amplifiers

Lecture 34 - MOSFET Differential Amplifiers

Lecture 35 - Cascading Differential Amplifiers

Lecture 36 - Current Source and Current Sink

Lecture 37 - NMOS Inverters and CMOS Inverters

Lecture 38 - Active Components used in Electronics

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NPTEL : Electronics for Analog Signal Processing - II (Electronics and Communication Engineering)

Co-ordinators : Prof. K. Radhakrishna Rao

Lecture 1 - Feedback Theory

Lecture 2 - Negative Feedback

Lecture 3 - Negative Feedback

Lecture 4 - Y-Feedback

Lecture 5 - h and g Negative Feedback

Lecture 6 - g Feedback with Mosfet

Lecture 7 - Operational Amplifier in Negative Feedback

Lecture 8 - Operational Amplifier in Negative Feedback

Lecture 9 - Positive Feedback (Regenerative)

Lecture 10 - Experimental Demonstration

Lecture 11 - Instrumentation Amplifiers

Lecture 12 - Active Filters

Lecture 13 - Simulation of Harmonic Oscillators

Lecture 14 - Oscillators

Lecture 15 - Oscillators

Lecture 16 - Frequency Compensation in Negative Feedback

Lecture 17 - Frequency Compensation

Lecture 18 - Wideband (video) Amplifiers

Lecture 19 - Wideband Amplifiers

Lecture 20 - ICs For Video And Tuned Amplifier Applications

Lecture 21 - Power Amplifier

Lecture 22 - Power Amplifier

Lecture 23 - Class B and C Power Amplifiers

Lecture 24 - Class-B Power Amplifier Load and Drive

Lecture 25 - Control Circuits

Lecture 26 - Voltage Regulators

Lecture 27 - Voltage Regulators

Lecture 28 - Voltage Regulators

Lecture 29 - Convertors

Lecture 30 - Analog Multipliers (Modems & Mixers)

Lecture 31 - Log-Antilog Multipliers

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Lecture 32 - Multipliers

Lecture 33 - Multipliers

Lecture 34 - AGC/AVC

Lecture 35 - AGC/AVC

Lecture 36 - Experimental Demonstration

Lecture 37 - PLL (Phase Locked Loop)

Lecture 38 - PLL (Phase Locked Loop)

Lecture 39 - Lock Range Capture Range and FSK and FM

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NPTEL : High Speed Devices and Circuits (Electronics and Communication Engineering)

Co-ordinators : Prof. K.N. Bhat

Lecture 1 - Introduction to Basic concepts

Lecture 2 - Requirements for high speed circuits, devices and materials

Lecture 3 - Classification and properties of semiconductor devices

Lecture 4 - Ternary compound semiconductors and their applications

Lecture 5 - Ternary compound semiconductors and their applications (Continued.)

Lecture 6 - Crystal structures in GaAs

Lecture 7 - Dopants and impurities in GaAs and InP

Lecture 8 - Brief Overview of GaAs Technology for High Speed Devices

Lecture 9 - Epitaxial Techniques for GaAs and high speed devices

Lecture 10 - MBE and LPE for GaAs Epitoxy

Lecture 11 - GaAs and InP devices for Microelectronics

Lecture 12 - Metal Semiconductor contacts for MESFET

Lecture 13 - Metal Semiconductor contacts for MESFET (Continued.)

Lecture 14 - Metal Semiconductor contacts for MESFET (Continued.)

Lecture 15 - Ohmic contacts on semiconductors

Lecture 16 - Fermi level pinning, I V characteristics of Schottky Barrier Diodes

Lecture 17 - Schottky Barrier Diodes I V characteristics of Non idealities -1

Lecture 18 - Schottky Barrier Diodes I V characteristics of Non idealities -1

Lecture 19 - Causes of Non idealities in the Schottky Barrier Diodes (I V characteristics)

Lecture 20 - MESFET operations and I V characteristics

Lecture 21 - MESFET I V characteristics Shockley's Model

Lecture 22 - MESFET Shockley's Model and velocity saturation effect

Lecture 23 - MESFET velocity saturation effect on drain current saturation

Lecture 24 - MESFET : Drain current saturation Ids due to velocity saturation

Lecture 25 - MESFET : Effects of channel length and gate length on IDS and gm

Lecture 26 - MESFET : Effects of velocity saturation and velocity field characteristics

Lecture 27 - MESFET : Effects of velocity field characteristics - Overshoot effects

Lecture 28 - MESFET : Velocity overshoot effect and self aligned MESFET SAINT

Lecture 29 - Self Aligned MESFET SAINT Threshold Voltage and Sub Threshold current

Lecture 30 - Hetero junctions

Lecture 31 - Hetero junctions and high electron Mobility Transistor (HEMT)

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Lecture 32 - Hetero junctions and high electron Mobility Transistor (HEMT) (Continued.)

Lecture 33 - High Electron Mobility Transistor

Lecture 34 - HEMT off voltage, I-V characteristics and trans conductance

Lecture 35 - I-V characteristics and trans conductance and optimization

Lecture 36 - Indium phosphide based HEMT

Lecture 37 - Pseudomorphic HEMT and Hetrojunction Bipolar Transistors

Lecture 38 - Hetero junction Bipolar Transistors (HBT)

Lecture 39 - Hetero junction Bipolar Transistors (HBT) (Continued.)

Lecture 40 - Hetero junction Bipolar Transistors (HBT) (Continued.)

Lecture 41 - Hetero junction Bipolar Transistors (HBT) (Continued.)

NPTEL : Solid State Devices (Electronics and Communication Engineering)

Co-ordinators : Prof. S. Karmalkar

Lecture 1 - Introduction on Solid State Devices

Lecture 2 - Evolution and Uniqueness of Semiconductor

Lecture 3 - Equilibrium Carrier Concentration

Lecture 4 - Equilibrium Carrier Concentration

Lecture 5 - Equilibrium Carrier Concentration

Lecture 6 - Equilibrium Carrier Concentration

Lecture 7 - Equilibrium Carrier Concentration

Lecture 8 - Equilibrium Carrier Concentration

Lecture 9 - Equilibrium Carrier Concentration

Lecture 10 - Equilibrium Carrier Concentration

Lecture 11 - Equilibrium Carrier Concentration

Lecture 12 - Carrier Transport

Lecture 13 - Carrier Transport (Continued.)

Lecture 14 - Carrier Transport (Continued.)

Lecture 15 - Excess Carriers

Lecture 16 - Excess Carriers (Continued.)

Lecture 17 - Procedure for Device Analysis

Lecture 18 - Procedure for Device Analysis (Continued.)

Lecture 19 - PN Junction

Lecture 20 - PN Junction (Continued.)

Lecture 21 - PN Junction (Continued.)

Lecture 22 - PN Junction (Continued.)

Lecture 23 - PN Junction (Continued.)

Lecture 24 - PN Junction (Continued.)

Lecture 25 - PN Junction (Continued.)

Lecture 26 - Bipolar Junction Transistor

Lecture 27 - Bipolar Junction Transistor (Continued.)

Lecture 28 - Bipolar Junction Transistor (Continued.)

Lecture 29 - Bipolar Junction Transistor (Continued.)

Lecture 30 - Bipolar Junction Transistor (Continued.)

Lecture 31 - Bipolar Junction Transistor (Continued.)

Lecture 32 - Bipolar Junction Transistor (Continued.)

Lecture 33 - Metal-Oxide-Semiconductor (MOS) Junction

Lecture 34 - Metal-Oxide-Semiconductor (MOS) Junction (Continued.)

Lecture 35 - Metal-Oxide-Semiconductor (MOS) Junction (Continued.)

Lecture 36 - Metal-Oxide-Semiconductor (MOS) Junction (Continued.)

Lecture 37 - Metal-Oxide-Semiconductor (MOS) Junction (Continued.)

Lecture 38 - MOS Field Effect Transistor

Lecture 39 - MOS Field Effect Transistor (Continued.)

Lecture 40 - MOS Field Effect Transistor (Continued.)

Lecture 41 - MOS Field Effect Transistor (Continued.)

Lecture 42 - The Final Lecture - Conclusion

NPTEL : VLSI Circuits (Electronics and Communication Engineering)

Co-ordinators : Prof. S. Srinivasan

Lecture 1 - Introduction to VLSI Design

Lecture 2 - Combinational Circuit Design

Lecture 3 - Programmable Logic Devices

Lecture 4 - Programmable Array Logic

Lecture 5 - Review of Flip-Flops

Lecture 6 - Sequential Circuits

Lecture 7 - Sequential Circuit Design

Lecture 8 - MSI Implementation of Sequential Circuits

Lecture 9 - Design of Sequential Circuits using One Hot Controller

Lecture 10 - Verilog Modeling of Combinational Circuits

Lecture 11 - Modeling of Verilog Sequential Circuits - Core Statements

Lecture 12 - Modeling of Verilog Sequential Circuits - Core Statements(Continued.)

Lecture 13 - RTL Coding Guidelines

Lecture 14 - Coding Organization - Complete Realization

Lecture 15 - Coding Organization - Complete Realization (Continued.)

Lecture 16 - Writing a Test Bench

Lecture 17 - System Design using ASM Chart

Lecture 18 - Example of System Design using ASM Chart

Lecture 19 - Examples of System Design using Sequential Circuits

Lecture 20 - Examples of System Design using Sequential Circuits (Continued.)

Lecture 21 - Microprogrammed Design

Lecture 22 - Microprogrammed Design (Continued.)

Lecture 23 - Design Flow of VLSI Circuits

Lecture 24 - Simulation of Combinational Circuits

Lecture 25 - Simulation of Combinational and Sequential Circuits

Lecture 26 - Analysis of Waveforms using Modelsim

Lecture 27 - Analysis of Waveforms using Modelsim (Continued.)

Lecture 28 - ModelSim Simulation Tool

Lecture 29 - Synthesis Tool

Lecture 30 - Synthesis Tool (Continued.)

Lecture 31 - Synplify Tool - Schematic Circuit Diagram View

Lecture 32 - Technology View using Synplify Tool

Lecture 33 - Synopsys Full and Parallel Cases

Lecture 34 - Xilinx Place & Route Tool

Lecture 35 - Xilinx Place & Route Tool (Continued.)

Lecture 36 - PCI Arbiter Design using ASM Chart

Lecture 37 - Design of Memories - ROM

Lecture 38 - Design of Memories- RAM

Lecture 39 - Design of External RAM

Lecture 40 - Design of Arithmetic Circuits

Lecture 41 - Design of Arithmetic Circuits (Continued.)

Lecture 42 - Design of Arithmetic Circuits (Continued.)

Lecture 43 - System Design Examples

Lecture 44 - System Design Examples (Continued.)

Lecture 45 - System Design Examples (Continued.)

Lecture 46 - System Design Examples (Continued.)

Lecture 47 - System Design Examples (Continued.)

Lecture 48 - System Design Examples using FPGA Board

Lecture 49 - System Design Examples using FPGA Board (Continued.)

Lecture 50 - Advanced Features of Xilinx Project Navigator

Lecture 51 - System Design Examples using FPGA Board (Continued.)

Lecture 52 - System Design Examples using FPGA Board (Continued.)

Lecture 53 - System Design Examples using FPGA Board (Continued.)

Lecture 54 - System Design Examples using FPGA Board (Continued.)

Lecture 55 - Project Design Suggested for FPGA/ASIC Implementations

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NPTEL : VLSI Technology (Electronics and Communication Engineering)

Co-ordinators : Dr. Nandita Dasgupta

Lecture 1 - Introduction on VLSI Design

Lecture 2 - Bipolar Junction Transistor Fabrication

Lecture 3 - MOSFET Fabrication for IC

Lecture 4 - Crystal Structure of Si

Lecture 5 - Crystal Structure (Continued.)

Lecture 6 - Defects in Crystal + Crystal growth

Lecture 7 - Crystal growth Contd + Epitaxy I

Lecture 8 - Epitaxy II - Vapour phase Epitaxy

Lecture 9 - Epitaxy III - Doping during Epitaxy

Lecture 10 - Molecular beam Epitaxy

Lecture 11 - Oxidation I - Kinetics of Oxidation

Lecture 12 - Oxidation II - Oxidation rate constants

Lecture 13 - Oxidation III - Dopant Redistribution

Lecture 14 - Oxidation IV - Oxide Charges

Lecture 15 - Diffusion I - Theory of Diffusion

Lecture 16 - Diffusion II - Infinite Source

Lecture 17 - Diffusion III - Actual Doping Profiles

Lecture 18 - Diffusion IV - Diffusion Systems

Lecture 19 - Ion - Implantation Process

Lecture 20 - Ion - Implantation Process

Lecture 21 - Annealing of Damages

Lecture 22 - Masking during Implantation

Lecture 23 - Lithography - I

Lecture 24 - Lithography - II

Lecture 25 - Wet Chemical Etching

Lecture 26 - Dry Etching

Lecture 27 - Plasma Etching Systems

Lecture 28 - Etching of Si,Sio2,SiN and other materials

Lecture 29 - Plasma Deposition Process

Lecture 30 - Metallization - I

Lecture 31 - Problems in Aluminium Metal contacts

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Lecture 32 - IC BJT - From junction isolation to LOCOS

Lecture 33 - Problems in LOCOS + Trench isolation

Lecture 34 - More about BJT Fabrication and Realization

Lecture 35 - Circuits + Transistors in ECL Circuits

Lecture 36 - MOSFET I - Metal gate vs. Self-aligned Poly-gate

Lecture 37 - MOSFET II Tailoring of Device Parameters

Lecture 38 - CMOS Technology

Lecture 39 - Latch - up in CMOS

Lecture 40 - BICMOS Technology

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NPTEL : Basic Electrical Circuits (Electronics and Communication Engineering)

Co-ordinators : Dr. Nagendra Krishnapura

Lecture 1 - Introduction to the course;Current and Voltage;Kirchhoff's Current and Voltage laws

Lecture 2 - Electrical circuit elements: Voltage and current sources; R, C, L; Voltage sources in series; Example of superposition

Lecture 3 - Elements in series and parallel; Superposition in linear circuits

Lecture 4 - Controlled sources; Determining the characteristics of a two terminal element; Realizing a resistor using a VCCS or a CCVS

Lecture 5 - Nodal analysis of a network with conductances and current sources; Setting up the equations; Conductance matrix; Superposition

Lecture 6 - Circuit analysis; Number of KCL and KVL equations in a circuit; Nodal analysis of a network with conductances and current sources; Setting up the equations; Conductance matrix;

Lecture 7 - Nodal analysis with voltage sources and controlled sources; Brief introduction to modified nodal analysis; Use of supernode to solve circuits with voltage sources; Superposition theorem

Lecture 8 - Mesh analysis of a circuit with resistors and voltage sources; Comparison with nodal analysis; Mesh analysis of circuits with current sources-supermesh

Lecture 9 - Choice of nodal versus mesh analysis; Circuit theorems: Pushing a voltage source through a node, splitting a current source, substitution theorem, superposition

Lecture 10 - Thevenin and Norton (theorem and) equivalent circuits; Power conservation in a circuit

Lecture 11 - Tellegen's theorem; Reciprocity theorem

Lecture 12 - Compensation Theorem; Two ports

Lecture 13 - Two port parameters-y parameters

Lecture 14 - Two port parameters(z, h, and g); Reciprocal two ports

Lecture 15 - Opamp, ideal opamp circuits, non-inverting and inverting amplifiers; Ensuring that the opamp has negative feedback

Lecture 16 - RC circuit natural response; First order differential equation

Lecture 17 - RC (first-order) circuit, complete response with step inputs; Transient(natural) and steady state(forced) responses; Zero-state and zero-input responses

Lecture 18 - Step response of RC circuit with loops of voltage sources and capacitors; RL circuits; RLC circuits

Lecture 19 - Second order(RLC circuit) natural response; Series and prallel RLC circuits; Differential equation-characteristic equation and solutions; Forced response of a second order circuit

Lecture 20 - General formulation of second order(RLC circuit) natural response; Natural frequency and damping/quality factor; Series/parallel RLC circuits; R, L, C in sinusoidal steady state

Lecture 21 - Sinusoidal steady state response of RC and RLC circuits

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NPTEL : NOC:Basic Electrical Circuits (Electronics and Communication Engineering)

Co-ordinators : Dr. Nagendra Krishnapura

Lecture 1 - Preliminaries

Lecture 2 - Current

Lecture 3 - Voltage

Lecture 4 - Electrical elements and circuits

Lecture 5 - Kirchhoff's current law (KCL)

Lecture 6 - Kirchhoff's Voltage law (KVL)

Lecture 7 - Voltage Source

Lecture 8 - Current Source

Lecture 9 - Resistor

Lecture 10 - Capacitor

Lecture 11 - Inductor

Lecture 12 - Mutual Inductor

Lecture 13 - Linearity of Elements

Lecture 14 - Solutions to the assignment on units 1 and 2

Lecture 15 - Series connection-Voltage sources in series

Lecture 16 - Series connection of R, L, C, current source

Lecture 17 - Elements in parallel

Lecture 18 - Current source in series with an element; Voltage source in parallel with an element

Lecture 19 - Extreme cases: Open and short circuits

Lecture 20 - Summary

Lecture 21 - Voltage controlled voltage source (VCVS)

Lecture 22 - Voltage controlled current source (VCCS)

Lecture 23 - Current controlled voltage source (CCVS)

Lecture 24 - Current controlled current source (CCCS)

Lecture 25 - Realizing a resistance using a VCCS or CCCS

Lecture 26 - Scaling an element's value using controlled sources

Lecture 27 - Example calculation

Lecture 28 - Solution to the assignment on units 3 and 4

Lecture 29 - Power and energy absorbed by electrical elements

Lecture 30 - Power and energy in a resistor

Lecture 31 - Power and energy in a capacitor

Lecture 32 - Power and energy in an inductor

Lecture 33 - Power and energy in a voltage source

Lecture 34 - Power and energy in a current source

Lecture 35 - Goals of circuit analysis

Lecture 36 - Number of independent KCL equations

Lecture 37 - Number of independent KVL equations and branch relationships

Lecture 38 - Analysis of circuits with a single independent source

Lecture 39 - Analysis of circuits with multiple independent sources using superposition

Lecture 40 - Superposition: Example

Lecture 41 - Solution to the assignment on units 5 and 6

Lecture 42 - What is nodal analysis

Lecture 43 - Setting up nodal analysis equations

Lecture 44 - Structure of the conductance matrix

Lecture 45 - How elements appear in the nodal analysis formulation

Lecture 46 - Completely solving the circuit starting from nodal analysis

Lecture 47 - Nodal analysis example

Lecture 48 - Matrix inversion basics

Lecture 49 - Nodal analysis with independent voltage sources

Lecture 50 - Supernode for nodal analysis with independent voltage sources

Lecture 51 - Nodal analysis with VCCS

Lecture 52 - Nodal analysis with VCVS

Lecture 53 - Nodal analysis with CCVS

Lecture 54 - Nodal analysis with CCCS

Lecture 55 - Nodal analysis summary

Lecture 56 - Solution to the assignment on units 7 and 8

Lecture 57 - Planar circuits

Lecture 58 - Mesh currents and their relationship to branch currents

Lecture 59 - Mesh analysis

Lecture 60 - Mesh analysis with independent current sources-Supermesh

Lecture 61 - Mesh analysis with current controlled voltage sources

Lecture 62 - Mesh analysis with current controlled current sources

Lecture 63 - Mesh analysis using voltage controlled sources

Lecture 64 - Nodal analysis versus Mesh analysis

Lecture 65 - Superposition theorem

Lecture 66 - Pushing a voltage source through a node

Lecture 67 - Splitting a current source

Lecture 68 - Substitution theorem: Current source

Lecture 69 - Substitution theorem: Voltage source

Lecture 70 - Substituting a voltage or current source with a resistor

Lecture 71 - Solutions

Lecture 72 - Extensions to Superposition and Substitution theorem

Lecture 73 - Thevenin's theorem

Lecture 74 - Worked out example: Thevenin's theorem

Lecture 75 - Norton's theorem

Lecture 76 - Worked out example: Norton's theorem

Lecture 77 - Maximum power transfer theorem

Lecture 78 - Preliminaries.

Lecture 79 - Two port parameters

Lecture 80 - y parameters

Lecture 81 - y parameters: Examples

Lecture 82 - Solutions.

Lecture 83 - z parameters

Lecture 84 - z parameters: Examples

Lecture 85 - h parameters

Lecture 86 - h parameters: Examples

Lecture 87 - g parameters

Lecture 88 - g parameters: Examples

Lecture 89 - Calculations with a two-port element

Lecture 90 - Calculations with a two-port element.

Lecture 91 - Degenerate cases

Lecture 92 - Relationships between different two-port parameters

Lecture 93 - Equivalent circuit representation for two ports

Lecture 94 - Reciprocity

Lecture 95 - Proof of reciprocity of resistive two-ports

Lecture 96 - Proof for 4-terminal two-ports

Lecture 97 - Reciprocity in terms of different two-port parameters

Lecture 98 - Reciprocity in circuits containing controlled sources

Lecture 99 - Examples

Lecture 100 - Solutions..

Lecture 101 - Feedback amplifier using an opamp

Lecture 102 - Ideal opamp

Lecture 103 - Negative feedback around the opamp

Lecture 104 - Finding opamp signs for negative feedback

Lecture 105 - Example: Determining opamp sign for negative feedback

Lecture 106 - Analysis of circuits with opamps

Lecture 107 - Inverting amplifier

Lecture 108 - Summing amplifier

Lecture 109 - Instrumentation amplifier

Lecture 110 - Negative resistance and Miller effect

Lecture 111 - Finding opamp signs for negative feedback-circuits with multiple opamps

Lecture 112 - Opamp supply voltages and saturation

Lecture 113 - KCL with an opamp and supply currents

Lecture 114 - Solutions...

Lecture 115 - Circuits with storage elements (capacitors and inductors)

Lecture 116 - First order circuit with zero input-natural response

Lecture 117 - First order RC circuit with zero input-Example

Lecture 118 - First order circuit with a constant input

Lecture 119 - General form of the first order circuit response

Lecture 120 - First order RC circuit with a constant input-Example

Lecture 121 - First order circuit with piecewise constant input

Lecture 122 - First order circuit with piecewise constant input-Example

Lecture 123 - First order circuit-Response of arbitrary circuit variables

Lecture 124 - Summary: Computing first order circuit response

Lecture 125 - Does a capacitor block DC?

Lecture 126 - Finding the order of a circuit

Lecture 127 - First order RC circuits with discontinuous capacitor voltages

Lecture 128 - Summary: Computing first order circuit response with discontinuities

Lecture 129 - First order RL circuits

Lecture 130 - First order RL circuit with discontinuous inductor current-Example

Lecture 131 - First order RC circuit with an exponential input

Lecture 132 - First order RC response to its own natural response

Lecture 133 - First order RC response to a sinusoidal input

Lecture 134 - First order RC response to a sinusoidal input-via the complex exponential

Lecture 135 - Summary: Linear circuit response to sinusoidal input via the complex exponential

Lecture 136 - Three methods of calculating the sinusoidal steady state response

Lecture 137 - Calculating the total response including initial conditions

Lecture 138 - Why are sinusoids used in measurement?

Lecture 139 - Second order system natural response

Lecture 140 - Second order system as a cascade of two first order systems

Lecture 141 - Second order system natural response-critically damped and underdamped

Lecture 142 - Generalized form of a second order system

Lecture 143 - Numerical example

Lecture 144 - Series and parallel RLC circuits

Lecture 145 - Forced response of a second order system

Lecture 146 - Steady state response calculation and Phasors

Lecture 147 - Phasors (Continued...)

Lecture 148 - Magnitude and Phase plots

Lecture 149 - Magnitude and phase plotes of a second order system

Lecture 150 - Maximum power transfer and Conjugate matching

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NPTEL : Advanced Logic Synthesis (Electronics and Communication Engineering)

Co-ordinators : Mr. Dhiraj Taneja

Lecture 1 - MOS Transistor

Lecture 2 - MOS Transistor - Detailed Study

Lecture 3 - Combinational Circuits and layout

Lecture 4 - Delay

Lecture 5 - Sequential Circuits

Lecture 6 - Logical Effort

Lecture 7 - Circuit Families

Lecture 8 - Lab-01

Lecture 9 - Lab-02

Lecture 10 - Lab-03

Lecture 11 - Lab-04

Lecture 12 - Introduction to Synthesis

Lecture 13 - Libraries

Lecture 14 - RTL Coding for Synthesis

Lecture 15 - Reading Design in DC

Lecture 16 - Design Environment

Lecture 17 - Design Constraints

Lecture 18 - Compile Flow and stratergies

Lecture 19 - Analysis and Reporting

Lecture 20 - Lab-05

Lecture 21 - Advanced Synthesis Techniques

Lecture 22 - Datapath Extraction Guidelines

Lecture 23 - Power - Methodology and Analysis

Lecture 24 - Lab-06

Lecture 25 - Lab-07

Lecture 26 - Lab-08

Lecture 27 - Lab-09

Lecture 28 - Static Timing Analysis - Concepts and Flow

Lecture 29 - Interconnects and Delay calculation

Lecture 30 - Clock and Exceptions

Lecture 31 - On Chip Variation

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Lecture 32 - Introduction to Crosstalk

Lecture 33 - Gaussian / Normal Distribution

Lecture 34 - Equivalence Checking / Formal Verification

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NPTEL : ARM Based Development (Electronics and Communication Engineering)

Co-ordinators : Mr. S. Chandramouleeswaran

Lecture 1 - Types of computer Architectures, ISA's and ARM History

Lecture 2 - Embedded System Software and Hardware, stack implementation in ARM, Endianness, condition codes

Lecture 3 - Processor core VS CPU core, ARM7TDMI Interface signals, Memory Interface, Bus Cycle types, Register set, Operational Modes

Lecture 4 - Instruction Format, ARM Core Data Flow Model, ARM 3 stage Pipeline, ARM family attribute comparision

Lecture 5 - ARM 5 stage Pipeline, Pipeline Hazards, Data forwarding - a hardware solution

Lecture 6 - ARM ISA and Processor Variants, Different Types of Instructions, ARM Instruction set, data processing instructions

Lecture 7 - Shift Operations, shift Operations using RS lower byte, Immediate value encoding

Lecture 8 - Dataprocessing Instructions

Lecture 9 - Addressing Mode-1, Addressing Mode-2

Lecture 10 - Addressing Mode-2, LDR/STR, Addressing mode-3 with examples

Lecture 11 - Instruction Timing, Addressing Mode-4 with Examples

Lecture 12 - Swap Instructions, Swap Register related Instructions, Loading Constants

Lecture 13 - Program Control Flow, Control Flow Instructions, B & BL instructions, BX instruction

Lecture 14 - Interrupts and Exceptions, Exception Handlers, Reset Handling

Lecture 15 - Aborts, software Interrupt Instruction, undefined instruction exception

Lecture 16 - Interrupt Latency, Multiply Instructions, Instruction set examples

Lecture 17 - Thumb state, Thumb Programmers model, Thumb Implementation, Thumb Applications

Lecture 18 - Thumb Instructions, Interrupt processing

Lecture 19 - Interrupt Handelling schemes, Examples of Interrupt Handlers

Lecture 20 - Coprocessors

Lecture 21 - Coprocessor Instructions, data Processing Instruction, data transfers, register transfers

Lecture 22 - Number representations, floating point representation

Lecture 23 - Flynn's Taxonomy, SIMD and Vector Processors, Vector Floating Point Processor (VFP), VFP and ARM interactions, An example vector operation

Lecture 24 - Memory Technologies, Need for memory Hierarchy, Hierarchical Memory Organization, Virtual Memory

Lecture 25 - Cache Memory, Mapping Functions

Lecture 26 - Cache Design, Unified or split cache, multiple level of caches, ARM cache features, coprocessor 15 for system control

Lecture 27 - Processes, Memory Map, Protected Systems, ARM systems with MPU, memory Protection Unit (MPU)

Lecture 28 - Physical Vs Virtual Memory, Paging, Segmentation

Lecture 29 - MMU Advantage, virtual memory translation, Multitasking with MMU, MMU organization, Tightly coupled Memory (TCM)

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Lecture 30 - ARM Development Environment, Arm Procedure Call Standard (APCS),

Lecture 31 - Example C program

Lecture 32 - Embedded software Development, Image structure, linker inputs and outputs, memory map, application startup

Lecture 33 - AMBA Overview, Typical AMAB Based Microcontroller, AHB bus features, AHB Bus transfers, APB bus transfers, APB bridge

Lecture 34 - DMA, Peripherals, Programming Peripherals in ARM

Lecture 35 - DMA:Direct Memory Access

Lecture 36 - Protocols (I2c, SPI), UART, GPIO

Lecture 37 - ARM ISAs, ARMv5, ARMv6, ARM v7, big.little technology, ARMv8

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NPTEL : Embedded Software Testing (Electronics and Communication Engineering)

Co-ordinators : Mr. Madhukeshwara H.M

Lecture 1 - Embedded Systems Basics Session 1

Lecture 2 - Embedded Systems Basics Session 1 (Continued...)

Lecture 3 - Prerequistics for Embedded Systems Testing

Lecture 4 - Test Case Designa and procedures

Lecture 5 - Test Standards

Lecture 6 - Depicting Levels of Testing

Lecture 7 - Depicting Levels of Testing (Continued...)

Lecture 8 - Software Life Cycle

Lecture 9 - Embedded V-Model Life Cycle

Lecture 10 - Embedded V-Model Life Cycle (Continued...)

Lecture 11 - Master Test Planning

Lecture 12 - Dynamic Testing

Lecture 13 - Black Box Testing

Lecture 14 - Black Box Testing (Continued...)

Lecture 15 - Black Box Testing (Continued...)

Lecture 16 - Black Box Testing (Continued...)

Lecture 17 - Model based Design Introduction

Lecture 18 - Dynamic Testing

Lecture 19 - Dynamic Testing (Continued...)

Lecture 20 - White Box Testing

Lecture 21 - White Box Testing (Continued...)

Lecture 22 - Grey-box testing

Lecture 23 - Static Testing

Lecture 24 - Static Analysis

Lecture 25 - Static Analysis (Continued...)

Lecture 26 - Static Analysis (Continued...)

Lecture 27 - Test Metrics

Lecture 28 - Software Testing Metrics

Lecture 29 - Integration Test Strategy

Lecture 30 - Integration Tests Environment

Lecture 31 - Use Case Diagram

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Lecture 32 - Depicting Levels of Testing (Continued...)

Lecture 33 - Configure Management Elements

Lecture 34 - SCM Activities

Lecture 35 - Test Management Tool

Lecture 36 - SCM Activities (Continued...)

Lecture 37 - Overview Lecture 1

Lecture 38 - Unit Testing

Lecture 39 - Unit Testing (Continued...)

Lecture 40 - Understading C++

Lecture 41 - Unit Testing (Continued...)

Lecture 42 - Level Testing

Lecture 43 - Identify Test Cases

Lecture 44 - Test Link Work Flow

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NPTEL : Linux Programming and Scripting (Electronics and Communication Engineering)

Co-ordinators : Mr. Anand Iyer

Lecture 1 - Linux Basics - I

Lecture 2 - Linux Basics - II

Lecture 3 - Linux Basics - III

Lecture 4 - Linux Basics - IV

Lecture 5 - Linux Networking - I

Lecture 6 - Linux Networking - II

Lecture 7 - File Transfer Protocol

Lecture 8 - Domain Name System

Lecture 9 - DNS (Continued...)

Lecture 10 - DFS

Lecture 11 - AFS and NIS

Lecture 12 - PERL 1

Lecture 13 - PERL 2

Lecture 14 - PERL 3

Lecture 15 - PERL 4

Lecture 16 - PERL 5

Lecture 17 - PERL 6

Lecture 18 - PERL 7

Lecture 19 - PERL 8

Lecture 20 - PERL 9

Lecture 21 - Using sort

Lecture 22 - PERL 10

Lecture 23 - Programming Using Tcl/Tk - I

Lecture 24 - Programming Using Tcl/Tk - II

Lecture 25 - Programming Using Tcl/Tk - III

Lecture 26 - More about Procedures

Lecture 27 - TCP, Ports and Sockets

Lecture 28 - I/O and Processes

Lecture 29 - Bindings

Lecture 30 - Programming Using Tcl/Tk - IV

Lecture 31 - Furniture Arranger

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Lecture 32 - Bindtags

Lecture 33 - Tcl in Synopsys Tools

Lecture 34 - Python Programming

Lecture 35 - Scope

Lecture 36 - Iteration

Lecture 37 - More about Regexps

Lecture 38 - Advanced Functions

Lecture 39 - Exception Handling

Lecture 40 - Examples of file Parsing

Lecture 41 - Program on If Statement

Lecture 42 - Program on Lists

Lecture 43 - Makefiles

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NPTEL : NOC:Digital Circuits and Systems (Electronics and Communication Engineering)

Co-ordinators : Prof. Shankar Balachandran

Lecture 1 - Introduction

Lecture 2 - Basic Boolean Logic

Lecture 3 - Boolean Theorems

Lecture 4 - Definitions, SoP and Pos

Lecture 5 - Algebraic Minimization Examples

Lecture 6 - Introduction to Verilog

Lecture 7 - Universality, Rearranging Truth Tables

Lecture 8 - Karnaugh Maps

Lecture 9 - K-Map Minimization

Lecture 10 - K-Map with Don't cares

Lecture 11 - Multiple Output Functions

Lecture 12 - Number Systems

Lecture 13 - Encoders and Decoders

Lecture 14 - Multiplexers

Lecture 15 - Multiplexer based Circuit Design

Lecture 16 - Verilog

Lecture 17 - Compiling and Running Verilog - A Demonstration

Lecture 18 - Sequential Elements

Lecture 19 - Gated Latches

Lecture 20 - Flipflops

Lecture 21 - Verilog - Assign Statement and Instantiation

Lecture 22 - Sequential Circuits

Lecture 23 - CMOS+Electrical Properties

Lecture 24 - Delays

Lecture 25 - Sequential Element Delays

Lecture 26 - More Sequential Circuits

Lecture 27 - Introduction to State Machines

Lecture 28 - Always Statement in Verilog

Lecture 29 - Sequential Logic Synthesis

Lecture 30 - FSM Design Problems

Lecture 31 - State Minimization

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Lecture 32 - State Assignment

Lecture 33 - Timing Sequential Circuits

Lecture 34 - Verilog Styles + Sequential Elements

Lecture 35 - GCD Algorithm

Lecture 36 - GCD Machines Datapath

Lecture 37 - GCD State Machine

Lecture 38 - GCD Top Level Module

Lecture 39 - Datapath in Verilog

Lecture 40 - Datapath Elements in Verilog

Lecture 41 - FSM in Verilog

Lecture 42 - Putting it all together

Lecture 43 - Pipelining

Lecture 44 - K-stage Pipeline

Lecture 45 - Interleaving and Parallelism

Lecture 46 - Blocking and Non-blocking Statements

Lecture 47 - Modeling Circuits with Pipelining

Lecture 48 - Signed Number Representation

Lecture 49 - Signed Number Addition

Lecture 50 - Adder/Subtracter

Lecture 51 - Fast Adders

Lecture 52 - Multiplication

Lecture 53 - Closing

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NPTEL : NOC:Networks and Systems (Electronics and Communication Engineering)

Co-ordinators : Prof. V.G.K. Murti, Mr. C. S. Ramalingam, Dr. Andrew Thangaraj

Lecture 1 - Functions in circuits - constant and sinusoidal functions

Lecture 2 - Functions in circuits - Exponential function

Lecture 3 - Complex numbers and other topics

Lecture 4 - Systems, Signals, Networks

Lecture 5 - Representation and Classification of Systems

Lecture 6 - Linear systems

Lecture 7 - Time-invariance and causality

Lecture 8 - Signals, Elementary continuous signals

Lecture 9 - Complex frequencies of signals

Lecture 10 - Discontinuous signals - step, ramp

Lecture 11 - Unit impulse or delta function

Lecture 12 - Basic discrete-time signals

Lecture 13 - Examples of Signals

Lecture 14 - Introduction to Systems, Complementary Functions, Initial Conditions

Lecture 15 - Special initial conditions

Lecture 16 - Characterization of a linear system

Lecture 17 - Impulse Response

Lecture 18 - Evaluating the Convolution Integral

Lecture 19 - Worked-out Problems

Lecture 20 - Introduction and Motivation

Lecture 21 - Evaluating Fourier series coefficients

Lecture 22 - Symmetry conditions

Lecture 23 - Symmetry Condition Examples

Lecture 24 - Application to Network Analysis

Lecture 25 - Exponential Fourier Series

Lecture 26 - Frequency Spectrum

Lecture 27 - Examples

Lecture 28 - Signal Power and Related Ideas

Lecture 29 - Convergence of Fourier Series

Lecture 30 - Week 1 Solutions

Lecture 31 - Hints for Assignment 2

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Lecture 32 - Hints for Assignment 3

Lecture 33 - Additional Properties of Fourier Series

Lecture 34 - Exercises on Fourier Series

Lecture 35 - Lab Demo

Lecture 36 - From Fourier Series to Fourier Transform

Lecture 37 - Continuous Time Fourier Transform

Lecture 38 - Fourier Transform Examples

Lecture 39 - Examples and Some Properties of Fourier Transform

Lecture 40 - Properties of Fourier Transform (contd.)

Lecture 41 - More Fourier Transform Properties

Lecture 42 - Energy Considerations

Lecture 43 - Energy Considerations II

Lecture 44 - Helpful Relationships for Inverse Fourier Transform

Lecture 45 - Fourier transform of signals that are not absolutely integrable

Lecture 46 - Fourier Transform of Periodic Signals, Unit Step and Signum Function

Lecture 47 - Truncated Sine wave and Convolution properties

Lecture 48 - Integration in Time domain

Lecture 49 - Application of continuous-time Fourier transform to system analysis

Lecture 50 - Comments about transient analysis

Lecture 51 - Sampling Theorem and Exercises on Fourier Transforms

Lecture 52 - Introduction to Laplace Transform

Lecture 53 - Laplace transforms of important functions

Lecture 54 - Recap, Poles / Zeros and Laplace Transform Notation

Lecture 55 - Properties: Linearity, differentiation in the time domain

Lecture 56 - Application and properties of Laplace transform

Lecture 57 - More properties of Laplace transform: Shift in frequency domain

Lecture 58 - More properties of Laplace transform

Lecture 59 - Properties: Division by `t, Initial value theorem, Final value theorem

Lecture 60 - Properties: Convolution in time domain

Lecture 61 - Complex convolution and periodic functions

Lecture 62 - Examples of Laplace transform

Lecture 63 - Laplace transform examples

Lecture 64 - Inverse Laplace transform

Lecture 65 - Partial fractions: general case

Lecture 66 - Inverse Laplace Transform and Contour Integration

Lecture 67 - Relating Fourier and Laplace Transform

Lecture 68 - Exercises

Lecture 69 - Applications of Laplace transform to network transients

Lecture 70 - Laplace transform for resistor and system analysis

Lecture 71 - Laplace transform method for mutual inductance

Lecture 72 - Mutual Inductance Continued

Lecture 73 - Examples and Advantages of L-transform

Lecture 74 - General LTI systems and more about H(s)

Lecture 75 - Many facets of the system function (contd)

Lecture 76 - Frequency response and stability

Lecture 77 - Full circuit example

Lecture 78 - Exercises

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NPTEL : NOC:Circuit Analysis for Analog Designers (Electronics and Communication Engineering)

Co-ordinators : Prof. Shanthi Pavan

Lecture 1 - Course Introduction and Motivation

Lecture 2 - Kirchoff's Current and Voltage Laws, and the Incidence Matrix

Lecture 3 - Power Conservation and Tellegen's Theorem

Lecture 4 - Intuition behind Tellegen's Theorem

Lecture 5 - Tellegen's Theorem and reciprocity in linear resistive networks

Lecture 6 - Why is reciprocity useful in practice?

Lecture 7 - Inter-reciprocity in linear time-invariant networks

Lecture 8 - Inter-reciprocity in linear time-invariant networks (Continued...)

Lecture 9 - Inter-reciprocity in networks with ideal operational amplifiers

Lecture 10 - Review of Modified Nodal Analysis (MNA) of linear networks

Lecture 11 - MNA stamps of controlled sources - the VCCS and VCVS

Lecture 12 - MNA stamps of controlled sources - the CCCS and CCVS

Lecture 13 - Inter-reciprocity in linear networks - using the MNA stamp approach

Lecture 14 - The Adjoint Network

Lecture 15 - MNA stamp of an ideal opamp

Lecture 16 - Properties of circuits with multiple ideal opamps

Lecture 17 - Introduction to Analog Active Filters

Lecture 18 - Magnitude approximation principles

Lecture 19 - The maximally flat (Butterworth) approximation

Lecture 20 - The Butterworth Approximation (Continued...)

Lecture 21 - Connection between magnitude response and pole locations in an all-pole filter

Lecture 22 - Cascade-of-biquads, realization of stray-insensitive first-order section

Lecture 23 - Opamp-RC biquadratic sections

Lecture 24 - Active-RC biquads and Impedance scaling

Lecture 25 - Opamp-RC biquadratic sections (Continued...)

Lecture 26 - High-order filters using cascade of biquads, Dynamic range scaling in opamp-RC filters

Lecture 27 - The finite gain-bandwidth model of nonideal opamps

Lecture 28 - Effect of finite opamp bandwidth on an active-RC integrator

Lecture 29 - Effect of finite opamp bandwidth on an active-RC biquad

Lecture 30 - Visualization and mitigation of the effect of Q-enhancement

Lecture 31 - Transconductance-Capacitance integrators

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Lecture 32 - Introduction to noise in electrical networks

Lecture 33 - Noise processed by a linear time-invariant system

Lecture 34 - kT/C noise in a sample-and-hold circuit

Lecture 35 - Noise in RLC networks

Lecture 36 - Total integrated noise in RLC Networks

Lecture 37 - Bode's Noise Theorem - Frequency domain

Lecture 38 - Input referred noise in electrical networks - Part 1

Lecture 39 - Input referred noise in electrical networks - Part 2

Lecture 40 - Input referred noise and the noise factor

Lecture 41 - Noise Factor Examples

Lecture 42 - Introduction to distributed networks, the ideal transmission line

Lecture 43 - Solving the wave equation in an ideal transmission line

Lecture 44 - Transmisson line circuit analysis : The short circuited and open circuited line

Lecture 45 - Transmission line circuit analysis, the reflection coefficient, open and short-circuited lines

Lecture 46 - Transmission line driven by a source, power in a transmission line

Lecture 47 - The Smith chart

Lecture 48 - The need for scattering parameters

Lecture 49 - Scattering Parameters: Introduction

Lecture 50 - Example scattering matrix calculations

Lecture 51 - Scattering matrices properties

Lecture 52 - Measuring the S-parameters of a one-port

Lecture 53 - The one-port vector network analyzer

Lecture 54 - The two-port vector network analyzer

Lecture 55 - Weak nonlinearity in electronic circuits, second-order harmonic distortion, HD2 and IM2

Lecture 56 - Weak nonlinearity in electronic circuits, second-order intermodulation distortion

Lecture 57 - Gain compression and third-order harmonic distortion

Lecture 58 - Third-order intermodulation distortion

Lecture 59 - Weak nonlinearities in circuits: Intuition behind the method of current injection

Lecture 60 - Weak nonlinearities in circuits: Calculating nonlinear components

Lecture 61 - Current-injection analysis of distortion in a negative feedback system

Lecture 62 - Current-injection analysis of distortion in a negative feedback system (Continued...)

Lecture 63 - Course summary and recap

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NPTEL : NOC:Design and Analysis of VLSI Subsystems (Electronics and Communication Engineering)

Co-ordinators : Prof. Madhav Rao

Lecture 1 - Understanding Silicon

Lecture 2 - Introduction to NMOS

Lecture 3 - NMOS Transistor Working

Lecture 4 - PMOS Transistor

Lecture 5 - MOS Capacitances

Lecture 6 - Non Ideal MOS model

Lecture 7 - Short channel current model

Lecture 8 - Short channel current model analysis

Lecture 9 - Channel Length modulation index

Lecture 10 - DC characteristics of Inverter

Lecture 11 - Transfer characteristics of Inverter

Lecture 12 - Skewed Inverter

Lecture 13 - Skewed Inverter and threshold voltage

Lecture 14 - Equivalent of transistors in series

Lecture 15 - Transmission Gate

Lecture 16 - Bad CMOS Buffer - Part 1

Lecture 17 - Bad CMOS Buffer - Part 2

Lecture 18 - Noise margin characteristics of inverter

Lecture 19 - Noise margin parameters

Lecture 20 - Introduction to Delay in CMOS

Lecture 21 - Transient analysis of CMOS Inverter

Lecture 22 - RC approximated delay

Lecture 23 - Switching Resistance

Lecture 24 - CMOS Inverter approximated to RC Circuit

Lecture 25 - Elmore delay

Lecture 26 - Delay of FO4 inverter

Lecture 27 - Extracting capacitances of 3-Nand gate for delay estimation

Lecture 28 - Characterizing Delay of NOR gate

Lecture 29 - Linear Delay model

Lecture 30 - Logical effort and Parasitic delay

Lecture 31 - Logical effort and Parasitic delay for different gates

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Lecture 32 - Logical effort for short-channel current model

Lecture 33 - Ring Oscillator design

Lecture 34 - Optimizing Gate Size

Lecture 35 - Optimizing Gate Sizes Example

Lecture 36 - Optimizing the Stages for an inverter path

Lecture 37 - Optimizing the Stages for a General Circuit

Lecture 38 - Decoder Design

Lecture 39 - Introduction to Combinational Circuit and assymetric gates

Lecture 40 - Assymetric Gates analysis

Lecture 41 - Assymetric Gates analysis using short-channel current model

Lecture 42 - Introduction to Skewed gates

Lecture 43 - Skewed gates and best P/N ratio

Lecture 44 - vIntroduction to Pseudo NMOS

Lecture 45 - Psudeo NMOS gates

Lecture 46 - Other Logic Family

Lecture 47 - Dynamic Logic and Domino logic

Lecture 48 - Domino gates

Lecture 49 - Introduction to Stick Diagram

Lecture 50 - Stick Diagram for different gates

Lecture 51 - Applying Eulers path for stick diagram representations

Lecture 52 - Multiplexer design and layout

Lecture 53 - Introduction to Interconnects

Lecture 54 - Interconnects - RC delay, and Energy

Lecture 55 - Introduction to crosstalks in interconnects

Lecture 56 - Transient analysis in Crosstalk

Lecture 57 - Introduction to Repeaters in Interconnect Engineering

Lecture 58 - Repeater Design

Lecture 59 - Energy and delay analysis for interconnectwith repeaters

Lecture 60

Lecture 61 - Introduction to Power

Lecture 62 - Switching Power and Energy Estimation

Lecture 63 - Activity factor and estimating dynamic power for a combinational circuit design

Lecture 64 - Analyzing Dynamic Power

Lecture 65 - Energy estimation through driving factor

Lecture 66 - Energy expression in terms of delay

Lecture 67 - Voltage Scaling

Lecture 68 - DVFS

Lecture 69 - Introduction to subthreshold leakage current model

Lecture 70 - Subthreshold leakage current and Gate leakage current

Lecture 71 - Estimating Static Power

Lecture 72 - Introduction to CMOS Latch design

Lecture 73 - CMOS Latch Design

Lecture 74 - CMOS Latch and flipflop design

Lecture 75 - Static Timing Analysis

Lecture 76 - Static Timing Analysis (Continued...)

Lecture 77 - Static Timing Analysis - Part 2

Lecture 78 - Static Timing Analysis - Part 2.1

Lecture 79 - Static Timing Analysis - Part 3

Lecture 80 - TPDQ and TPCQ

Lecture 81 - Static Timing Analysis - Part 4

Lecture 82 - Static Timing Analysis - Part 5

Lecture 83 - Static Timing Analysis - Part 6

Lecture 84 - SET and CLEAR enabled Latch and Flipflop Design

Lecture 85 - 1-bit Adder design

Lecture 86 - Adder-Part2

Lecture 87 - PG architecture - Part 1

Lecture 88 - PG architecture - Part 2

Lecture 89 - Carry Skip Adder

Lecture 90 - Carry Look Ahead and Carry Increment Adder

Lecture 91 - Other Adder Subsystems

Lecture 92 - Approximate Multipliers - Part 1

Lecture 93 - Approximate Multipliers - Part 2

Lecture 94 - Approximate Adder

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NPTEL : NOC:Nonlinear Dynamical Systems and Control (Electronics and Communication Engineering)

Co-ordinators : Prof. Sanjay Bhat, Prof. Vijaysekhar Chellaboina

Lecture 1 - Introduction - Part 1

Lecture 2 - Introduction - Part 2

Lecture 3 - Ordinary Differential Equations - Part 1

Lecture 4 - Ordinary Differential Equations - Part 2

Lecture 5 - ODE Solutions via Examples

Lecture 6 - Solutions to ODEs

Lecture 7 - Existence and Uniqueness Theorems

Lecture 8 - Asymptotic Behaviour of Dynamical Systems - Part 1

Lecture 9 - Asymptotic Behaviour of Dynamical Systems - Part 2

Lecture 10 - Asymptotic Behaviour of Dynamical Systems - Part 3

Lecture 11 - Stability Theory: Definitions - Part 1

Lecture 12 - Stability Theory: Definitions - Part 2

Lecture 13 - Stability Theory: Lyapunov Methods - Part 1

Lecture 14 - Stability Theory: Lyapunov Methods - Part 2

Lecture 15 - Lyapunov Function Examples

Lecture 16 - LaSalle's Invariance Theorem

Lecture 17 - Stability Theory: Converse Lyapunov and Instability Theorems

Lecture 18 - Solved Problems - Part 1

Lecture 19 - Solved Problems - Part 2

Lecture 20 - Linear Systems - Part 1

Lecture 21 - Linear Systems - Part 2

Lecture 22 - Linearization of Nonlinear Systems

Lecture 23 - Linear Systems and Linearization: Solved Problems - Part 1

Lecture 24 - Linear Systems and Linearization: Solved Problems - Part 2

Lecture 25 - Nonlinear Analysis: Key Concepts and Results - Part 1

Lecture 26 - Nonlinear Analysis: Key Concepts and Results - Part 2

Lecture 27 - Construction of Lyapunov Functions - Part 1

Lecture 28 - Construction of Lyapunov Functions - Part 2

Lecture 29 - Futher Topics - Part 1

Lecture 30 - Futher Topics - Part 2

Lecture 31 - Introduction to Robust Stability

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Lecture 32 - Robust Stability for Structured Uncertainty - Part 1

Lecture 33 - Robust Stability for Structured Uncertainty - Part 2

Lecture 34 - Robust Stability for Structured Uncertainty - Part 3

Lecture 35 - The Absolute Stability (Lure) Problem

Lecture 36 - Robust Stability: A Solved Problem

Lecture 37 - Dissipativity Theory - Part 1

Lecture 38 - Dissipativity Theory - Part 2

Lecture 39 - Dissipativity: Solved Problems

Lecture 40 - Feedback Interconnection of Dissipative Systems - Part 1

Lecture 41 - Feedback Interconnection of Dissipative Systems - Part 2

Lecture 42 - Stable Adaptive Control - Part 1

Lecture 43 - Stable Adaptive Control - Part 2

Lecture 44 - Examples and Generalizations - Part 1

Lecture 45 - Examples and Generalizations - Part 2

Lecture 46 - Optimization - Part 1

Lecture 47 - Optimization - Part 2

Lecture 48 - Functional Optimization - Part 1

Lecture 49 - Functional Optimization - Part 2

Lecture 50 - Optimal Control - Part 1

Lecture 51 - Optimal Control - Part 2

Lecture 52 - Optimal Control - Part 3

Lecture 53 - Stability Margins of Feedback Controllers

Lecture 54 - Control Lyapunov Functions

Lecture 55 - Disturbance Rejection - Part 1

Lecture 56 - Disturbance Rejection - Part 2

Lecture 57 - Revisition through Solved Problems - I

Lecture 58 - Revisition through Solved Problems - I (Continued...)

Lecture 59 - Revision through Solved Problems II

Lecture 60 - Revision through Solved Problems III - Part 1

Lecture 61 - Revision through Solved Problems III - Part 2

Lecture 62 - Assorted Topics: Highlights - Part 1

Lecture 63 - Assorted Topics: Highlights - Part 2

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NPTEL : NOC:Digital Protection of Power System (Electronics and Communication Engineering)

Co-ordinators : Prof. Bhaveshkumar R. Bhalja

Lecture 1 - Introduction to Digital Relays - I

Lecture 2 - Introduction to Digital Relays - II

Lecture 3 - Components of Digital Relays

Lecture 4 - Fundamentals of Digital Relays

Lecture 5 - Phasor Estimation Algorithm - I

Lecture 6 - Phasor Estimation Algorithm - II

Lecture 7 - Phasor Estimation Algorithm - III

Lecture 8 - Phasor Estimation Algorithm - IV

Lecture 9 - Phasor Estimation Algorithm - V

Lecture 10 - Frequency Estimation Algorithm

Lecture 11 - Digital Protection of Transformer - I

Lecture 12 - Digital Protection of Transformer - II

Lecture 13 - Digital Protection of Transformer - III

Lecture 14 - Digital Protection of Transformer - IV

Lecture 15 - Digital Protection of Transformer - V

Lecture 16 - Digital Protection of Induction Motors - I

Lecture 17 - Digital Protection of Induction Motors - II

Lecture 18 - Digital Protection of Induction Motors - III

Lecture 19 - Digital Protection of Generators - I

Lecture 20 - Digital Protection OF Generators - II

Lecture 21 - Coordination of Overcurrent Relays for Distribution Network - I

Lecture 22 - Coordination of Overcurrent Relays for Distribution Network - II

Lecture 23 - Coordination of Overcurrent Relays for Distribution Network - III

Lecture 24 - Coordination of Overcurrent Relays for Distribution Network - IV

Lecture 25 - Coordination of Overcurrent Relays for Distribution Network - V

Lecture 26 - Coordination of Overcurrent Relays for Distribution Network - VI

Lecture 27 - Load Shedding and Frequency Relaying - I

Lecture 28 - Load Shedding and Frequency Relaying - II

Lecture 29 - Islanding Detection

Lecture 30 - Digital Distance Relaying Scheme for transmission Line - I

Lecture 31 - Digital Distance Relaying Scheme for transmission Line - II

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Lecture 32 - Introduction to Phasor Measurement Unit - I

Lecture 33 - Introduction to Phasor Measurement Unit - II

Lecture 34 - Introduction to Phasor Measurement Unit - III

Lecture 35 - Introduction to IEC 61850 - I

Lecture 36 - Introduction to IEC 61850 - II

Lecture 37 - Application of Big-Data Analytics in Power System Protection

Lecture 38 - Cyber Security Issues in Power System Network

Lecture 39 - Protection of Hybride AC/DC Microgrid: Issues and Challenges

Lecture 40 - Application of AI-Based Techniques in Digital Protection

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NPTEL : NOC:Physics of Nanoscale Devices (Electronics and Communication Engineering)

Co-ordinators : Prof. Vishvendra Singh Poonia

Lecture 1 - Introduction

Lecture 2 - Introduction and Course Overview

Lecture 3 - Basics of Quantum Mechanics

Lecture 4 - Electron in a Potential Well

Lecture 5 - Electrons in Solids

Lecture 6 - KP Model

Lecture 7 - KP Model, Effective Mass

Lecture 8 - Bands, Effective Mass, DOS

Lecture 9 - Effective Mass, DOS

Lecture 10 - Density of States

Lecture 11 - Density of States

Lecture 12 - Density of States - 3D, 2D

Lecture 13 - Density of States - 2D, 1D, 0D

Lecture 14 - DOS, Fermi Function

Lecture 15 - Fermi- Dirac Distribution

Lecture 16 - Fermi Function, General Model of Transport

Lecture 17 - General Model of Transport - I

Lecture 18 - General Model of Transport - II

Lecture 19 - General Model of Transport - III

Lecture 20 - General Model of Transport, Modes

Lecture 21 - Modes - I

Lecture 22 - Modes - II

Lecture 23 - Modes, Diffusive Transport

Lecture 24 - Diffusive Transport

Lecture 25 - Diffusive Transport, Conductance

Lecture 26 - Conductance, Bulk Transport - I

Lecture 27 - Conductance, Bulk Transport - II

Lecture 28 - Resistance: Ballistic and Diffusive Cases - I

Lecture 29 - Resistance: Ballistic and Diffusive Cases - II

Lecture 30 - Resistance: Ballistic and Diffusive Cases - III

Lecture 31 - Resistance: Diffusive Case

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Lecture 32 - The Idea of Mobility

Lecture 33 - Voltage Drop in Ballistic Conductor

Lecture 34 - 1D and 2D Realistic Conductors

Lecture 35 - Introduction to MOSFET - I

Lecture 36 - Introduction to MOSFET - II

Lecture 37 - MOSFET: A Barrier Controlled Device

Lecture 38 - MOSFET Electrical Characteristics

Lecture 39 - MOSFET IV Characteristics - I

Lecture 40 - MOSFET IV Characteristics - II

Lecture 41 - MOSFET IV Characteristics - III

Lecture 42 - MOSFET IV Characteristics - Traditional Approach

Lecture 43 - MOSFET: Transport - I

Lecture 44 - MOSFET: Transport - II

Lecture 45 - MOSFET: Landauer Transport

Lecture 46 - Landauer Transport and Ballistic MOSFET

Lecture 47 - Ballistic MOSFET

Lecture 48 - Ballistic Injection Velocity

Lecture 49 - Velocity Saturation in Ballistic MOSFET and Electrostatics

Lecture 50 - MOS Electrostatics

Lecture 51 - MOS Electrostatics

Lecture 52 - MOSFET: Electrostatics, Threshold Voltage

Lecture 53 - MOSFET: 2D Electrostatics

Lecture 54 - MOSFET: 2D Electrostatics and Quantum Confinement

Lecture 55 - ETSOI MOSFETs, Quantum Confinement, Strain Engineering

Lecture 56 - Strain Engineering, Thermoelectric Effects

Lecture 57 - Thermoelectric Effects

Lecture 58 - Thermoelectric Effects, Quantum Dot Devices

Lecture 59 - Quantum Dot Devices

Lecture 60 - Quantum Dot Devices - IV Characteristics, DFT, Course Summary

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NPTEL : NOC:Low Voltage CMOS Circuit Operation (Electronics and Communication Engineering)

Co-ordinators : Prof. Anand Bulusu

Lecture 1 - Introduction and Motivation

Lecture 2 - Review of MOSFET operation - I

Lecture 3 - Review of MOSFET operation - II

Lecture 4 - Basic charge model - I

Lecture 5 - Basic charge model - II

Lecture 6 - Basic charge model - III

Lecture 7 - Basic charge model - IV

Lecture 8 - Basic charge model - V

Lecture 9 - Basic charge model - VI

Lecture 10 - Basic charge model - VII

Lecture 11 - Basic charge model - VIII

Lecture 12 - Basic charge model - IX

Lecture 13 - Basic charge model - X

Lecture 14 - Minimum energy point - I

Lecture 15 - Minimum energy point - II

Lecture 16 - Minimum energy point - III

Lecture 17 - Transistor sizing for combinational circuit - I

Lecture 18 - Transistor sizing for combinational circuit - II

Lecture 19 - Transistor sizing for asymmetric combinational circuits

Lecture 20 - Charging and discharging mechanism in NTV combinational gates

Lecture 21 - Effective current for NTV inverter

Lecture 22 - Effective current for NTV combinational gates - I

Lecture 23 - Effective current for NTV combinational gates - II

Lecture 24 - Effective current for NTV combinational gates - III

Lecture 25 - Combinational circuit design considering variations - I

Lecture 26 - Combinational circuit design considering variations - II

Lecture 27 - Buffer design considering INWE

Lecture 28 - Decoder design considering INWE

Lecture 29 - Flip-flop operation

Lecture 30 - Warning flip-flops design and operation

Lecture 31 - Single phase flip-flops design and operation

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Lecture 32 - Consideration of radiation effects in NTV

Lecture 33 - Radiation-hardened NTV sequential circuit elements

Lecture 34 - Level shifters for multi-Vdd domains

Lecture 35 - Introduction to 6T SRAM

Lecture 36 - Stability and Reliability Issues in 6T SRAM

Lecture 37 - Read and Write-Assist Circuits in 6T SRAM

Lecture 38 - Physical Insights into Channel Charge Distribution

Lecture 39 - FinFET based Standard Cell Design

Lecture 40 - Example problems

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NPTEL : Circuits for Analog System Design (Electronics and Communication Engineering)

Co-ordinators : Prof. M.K. Gunasekaran

Lecture 1 - Transistor Amplifier

Lecture 2 - Transistor Op-amp and Transistor Based Voltage Regulator

Lecture 3 - Some applications of transistor - I

Lecture 4 - Some applications of transistor - II

Lecture 5 - Transformer design & Heat sink design

Lecture 6 - Op-amp Based Linear Voltage Regulator

Lecture 7 - Short circuit protection for linear power supply

Lecture 8 - Temperature indicator design using Op-amp

Lecture 9 - On & off Temperature controller design

Lecture 10 - Proportional Temperature Controller Design

Lecture 11 - PID - Temperature Controller Design

Lecture 12 - Heater Drive for Various Temperature Controllers

Lecture 13 - Short Circuit Protection of Power MOSFET

Lecture 14 - Error budgeting for temperature Indicator

Lecture 15 - PID Temperature Controllers with Error Budgeting

Lecture 16 - Error Budgeting for Constant Current Sources

Lecture 17 - Error Budgeting for Thermo Couple Amplifier

Lecture 18 - Error Budgeting for Op amp Circuits

Lecture 19 - Gain Error Calculation in Op amp Circuits

Lecture 20 - Input Resistance Calculations for Op amp

Lecture 21 - Output Resistance Calculations for Op amp

Lecture 22 - Error Budgeting for Different Circuits

Lecture 23 - 4-20 mA current Transmitter design

Lecture 24 - Error budgeting for 4-20mA Current Transmitters

Lecture 25 - LVDT Based Current Transmitters

Lecture 26 - Constant Current Source Design

Lecture 27 - 4-20 MA Based Temperature Transmitter

Lecture 28 - 3-Wire Current Transmitter

Lecture 29 - Various Resistance Measurement Techniques

Lecture 30 - Ratio Transformer Technique to Measure Resistance and capacitance

Lecture 31 - Capacitive Sensor Circuit Design Examples

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Lecture 32 - Capacitive Sensor Circuit With High Impedance Amplifier

Lecture 33 - AC- applications of the Op-Amp and Lock in Amplifier Design

Lecture 34 - Design of lock in Amplifier Circuit with example

Lecture 35 - Dual Slopes ADC â€“ Design Examples

Lecture 36 - Dual Slope ADC and Successor approximation ADC

Lecture 37 - MC based ADC

Lecture 38 - Digital to analog Converter design and working, Flash ADC

Lecture 39 - Flash ADC and ADC Converter errors

Lecture 40 - Sigma delta ADC working Principle

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NPTEL : Digital System design with PLDs and FPGAs (Electronics and Communication Engineering)

Co-ordinators : Prof. Kuruvilla Varghese

Lecture 1 - Course Contents, Objective

Lecture 2 - Revision of Prerequisite

Lecture 3 - Design of Synchronous Sequential Circuits

Lecture 4 - Analysis of Synchronous Sequential Circuits

Lecture 5 - Top-down Design

Lecture 6 - Controller Design

Lecture 7 - Control algorithm and State diagram

Lecture 8 - Case study 1

Lecture 9 - FSM issues 1

Lecture 10 - FSM Issues 2

Lecture 11 - FSM Issues 3

Lecture 12 - FSM Issues 4

Lecture 13 - FSM Issues 5

Lecture 14 - Synchronization 1

Lecture 15 - Synchronization 2

Lecture 16 - Case study 2

Lecture 17 - Case study on FPGA Board

Lecture 18 - Entity, Architecture and Operators

Lecture 19 - Concurrency, Data flow and Behavioural models

Lecture 20 - Structural Model, Simulation

Lecture 21 - Simulating Concurrency

Lecture 22 - Classes and Data types

Lecture 23 - Concurrent statements and Sequential statements

Lecture 24 - Sequential statements and Loops

Lecture 25 - Modelling flip-flops, Registers

Lecture 26 - Synthesis of Sequential circuits

Lecture 27 - Libraries and Packages

Lecture 28 - Operators, Delay modelling

Lecture 29 - Delay modelling

Lecture 30 - VHDL Examples

Lecture 31 - VHDL coding of FSM

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Lecture 32 - VHDL Test bench

Lecture 33 - VHDL Examples, FSM Clock

Lecture 34 - Evolution of PLDs

Lecture 35 - Simple PLDs

Lecture 36 - Simple PLDs: Fitting

Lecture 37 - Complex PLDs

Lecture 38 - FPGA Introduction

Lecture 39 - FPGA Interconnection, Design Methodology

Lecture 40 - Xilinx Virtex FPGAâ€™s CLB

Lecture 41 - Xilinx Virtex Resource Mapping, IO Block

Lecture 42 - Xilinx Virtex Clock Tree

Lecture 43 - FPGA Configuration

Lecture 44 - Altera and Actel FPGAs

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NPTEL : Error Correcting Codes (Electronics and Communication Engineering)

Co-ordinators : Prof. P. Vijay Kumar

Lecture 1 - Course Overview & Basics

Lecture 2 - Example Codes and their Parameters

Lecture 3 - Mathematical Preliminaries: Groups

Lecture 4 - Subgroups and Equivalence Relations

Lecture 5 - Cosets, Rings & Fields

Lecture 6 - Vector Spaces, Linear Independence and Basis

Lecture 7 - Linear Codes, & Linear independence

Lecture 8 - Spanning & Basis

Lecture 9 - The Dual Code

Lecture 10 - Systematic Generator Matrix

Lecture 11 - Minimum Distance of a Linear Code

Lecture 12 - Bounds on the size of a Code

Lecture 13 - Asymptotic Bounds

Lecture 14 - Standard Array Decoding

Lecture 15 - Performance Analysis of the SAD

Lecture 16 - State and Trellis

Lecture 17 - The Viterbi Decoder

Lecture 18 - Catastrophic Error Propagation

Lecture 19 - Path Enumeration

Lecture 20 - Viterbi Decoder over the AWGN Channel

Lecture 21 - Generalized Distributive Law

Lecture 22 - The MPF Problem

Lecture 23 - Further Examples of the MPF Problem

Lecture 24 - Junction Trees

Lecture 25 - Example of Junction Tree Construction

Lecture 26 - Message passing on the Junction tree

Lecture 27 - GDL Approach to Decoding Convolutional Codes

Lecture 28 - ML Code-Symbol Decoding of the Convolutional Code

Lecture 29 - LDPC Codes

Lecture 30 - LDPC Code Terminology

Lecture 31 - Gallager Decoding Algorithm A

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Lecture 32 - BP Decoding of LDPC Codes

Lecture 33 - BP Decoding (Continued)

Lecture 34 - Density Evolution under BP decoding

Lecture 35 - Convergence & Concentration Theorem - LDPC Codes

Lecture 36 - A Construction for Finite Fields

Lecture 37 - Finite Fields: A Deductive Approach

Lecture 38 - Deductive Approach to Finite Fields

Lecture 39 - Subfields of a Finite field

Lecture 40 - Transform Approach to Cyclic Codes

Lecture 41 - Estimating the Parameters of a Cyclic Code

Lecture 42 - Decoding Cyclic Codes

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NPTEL : Nanoelectronics: Devices and Materials (Electronics and Communication Engineering)

Co-ordinators : Dr. Navakanta Bhat, Prof. K.N. Bhat, Dr. S.A. Shivashankar

Lecture 1 - Introduction to Nanoelectronics

Lecture 2 - CMOS Scaling Theory

Lecture 3 - Short Channel Effects

Lecture 4 - Subthreshold Conduction

Lecture 5 - Drain Induced Barrier Lowering

Lecture 6 - Channel and Source / Drain Engineering

Lecture 7 - CMOS Process Flow

Lecture 8 - Gate oxide scaling and reliability

Lecture 9 - High-k gate dielectrics

Lecture 10 - Metal gate transistor

Lecture 11 - Industrial CMOS Technology

Lecture 12 - Ideal MOS C-V Characteristics

Lecture 13 - Effect of non idealities on C-V

Lecture 14 - MOS Parameter Extraction from C-V Characteristics

Lecture 15 - MOS Parameter Extraction from I-V Characteristics

Lecture 16 - MOSFET Analysis, sub-threshold swing Â“SÂ”

Lecture 17 - Interface state density effects on Â“SÂ”. Short Channel Effects (SCE) and Drain Induced Barrier Lowering (DIBL)

Lecture 18 - Velocity Saturation, Ballistic transport, and Velocity Overshoot Effects and Injection Velocity

Lecture 19 - SOI Technology and comparisons with Bulk Silicon CMOS technology

Lecture 20 - SOI MOSFET structures, Partially Depleted (PD)and Fully Depleted (FD) SOIMOSFETs

Lecture 21 - FD SOI MOSFET: Operation Modes and Threshold Voltages and Electric Fields

Lecture 22 - Sub-threshold Slope & SCE suppression in FD SOI MOSFET, Volume Inversion and Ultra thin (UTFD) SOI MOSFET and quantization Effect, FINFET

Lecture 23 - Need for MS contact Source/Drain Junction in Nano scale MOSFETs

Lecture 24 - Rectifying and Ohmic contacts and challenges in MS unction source drain MOSFET Technology

Lecture 25 - Effect of Interface states and Fermi level pinning on MS contacts on Si and passivation techniques for MS S/D MOSFETS

Lecture 26 - Germanium as an alternate to silicon for high performance MOSFETs and the challenges in Germanium Technology

Lecture 27 - Germanium MOSFT technology and recent results on surface passivated Ge MOSFETS

Lecture 28 - Compound semiconductors and hetero junction FETsfor high performance

Lecture 29 - GaAs MESFETs: Enhancement and depletion types. Velocity Overshoot effcts in GaAs MESFETs

Lecture 30 - Hetero-junctions and High Electron Mobility Transistors (HEMT)

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Lecture 31 - Introduction to Nanomaterials

Lecture 32 - Basic Principles of Quantum Mechanics

Lecture 33 - Basic Principles of Quantum Mechanics (Continued...)

Lecture 34 - Energy bands in crystalline solids

Lecture 35 - Quantum structures and devices

Lecture 36 - Crystal growth and nanocrystals

Lecture 37 - Nanocrystals and nanostructured thin films

Lecture 38 - Nanowires and other nanostructures

Lecture 39 - Carbon Nanostructures and CVD

Lecture 40 - Atomic layer deposition (ALD)

Lecture 41 - Characterisation of nanomaterials

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NPTEL : Pattern Recognition (Electronics and Communication Engineering)

Co-ordinators : Prof. P.S. Sastry

Lecture 1 - Introduction to Statistical Pattern Recognition

Lecture 2 - Overview of Pattern Classifiers

Lecture 3 - The Bayes Classifier for minimizing Risk

Lecture 4 - Estimating Bayes Error; Minimax and Neymann-Pearson classifiers

Lecture 5 - Implementing Bayes Classifier; Estimation of Class Conditional Densities

Lecture 6 - Maximum Likelihood estimation of different densities

Lecture 7 - Bayesian estimation of parameters of density functions, MAP estimates

Lecture 8 - Bayesian Estimation examples; the exponential family of densities and ML estimates

Lecture 9 - Sufficient Statistics; Recursive formulation of ML and Bayesian estimates

Lecture 10 - Mixture Densities, ML estimation and EM algorithm

Lecture 11 - Convergence of EM algorithm; overview of Nonparametric density estimation

Lecture 12 - Convergence of EM algorithm, Overview of Nonparametric density estimation

Lecture 13 - Nonparametric estimation, Parzen Windows, nearest neighbour methods

Lecture 14 - Linear Discriminant Functions; Perceptron -- Learning Algorithm and convergence proof

Lecture 15 - Linear Least Squares Regression; LMS algorithm

Lecture 16 - AdaLinE and LMS algorithm; General nonliner least-squares regression

Lecture 17 - Logistic Regression; Statistics of least squares method; Regularized Least Squares

Lecture 18 - Fisher Linear Discriminant

Lecture 19 - Linear Discriminant functions for multi-class case; multi-class logistic regression

Lecture 20 - Learning and Generalization; PAC learning framework

Lecture 21 - Overview of Statistical Learning Theory; Empirical Risk Minimization

Lecture 22 - Consistency of Empirical Risk Minimization

Lecture 23 - Consistency of Empirical Risk Minimization; VC-Dimension

Lecture 24 - Complexity of Learning problems and VC-Dimension

Lecture 25 - VC-Dimension Examples; VC-Dimension of hyperplanes

Lecture 26 - Overview of Artificial Neural Networks

Lecture 27 - Multilayer Feedforward Neural networks with Sigmoidal activation functions;

Lecture 28 - Backpropagation Algorithm; Representational abilities of feedforward networks

Lecture 29 - Feedforward networks for Classification and Regression; Backpropagation in Practice

Lecture 30 - Radial Basis Function Networks; Gaussian RBF networks

Lecture 31 - Learning Weights in RBF networks; K-means clustering algorithm

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Lecture 32 - Support Vector Machines -- Introduction, obtaining the optimal hyperplane

Lecture 33 - SVM formulation with slack variables; nonlinear SVM classifiers

Lecture 34 - Kernel Functions for nonlinear SVMs; Mercer and positive definite Kernels

Lecture 35 - Support Vector Regression and ?-insensitive Loss function, examples of SVM learning

Lecture 36 - Overview of SMO and other algorithms for SVM; ?-SVM and ?-SVR; SVM as a risk minimizer

Lecture 37 - Positive Definite Kernels; RKHS; Representer Theorem

Lecture 38 - Feature Selection and Dimensionality Reduction; Principal Component Analysis

Lecture 39 - No Free Lunch Theorem; Model selection and model estimation; Bias-variance trade-off

Lecture 40 - Assessing Learnt classifiers; Cross Validation;

Lecture 41 - Bootstrap, Bagging and Boosting; Classifier Ensembles; AdaBoost

Lecture 42 - Risk minimization view of AdaBoost

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NPTEL : Analog Circuits and Systems 1 (Electronics and Communication Engineering)

Co-ordinators : Prof. K. Radhakrishna Rao

Lecture 1 - Introduction to Sensors, Signals and Systems

Lecture 2 - Role of Analog Signal Processing in Electronic Products - Part I

Lecture 3 - Role of Analog Signal Processing in Electronic Products - Part II

Lecture 4 - Analog Signal Processing using One Port Networks

Lecture 5 - Analog Signal Processing using One Port Networks, Passive Two Ports and Ideal amplifiers

Lecture 6 - Synthesis of Amplifiers using Nullators and Norators

Lecture 7 - Passive Electronic Devices for Analog Signal Processing

Lecture 8 - Active Devices for Analog Signal Processing Systems

Lecture 9 - Electronic Devices for Analog Circuits - Part I

Lecture 10 - Electronic Devices for Analog Circuits - Part II

Lecture 11 - Feedback in Systems

Lecture 12 - Static Charecteristic of Feedback Systems

Lecture 13 - Dynamic Behaviour of Feedback Systems - Part I

Lecture 14 - Dynamic Behavior of Feedback Systems - Part II

Lecture 15 - Design of Feedback Amplifiers - Part I

Lecture 16 - Design of Feedback Amplifiers - Part II

Lecture 17 - Design of Feedback Amplifiers and Instrumentation Amplifiers

Lecture 18 - Instrumentation Amplifiers, Integrators and Differentiators

Lecture 19 - Non-linear Analog Signal Processing

Lecture 20 - DC Voltage Regulators

Lecture 21 - Filters - Approximations to ideal filter functions

Lecture 22 - Passive Filters - Part I

Lecture 23 - Passive Filters - Part II

Lecture 24 - Active Filters - Part I

Lecture 25 - Active Filters - Part II

Lecture 26 - Active Filters: Q-enhancement

Lecture 27 - State Space Filters

Lecture 28 - Universal Active Filter - Effect of Active Device GB

Lecture 29 - State-Space Filters (Tuning of Filters)

Lecture 30 - Automatic Tuning of Filters (PLL) and Review of Filter Design

Lecture 31 - Waveform Generation

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Lecture 32 - LC Oscillator - Effect of Non-idealities

Lecture 33 - Transconductor based Oscillator

Lecture 34 - Regenerative Comparators and Non-Sinusoidal Oscillators

Lecture 35 - Non-Sinusoidal Oscillators and VCO (FM & FSK Generators)

Lecture 36 - Phase and Frequency Followers

Lecture 37 - Frequency Locked Loop (Popularly known as PLL)

Lecture 38 - Design of PLL and FLL

Lecture 39 - Analog System Design

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NPTEL : NOC:Design and Simulation of DC-DC converters using Open Source Tools (Electronics and Communication Engineering)

Co-ordinators : Prof. L. Umanand

Lecture 1 - System Overview

Lecture 2 - Understanding Rectifier with C-filter

Lecture 3 - Setting up gEDA, ngSpice and Octave

Lecture 4 - Simulation walk-through : Rectifier C-filter example

Lecture 5 - Designing the rectifier capacitor filter circuit

Lecture 6 - Startup surge limiting

Lecture 7 - DC-DC converter concepts

Lecture 8 - Buck, Boost and Buck-Boost Converters

Lecture 9 - Simulation Example of Buck Converter

Lecture 10 - Understanding Buck Converter

Lecture 11 - Understanding Boost and Buck-Boost

Lecture 12 - Forward Converter Topology

Lecture 13 - Waveforms and Design

Lecture 14 - Simulation of Forward Converter

Lecture 15 - Forward Converter with Lossless Core Reset

Lecture 16 - Transformer Design

Lecture 17 - Inductor Design

Lecture 18 - Flyback Converter Topology

Lecture 19 - Pushpull Converter

Lecture 20 - Half and Full Bridge Converters

Lecture 21 - Close Loop Operation of Converters

Lecture 22 - Simulation examples

Lecture 23 - Multi-Output Converters

Lecture 24 - Concluding Remarks

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NPTEL : NOC:Enclosure Design of Electronics Equipment (Electronics and Communication Engineering)

Co-ordinators : Prof. N. V Chalapathi Rao

Lecture 1 - Enclosure design for Electronics Equipment Introduction

Lecture 2 - Aspects and features that are non electrical and are essential to Electronic Product Realisation

Lecture 3 - Enclosure Design in electronic equipment

Lecture 4 - Design as applied to small electronics products and projects

Lecture 5 - Sketching in design for communication

Lecture 6 - Sketching as a tool with example and exercise

Lecture 7 - Sketching Part 2

Lecture 8 - Enclosures to Product design

Lecture 9 - Examples of product enclosures ID_PD

Lecture 10 - Enclosures with detailing: Examples

Lecture 11 - Alternate Designs in an everyday item

Lecture 12 - Sheet metal in small equipment (PSU)

Lecture 13 - Layouts and Materials of small equipment

Lecture 14 - Materials used for construction

Lecture 15 - Materials choice

Lecture 16 - Aluminium for common equipment

Lecture 17 - Use of Aluminium extrusions

Lecture 18 - Application of Sheet metal

Lecture 19 - Sheet Metal bending

Lecture 20 - Development of enclosures for bending

Lecture 21 - Video of Fabrication

Lecture 22 - What can be done in the lab Bending

Lecture 23 - Issues in bending and folding

Lecture 24 - Making a quick model

Lecture 25 - Detailing in plastic

Lecture 26 - Fabricating with flat plastic

Lecture 27 - Video in ID Lab

Lecture 28 - Off the shelf enclosures

Lecture 29 - Ready made enclosures

Lecture 30 - Application documentation and Selection

Lecture 31 - Index of protection, Safety

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Lecture 32 - NEMA and related

Lecture 33 - Testing for IP class

Lecture 34 - Sealed Enclosures Video

Lecture 35 - Public utility boxes

Lecture 36 - EMI Sealing

Lecture 37 - Sealed Enclosures 2

Lecture 38 - Gasketing practice

Lecture 39 - Gasketing Basics

Lecture 40 - Off the shelf Aluminum enclosures

Lecture 41 - Understanding

Lecture 42 - Heat sink enclosures

Lecture 43 - Detailing of Built in Heat sink boxes

Lecture 44 - Connector basics

Lecture 45 - Connectors - Part 2

Lecture 46 - Common connectors

Lecture 47 - Connectors (multi way) and CoAx

Lecture 48 - MIL C connectors

Lecture 49 - CAD in Layout Drawing

Lecture 50 - Types of CAD

Lecture 51 - CAD for enclosure Design

Lecture 52 - Egpt layout with CAD

Lecture 53 - CAD sample Example

Lecture 54 - CAD Layout

Lecture 55 - Detailing with CAD

Lecture 56 - Integrating Products with CAD

Lecture 57 - Product Detailing

Lecture 58 - Components CAD Physical Models

Lecture 59 - Sheet Metal and Plastic common details

Lecture 60 - Sample of Simple Organic Shapes

Lecture 61 - Conclusion

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NPTEL : NOC:Design of Photovoltaic Systems (Electronics and Communication Engineering)

Co-ordinators : Prof. L. Umanand

Lecture 1 - A historical perspective

Lecture 2 - PV cell characteristics and equivalent circuit

Lecture 3 - Model of PV cell

Lecture 4 - Short Circuit, Open Circuit and peak power parameters

Lecture 5 - Datasheet study

Lecture 6 - Cell efficiency

Lecture 7 - Effect of temperature

Lecture 8 - Temperature effect calculation example

Lecture 9 - Fill factor

Lecture 10 - PV cell simulation

Lecture 11 - Identical cells in series

Lecture 12 - Load line

Lecture 13 - Non-identical cells in series

Lecture 14 - Protecting cells in series

Lecture 15 - Interconnecting modules in series

Lecture 16 - Simulation of cells in series

Lecture 17 - Identical cells in parallel

Lecture 18 - Non-identical cells in parallel

Lecture 19 - Protecting cells in parallel

Lecture 20 - Interconnecting modules

Lecture 21 - Simulation of cells in parallel

Lecture 22 - Practicals - Measuring i-v characteristics

Lecture 23 - Practicals - PV source emulation

Lecture 24 - Introduction

Lecture 25 - Insolation and irradiance

Lecture 26 - Insolation variation with time of day

Lecture 27 - Earth centric viewpoint and declination

Lecture 28 - Solar geometry

Lecture 29 - Insolation on a horizontal flat plate

Lecture 30 - Energy on a horizontal flat plate

Lecture 31 - Sunrise and sunset hour angles

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Lecture 32 - Examples

Lecture 33 - Energy on a tilted flat plate

Lecture 34 - Energy plots in octave

Lecture 35 - Atmospheric effects

Lecture 36 - Airmass

Lecture 37 - Energy with atmospheric effects

Lecture 38 - Clearness index

Lecture 39 - Clearness index and energy scripts in Octave

Lecture 40 - Sizing PV for applications without batteries

Lecture 41 - Sizing PV Examples

Lecture 42 - Batteries - intro

Lecture 43 - Batteries - Capacity

Lecture 44 - Batteries - C-rate

Lecture 45 - Batteries - Efficiency

Lecture 46 - Batteries - Energy and power densities

Lecture 47 - Batteries - Comparison

Lecture 48 - Battery selection

Lecture 49 - Other energy storage methods

Lecture 50 - PV system design - Load profile

Lecture 51 - PV system design - Days of autonomy and recharge

Lecture 52 - PV system design - Battery size

Lecture 53 - PV system design - PV array size

Lecture 54 - Design toolbox in octave

Lecture 55 - MPPT concept>

Lecture 56 - Input impedance of DC-DC converters - Boost converter

Lecture 57 - Input impedance of DC-DC converters - Buck converter

Lecture 58 - Input impedance of DC-DC converters - Buck-Boost converter

Lecture 59 - Input impedance of DC-DC converters - PV module in SPICE

Lecture 60 - Input impedance of DC-DC converters -Simulation - PV and DC-DC interface

Lecture 61 - Impedance control methods

Lecture 62 - Impedance control methods- Reference cell - voltage scaling

Lecture 63 - Impedance control methods- Reference cell - current scaling

Lecture 64 - Impedance control methods- Reference cell - Sampling method

Lecture 65 - Impedance control methods- Reference cell - Power slope method 1

Lecture 66 - Impedance control methods- Reference cell - Power slope method 2

Lecture 67 - Impedance control methods- Reference cell - Hill climbing method

Lecture 68 - Practical points - Housekeeping power supply

Lecture 69 - Practical points - Gate driver

Lecture 70 - Practical points - MPPT for non-resistive loads

Lecture 71 - Simulation - MPPT

Lecture 72 - Direct PV-battery connection

Lecture 73 - Charge controller

Lecture 74 - Battery charger - Understanding current control

Lecture 75 - Battery charger - slope compensation

Lecture 76 - Battery charger - simulation of current control

Lecture 77 - Batteries in series - charge equalisation

Lecture 78 - Batteries in parallel

Lecture 79 - Peltier device - principle

Lecture 80 - Peltier element - datasheet

Lecture 81 - Peltier cooling

Lecture 82 - Thermal aspects

Lecture 83 - Thermal aspects - Conduction

Lecture 84 - Thermal aspects - Convection

Lecture 85 - Thermal aspects - A peltier refrigeration example

Lecture 86 - Thermal aspects - Radiation and mass transport

Lecture 87 - Demo of Peltier cooling

Lecture 88 - Water pumping principle

Lecture 89 - Hydraulic energy and power

Lecture 90 - Total dynamic head

Lecture 91 - Numerical solution - Colebrook formula

Lecture 92 - Octave script for head calculation

Lecture 93 - PV and Water Pumping Examples

Lecture 94 - Octave script for hydraulic power

Lecture 95 - Centrifugal pump

Lecture 96 - Reciprocating pump

Lecture 97 - PV power

Lecture 98 - Pumped hydro application

Lecture 99 - Grid connection principle

Lecture 100 - PV to grid topologies Part-I

Lecture 101 - PV to grid topologies Part-II

Lecture 102 - PV to grid topologies Part-III

Lecture 103 - 3ph d-q controlled grid connection intro

Lecture 104 - 3ph d-q controlled grid connection dq-axis theory

Lecture 105 - 3ph d-q controlled grid connection AC to DC transformations

Lecture 106 - 3ph d-q controlled grid connection DC to AC transformations

Lecture 107 - 3ph d-q controlled grid connection Complete 3ph grid connection

Lecture 108 - 1ph d-q controlled grid connection

Lecture 109 - 3ph PV-Grid interface example

Lecture 110 - SVPWM - discrete implementation

Lecture 111 - SVPWM - analog implementation

Lecture 112 - Application of integrated magnetics

Lecture 113 - Life cycle Costing Growth models

Lecture 114 - Life cycle Costing Growth model examples

Lecture 115 - Life cycle Costing Annual payment and present worth factor

Lecture 116 - Life cycle Costing LCC with example - 1

Lecture 117 - Life cycle Costing LCC example - 2

Lecture 118 - Life cycle Costing LCC example - 3

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NPTEL : NOC:Photonic Integrated Circuits (Electronics and Communication Engineering)

Co-ordinators : Dr. Srinivas Talabatulla

Lecture 1 - Introduction to Photonic Integrated Circuits

Lecture 2 - Optical Waveguide Theory - Symmetric Waveguides

Lecture 3 - Optical Waveguide Theory - Asymmetric Waveguides

Lecture 4 - Vector Modes

Lecture 5 - Channel Waveguide

Lecture 6 - Directional Coupler and Coupled Mode Theory

Lecture 7 - Passive Devices and Beam Propagation Method

Lecture 8 - Dynamic Devices

Lecture 9 - Integrated optical Systems and Applications

Lecture 10 - Fabrication and Characterisation

Lecture 11 - MOEMS

Lecture 12 - Ring Resonators

Lecture 13 - Photonic Band Gap Devices

Lecture 14 - Lecture Summary

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NPTEL : NOC:Neural Science for Engineers (Electronics and Communication Engineering)

Co-ordinators : Prof. Vikas V

Lecture 1 - Course Outline and Scope

Lecture 2 - Biological Information Systems

Lecture 3 - Analogy between Living Systems with Semiconductor Structures

Lecture 4 - Action Potential - I

Lecture 5 - Action Potential - II

Lecture 6 - Synaptic Potential

Lecture 7 - Threshold and Action Potential Propogation

Lecture 8 - Anatomy of a Neuron

Lecture 9 - Neuro Muscular Junction

Lecture 10 - Spatial and Temporal Summation of neuronal electrical activities

Lecture 11 - Brain Anatomy Introduction

Lecture 12 - Architecture of the Nervous System

Lecture 13 - Architecture of the Nervous System (Continued...)

Lecture 14 - Analog and Digital Processing in the Neuron - I

Lecture 15 - Analog and Digital Processing in the Neuron - II

Lecture 16 - Energy Sources of Neuronal Systems

Lecture 17 - Skull Demonstration

Lecture 18 - Brain Anatomy: Skull

Lecture 19 - Brain Anatomty 3D - I

Lecture 20 - Brain Anatomty 3D - II

Lecture 21 - Brain Anatomty 3D - III

Lecture 22 - Basics of Brain Imaging Techniques

Lecture 23 - Brain anatomy using MR images - I

Lecture 24 - Brain anatomy using MR images - II

Lecture 25 - Spinal Cord Anatomy

Lecture 26 - Reflexes: Introduction

Lecture 27 - Monosynaptic Reflexes

Lecture 28 - Polysynaptic Reflexes

Lecture 29 - Criteria for electrode material

Lecture 30 - Introduction to brain stimulation

Lecture 31 - Brain Stimulation: Device fabrication - Illustration

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Lecture 32 - Brain Stimulation: Electronic Systems (Current Mirrors)

Lecture 33 - Brain regions and associated functions

Lecture 34 - Human vision system - II

Lecture 35 - Network analysis during visual processing

Lecture 36 - Control of eye movements

Lecture 37 - COMSOL Multiphysics for Medical Devices

Lecture 38 - COMSOL Brain Electrical Stimulation Demo

Lecture 39 - Human vision system - III

Lecture 40 - Human auditory system - I

Lecture 41 - Human auditory system - II

Lecture 42 - Human auditory system - III

Lecture 43 - The human balance system

Lecture 44 - Movement: Introduction

Lecture 45 - Movement: Synchronization

Lecture 46 - Movement: Role of Spinall Cord

Lecture 47 - Movement: Role of Cerebellum

Lecture 48 - Memory and Learning - I

Lecture 49 - Memory and Learning - II

Lecture 50 - Microengineering devices for Neural Signal Acquisiton

Lecture 51 - Microfabrication Process for Multi Electrode Array

Lecture 52 - Introduction and Applications of Event Related Potentials

Lecture 53 - ERP Extraction Demonstration

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NPTEL : NOC:Analog Circuits and Systems (Electronics and Communication Engineering)

Co-ordinators : Prof. K Radhakrishna Rao

Lecture 1 - Introduction to Sensors, Signals and Systems

Lecture 2 - Role of Analog Signal Processing in Electronic Products - Part 1

Lecture 3 - Role of Analog Signal Processing in Electronic Products - Part 2

Lecture 4 - Analog Signal Processing using One Port Networks

Lecture 5 - Analog Signal Processing using One Port Networks, Passive Two Ports and Ideal amplifiers

Lecture 6 - Synthesis of Amplifiers using Nullators and Norators

Lecture 7 - Passive Electronic Devices for Analog Signal Processing

Lecture 8 - Active Devices for Analog Signal Processing Systems

Lecture 9 - Electronic Devices for Analog Circuits

Lecture 10 - Electronic Devices for Analog Circuits

Lecture 11 - Feedback in Systems

Lecture 12 - Static Charecteristic of Feedback Systems

Lecture 13 - Dynamic Behavior of Feedback Systems - Part I

Lecture 14 - Dynamic Behavior of Feedback Systems - Part II

Lecture 15 - Design of Feedback Amplifiers

Lecture 16 - Design of Feedback Amplifiers

Lecture 17 - Design of Feedback Amplifiers and Instrumentation Amplifiers

Lecture 18 - Instrumentation Amplifiers, Integrators and Differentiators

Lecture 19 - Non-linear Analog Signal Processing

Lecture 20 - DC Voltage Regulators

Lecture 21 - Filters - Approximations to ideal filter functions

Lecture 22 - Passive Filters - Part 1

Lecture 23 - Passive Filters - Part 2

Lecture 24 - Active Filters - Part 1

Lecture 25 - Active Filters - Part 2

Lecture 26 - Active Filters: Q-enhancement

Lecture 27 - State Space Filters

Lecture 28 - Universal Active Filter - Effect of Active Device GB

Lecture 29 - State-Space Filters (Tuning of Filters)

Lecture 30 - Automatic Tuning of Filters (PLL) and Review of Filter Design

Lecture 31 - Waveform Generation

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Lecture 32 - LC Oscillator - Effect of Non-idealities

Lecture 33 - Transconductor based Oscillator

Lecture 34 - Regenerative Comparators and Non-Sinusoidal Oscillators

Lecture 35 - Non-Sinusoidal Oscillators and VCO (FM and FSK Generators)

Lecture 36 - Phase and Frequency Followers

Lecture 37 - Frequency Locked Loop (Popularly known as PLL)

Lecture 38 - Design of PLL and FLL

Lecture 39 - Analog System Design