NPTEL : Nonlinear Dynamical Systems (Electrical Engineering)

Co-ordinators : Prof. Harish K. Pillai, Prof. Madhu N. Belur

Lecture 1 - Introduction

Lecture 2 - First Order systems

Lecture 3 - Classification of Equilibrium points

Lecture 4 - Lipschitz Functions

Lecture 5 - Existence/uniqueness theorems

Lecture 6 - Existence/uniqueness of solutions to differential equations

Lecture 7 - Lyapunov theorem on stability

Lecture 8 - Extension of Lyapunov's Theorem in different contexts

Lecture 9 - LaSalle's Invariance principle, Barbashin and Krasovski theorems, periodic orbits

Lecture 10 - Bendixson criterion and Poincare-Bendixson criterion. Example: Lotka Volterra predator prey model

Lecture 11 - Bendixson and Poincare-Bendixson criteria van-der-Pol Oscillator

Lecture 12 - Scilab simulation of Lotka Volterra predator prey model, van-der-Pol Oscillator Review of linearization, operating point/operating trajectory

Lecture 13 - Signals, operators

Lecture 14 - Norms of signals, systems (operators), Finite gain L2 stable

Lecture 15 - Nyquist plots and Nyquist criterion for stability

Lecture 16 - Interconnection between linear system & non-linearity, passive filters

Lecture 17 - Passive filters, Dissipation equality, positive real lemma

Lecture 18 - Positive real lemma proof

Lecture 19 - Definition for positive realness and Kalman Yakubovich-Popov Theorem

Lecture 20 - Kalman-Yakubovich-Popov Lemma/theorem and memoryless nonlinearities

Lecture 21 - Loop tranformations and circle criterion

Lecture 22 - Nonlinearities based on circle criterion

Lecture 23 - Limit cycles

Lecture 24 - Popov criterion continuous, frequency-domain theorem

Lecture 25 - Popov criterion continuous, frequency-domain theorem

Lecture 26 - Describing function method

Lecture 27 - Describing Function : 2

Lecture 28 - Describing : optimal gain

Lecture 29 - Describing : optimal gain

Lecture 30 - Describing functions : Jump Hysteresis

NPTEL : Power System Dynamics and Control (Electrical Engineering)

Co-ordinators : Dr. A.M. Kulkarni

NPTEL : Control Engineering (Prof. S.D. Agashe) (Electrical Engineering)

Co-ordinators : Prof. S.D. Agashe

NPTEL : Power Electronics (Electrical Engineering)

Co-ordinators : Prof. Kishore Chatterjee, Prof. B.G. Fernandes

Lecture 32 - Power Electronics

Lecture 33 - Power Electronics

Lecture 34 - Power Electronics

Lecture 35 - Power Electronics

Lecture 36 - Power Electronics

Lecture 37 - Power Electronics

Lecture 38 - Power Electronics

Lecture 39 - Power Electronics

Lecture 40 - Power Electronics

Lecture 41 - Power Electronics

Lecture 42 - Power Electronics

Lecture 43 - Power Electronics

NPTEL : Fabrication of Silicon VLSI Circuits using the MOS technology (Electrical Engineering)

Co-ordinators : Prof. A.N. Chandorkar

NPTEL : NOC:Computational Electromagnetics and Applications (Electrical Engineering)

Co-ordinators : Prof.Krish Sankaran

Lecture 32 - Lecture 17

Lecture 33 - Lecture 18

Lecture 34 - Exercise 10

Lecture 35 - Summary week 5

Lecture 36 - Lecture 19

Lecture 37 - Lecture 20

Lecture 38 - Lecture 21

Lecture 39 - Lecture 22

Lecture 40 - Exercise 11

Lecture 41 - Summary week 6

Lecture 42 - Exercise 12

Lecture 43 - Exercise 13

Lecture 44 - Exercise 14

Lecture 45 - Exercise 15

Lecture 46 - Exercise 16

Lecture 47 - Exercise 17

Lecture 48 - Summary week 7

Lecture 49 - Lecture 23

Lecture 50 - Lecture 24

Lecture 51 - Lecture 25

Lecture 52 - Exercise 18

Lecture 53 - Exercise 19

Lecture 54 - Lab tour 3

Lecture 55 - Summary week 8

Lecture 56 - Lecture 26

Lecture 57 - Lecture 27

Lecture 58 - Lecture 28

Lecture 59 - Lecture 29

Lecture 60 - Lecture 30

Lecture 61 - Lecture 31

Lecture 62 - Lab tour 4

Lecture 63 - Summary week 9

Lecture 64 - Lecture 32

NPTEL : NOC:Basic Electronics (Electrical Engineering)

Co-ordinators : Prof. Mahesh B. Patil

Lecture 32 - Introduction to op-amps

Lecture 33 - Op-amp circuits - 1

Lecture 34 - Op-amp circuits - 2

Lecture 35 - Op-amp circuits - 3

Lecture 36 - Difference amplifier

Lecture 37 - Instrumentation amplifier - 1

Lecture 38 - Instrumentation amplifier - 2

Lecture 39 - Op-amp nonidealities - 1

Lecture 40 - Op-amp nonidealities - 2

Lecture 41 - Bode plots - 1

Lecture 42 - Bode plots - 2

Lecture 43 - Bode plots - 3

Lecture 44 - Op-amp filters

Lecture 45 - Simulation of op-amp filter

Lecture 46 - Precision rectifiers - 1

Lecture 47 - Precision rectifiers - 2

Lecture 48 - Precision rectifiers - 3

Lecture 49 - Simulation of triangle-to-sine converter

Lecture 50 - Schmitt triggers - 1

Lecture 51 - Schmitt triggers - 2

Lecture 52 - Schmitt triggers - 3

Lecture 53 - Sinusoidal oscillators - 1

Lecture 54 - Sinusoidal oscillators - 2

Lecture 55 - Introduction to digital circuits

Lecture 56 - Boolean algebra

Lecture 57 - Karnaugh maps

Lecture 58 - Combinatorial circuits - 1

Lecture 59 - Combinatorial circuits - 2

Lecture 60 - Combinatorial circuits - 3

Lecture 61 - Introduction to sequential circuits

Lecture 62 - Latch and flip-flop

Lecture 63 - JK flip-flop

Lecture 64 - D flip-flop

NPTEL : NOC:Antennas (Electrical Engineering)

Co-ordinators : Prof. Girish Kumar

Lecture 1 - Antenna Introduction - I

Lecture 2 - Antenna Introduction - II

Lecture 3 - Antenna Introduction - III

Lecture 4 - Antenna Fundamentals - I

Lecture 5 - Antenna Fundamentals - II

Lecture 6 - Antenna Radiation Hazards - I

Lecture 7 - Antenna Radiation Hazards - II

Lecture 8 - Dipole Antennas - I

Lecture 9 - Dipole Antennas - II

Lecture 10 - Dipole Antennas - III

Lecture 11 - Monopole Antennas - I

Lecture 12 - Monopole Antennas - II

Lecture 13 - Loop Antennas

Lecture 14 - Slot Antennas

Lecture 15 - Linear Arrays - I

Lecture 16 - Linear Arrays - II

Lecture 17 - Linear Arrays - III

Lecture 18 - Planar Arrays

Lecture 19 - Microstrip Antennas (MSA)

Lecture 20 - Rectangular MSA

Lecture 21 - MSA Parametric Analysis - I

Lecture 22 - MSA Parametric Analysis - II

Lecture 23 - Circular MSA

Lecture 24 - Broadband MSA - I

Lecture 25 - Broadband MSA - II

Lecture 26 - Broadband MSA - III

Lecture 27 - Broadband MSA - IV

Lecture 28 - Broadband MSA - V

Lecture 29 - Compact MSA - I

Lecture 30 - Compact MSA - II

Lecture 31 - Compact MSA - III

Lecture 32 - Tunable MSA - I

Lecture 33 - Tunable MSA - II

Lecture 34 - Circularly Polarized MSA - I

Lecture 35 - Circularly Polarized MSA - II

Lecture 36 - Circularly Polarized MSA - III

Lecture 37 - MSA Arrays - I

Lecture 38 - MSA Arrays - II

Lecture 39 - MSA Arrays - III

Lecture 40 - Helical Antennas - I

Lecture 41 - Helical Antennas - II

Lecture 42 - Helical Antennas - III

Lecture 43 - Helical Antennas - IV

Lecture 44 - Helical Antennas - V

Lecture 45 - Horn Antennas - I

Lecture 46 - Horn Antennas - II

Lecture 47 - Horn Antennas - III

Lecture 48 - Horn Antennas - IV

Lecture 49 - Horn Antennas - V

Lecture 50 - Yagi-Uda and Log-Periodic Antennas - I

Lecture 51 - Yagi-Uda and Log-Periodic Antennas - II

Lecture 52 - Yagi-Uda and Log-Periodic Antennas - III

Lecture 53 - IE3D Session TA - I

Lecture 54 - IE3D Session TA - II

Lecture 55 - IE3D Session TA - III

Lecture 56 - Reflector Antennas - I

Lecture 57 - Reflector Antennas - II

Lecture 58 - Reflector Antennas - III

Lecture 59 - Reflector Antennas - IV

Lecture 60 - Lab Session

NPTEL : NOC:Fundamentals of Wavelets, Filter Banks and Time Frequency Analysis (Electrical Engineering)

Co-ordinators : Prof. V.M. Gadre

Lecture 32 - Module 10 - Lecture 2 - Up sampling by a general factor M- a Z-domain analysis.

Lecture 33 - Module 10 - Lecture 3 - Down sampling by a general factor M- a Z-domain analysis

Lecture 34 - Module 11 - Lecture 1 - Z domain analysis of 2 channel filter bank.

Lecture 35 - Module 11 - Lecture 2 - Effect of X (-Z) in time domain and aliasing

Lecture 36 - Module 11 - Lecture 3 - Consequences of aliasing and simple approach to avoid it

Lecture 37 - Module 12 - Lecture 1 - Revisiting aliasing and the Idea of perfect reconstruction

Lecture 38 - Module 12 - Lecture 2 - Applying perfect reconstruction and alias cancellation on Haar MRA

Lecture 39 - Module 12 - Lecture 3 - Introduction to Daubechies family of MRA

Lecture 40 - Module 13 - Lecture 1 - Power Complementarity of low pass filter

Lecture 41 - Module 13 - Lecture 2 - Applying perfect reconstruction condition to obtain filter coefficient

Lecture 42 - Module 14 - Lecture 1 - Effect of minimum phase requirement on filter coefficients

Lecture 43 - Module 14 - Lecture 2 - Building compactly supported scaling functions

Lecture 44 - Module 14 - Lecture 3 - Second member of Daubechies family

Lecture 45 - Module 15 - Lecture 1 - Fourier transform analysis of Haar scaling and Wavelet functions

Lecture 46 - Module 15 - Lecture 2 - Revisiting Fourier Transform and Parseval's theorem

Lecture 47 - Module 15 - Lecture 3 - Transform Analysis of Haar Wavelet function

Lecture 48 - Module 16 - Lecture 1 - Nature of Haar scaling and Wavelet functions in frequency domain

Lecture 49 - Module 16 - Lecture 2 - The Idea of Time-Frequency Resolution

Lecture 50 - Module 16 - Lecture 3 - Some thoughts on Ideal time- frequency domain behavior

Lecture 51 - Module 17 - Lecture 1 - Defining Probability Density function

Lecture 52 - Module 17 - Lecture 2 - Defining Mean, Variance and Â“containment in a given domainÂ”

Lecture 53 - Module 17 - Lecture 3 - Example: Haar Scaling function

Lecture 54 - Module 17 - Lecture 4 - Variance from a slightly different perspective

Lecture 55 - Module 18 - Lecture 1 - Signal transformations: effect on mean and variance

Lecture 56 - Module 18 - Lecture 2 - Time-Bandwidth product and its properties

Lecture 57 - Module 18 - Lecture 3 - Simplification of Time-Bandwidth formulae

Lecture 58 - Module 19 - Lecture 1 - Introduction

Lecture 59 - Module 19 - Lecture 2 - Evaluation of Time-Bandwidth product

Lecture 60 - Module 19 - Lecture 3 - Optimal function in the sense of Time-Bandwidth product

Lecture 61 - Module 20 - Lecture 1 - Discontent with the Â“Optimal functionÂ”.

Lecture 62 - Module 20 - Lecture 2 - Journey from infinite to finite Time-Bandwidth product of Haar scaling function

Lecture 63 - Module 20 - Lecture 3 - More insights about Time-Bandwidth product

Lecture 64 - Module 20 - Lecture 4 - Time-frequency plane

NPTEL : NOC:Analog Circuits (2017) (Electrical Engineering)

Co-ordinators : Prof. Jayanta Mukherjee

NPTEL : NOC:Microwave Theory and Techniques (Electrical Engineering)

Co-ordinators : Prof. Girish Kumar

NPTEL : NOC:Principles of Digital Communications (Electrical Engineering)

Co-ordinators : Prof. S.N. Merchant

Lecture 65 - Channel Coding: Decoding using Standard Arrays

NPTEL : NOC:Fundamental of Power Electronics (Electrical Engineering)

Co-ordinators : Prof. Vivek Agarwal

Lecture 32 - Shunt regulator

Lecture 33 - Example on shunt regulator

Lecture 34 - Non-ideality and solution

Lecture 35 - Applications of shunt regulator

Lecture 36 - Series regulator

Lecture 37 - Efficiency of series

Lecture 38 - Negative and dual voltage regulators

Lecture 39 - Over current limiting circuits

Lecture 40 - Improvements to series regulator

Lecture 41 - Regulator performance parameters

Lecture 42 - Datasheet of few IC regulators

Lecture 43 - Common IC regulator circuits

Lecture 44 - Practicals 1

Lecture 45 - Switched mode DC-DC converter intro

Lecture 46 - Volt-sec and Amp-sec balance

Lecture 47 - Input-output relationship

Lecture 48 - Buck converter - operation and waveforms

Lecture 49 - Buck converter - component selection

Lecture 50 - Primary configurations

Lecture 51 - Boost converter

Lecture 52 - Buck-Boost converter

Lecture 53 - Simulating the primary converters

Lecture 54 - Forward converter

Lecture 55 - Core reset in forward converter

Lecture 56 - Simulating with lossy core reset

Lecture 57 - Simulating with lossless core reset

Lecture 58 - Flyback converter

Lecture 59 - Simulating the flyback converter

Lecture 60 - Octave mfile for design

Lecture 61 - Magnetics design intro

Lecture 62 - Magnetics review

Lecture 63 - Permeance

Lecture 64 - Inductor value and energy storage

Lecture 98 - Simulation of sinusoidal PWM

NPTEL : NOC:Electrical Equipment and Machines: Finite Element Analysis (Electrical Engineering)

Co-ordinators : Prof. Shrikrishna V. Kulkarni

NPTEL : NOC:Digital Signal Processing and its Applications (Electrical Engineering)

Co-ordinators : Prof. V. M. Gadre

Lecture 32 - Dual to convolution property

Lecture 33 - Multiplication Property, Introduction to Parsevalâ€™s theorem

Lecture 34 - Introduction and Property of DTFT

Lecture 35 - Review of Inverse DTFT

Lecture 36 - Parsevalâ€™s Theorem and energy and time spectral density

Lecture 37 - Discussion on Unit Step

Lecture 38 - Introduction to Z transform

Lecture 39 - Example of Z transform

Lecture 40 - Region of Convergence

Lecture 41 - Properties of Z transform

Lecture 42 - Z- Transform

Lecture 43 - Rational System

Lecture 44 - Introduction and Examples of Rational Z Transform and their Inverses

Lecture 45 - Double Pole Examples and their Inverse Z Transform

Lecture 46 - Partial Fraction Decomposition

Lecture 47 - LSI System Examples

Lecture 48 - Why are Rational Systems so important?

Lecture 49 - Solving Linear constant coefficient difference equations which are valid over a finite range of time

Lecture 50 - Introduction to Resonance in Rational Systems

Lecture 51 - Characterization of Rational LSI system

Lecture 52 - Causality and stability of the ROC of the system function

Lecture 53 - Recap of Rational Systems and Discrete Time Filters

Lecture 54 - Specifications for Filter Design

Lecture 55 - Four Ideal Piecewise Constant Filters

Lecture 56 - Important Characteristics Of Ideal Filters

Lecture 57 - Synthesis of Discrete Time Filters, Realizable specifications

Lecture 58 - Realistic Specifications for low pass filter. Filter Design Process

Lecture 59 - Introduction to Filter Design. Analog IIR Filter,FIR discrete-time filter, IIR discrete-time filter

Lecture 60 - Analog to discrete transform

Lecture 61 - Intuitive transforms, Bilinear Transformation

Lecture 62 - Steps for IIR filter design

Lecture 63 - Analog filter design using Butterworth Approximation

Lecture 64 - Butterworth filter Derivation And Analysis of butterworth system function

Lecture 65 - Chebychev filter Derivation

Lecture 66 - Midsem paper review discussion

Lecture 67 - The Chebyschev Approximation

Lecture 68 - Next step in design: Obtain poles

Lecture 69 - Introduction to Frequency Transformations in the Analog Domain

Lecture 70 - High pass transformation

Lecture 71 - Band pass transformation

Lecture 72 - Frequency Transformation

Lecture 73 - Different types of filters

Lecture 74 - Impulse invariant method and ideal impulse response

Lecture 75 - Design of FIR of length (2N+1) by the truncation method,Plotting the function V(w)

Lecture 76 - IIR filter using rectangular window, IIR filter using triangular window

Lecture 77 - Proof that frequency response of an fir filter using rectangular window function centred at 0 is real

Lecture 78 - Introduction to window functions

Lecture 79 - Examples of window functions

Lecture 80 - Explanation of Gibbâ€™s Phenomenon and itâ€™s application

Lecture 81 - Comparison of FIR And IIR Filterâ€™s

Lecture 82 - Comparison of FIR And IIR Filterâ€™s

Lecture 83 - Comparison of FIR And IIR Filterâ€™s

Lecture 84 - Introduction and approach to realization (causal rational system)

Lecture 85 - Comprehension of Signal Flow Graphs and Achievement of Pseudo Assembly Language Code

Lecture 86 - Introduction to IIR Filter Realization and Cascade Structure

Lecture 87 - Cascade Parallel Structure

Lecture 88 - Lattice Structure

Lecture 89 - Recap And Review of Lattice Structure, Realization of FIR Function

Lecture 90 - Backward recursion, Change in the recursive equation of lattice

Lecture 91 - Lattice structure for an arbitrary rational system

Lecture 92 - Example realization of lattice structure for rational system

Lecture 93 - Introductory Remarks of Discrete Fourier Transform and Frequency Domain Sampling

Lecture 94 - Principle of Duality, The Circular Convolution

NPTEL : NOC:Stochastic Control and Communication (Electrical Engineering)

Co-ordinators : Prof. Ankur A. Kulkarni

Lecture 32 - Stochastic Control under incomplete state information: Example (Continued...)

Lecture 33 - Stochastic Control under incomplete state information: Example (Continued...)

Lecture 34 - LQ systems with Imperfect Information - I

Lecture 35 - LQ systems with Imperfect Information - II

Lecture 36 - LQ systems with Imperfect Information - III

Lecture 37 - LQ systems with Imperfect Information - IV

Lecture 38 - Filtering - I

Lecture 39 - Filtering - II

Lecture 40 - Kalman Filtering - I

Lecture 41 - Kalman Filtering - II

Lecture 42 - Kalman Filtering - III

Lecture 43 - Belief State Formulation - I

Lecture 44 - Belief State Formulation - II

Lecture 45 - Information Structures - I

Lecture 46 - Information Structures - II

Lecture 47 - Witsenhausen Problem - I

Lecture 48 - Witsenhausen Problem - II

Lecture 49 - Witsenhausen Problem - III

Lecture 50 - Witsenhausen Problem - IV

Lecture 51 - Witsenhausen Problem - V

Lecture 52 - Witsenhausen Problem - VI

Lecture 53 - Witsenhausen Problem - VII

Lecture 54 - Team Decision Theory - I

Lecture 55 - Team Decision Theory - II

Lecture 56 - Team Decision Theory - III

Lecture 57 - Team Decision Theory - IV

Lecture 58 - Team Decision Theory - V

Lecture 59 - Team Decision Theory - VI

Lecture 60 - Team Decision Theory - VII

Lecture 61 - Communication Theory - I

Lecture 62 - Communication Theory - II

Lecture 63 - Communication Theory - III

Lecture 64 - Communication Theory - IV

Lecture 65 - Communication Theory - V

NPTEL : NOC:Applied Linear Algebra (2024) (Electrical Engineering)

Co-ordinators : Prof. Dwaipayan Mukherjee

Lecture 32 - Isomorphism and Inverses - Part C

Lecture 33 - Dual Basis and Annihilator - Part A

Lecture 34 - Dual Basis and Annihilator - Part B

Lecture 35 - Dual Basis and Annihilator - Part C

Lecture 36 - Dual maps and double dual - Part A

Lecture 37 - Dual maps and double dual - Part B

Lecture 38 - Dual maps and double dual - Part C

Lecture 39 - Quotient spaces and quotient map - Part A

Lecture 40 - Quotient spaces and quotient map - Part B

Lecture 41 - Quotient spaces and quotient map - Part C

Lecture 42 - Inner Product Spaces - Part A

Lecture 43 - Inner Product Spaces - Part B

Lecture 44 - Inner Product Spaces - Part C

Lecture 45 - Gram Schmidt Procedure - Part A

Lecture 46 - Gram Schmidt Procedure - Part B

Lecture 47 - Gram Schmidt Procedure - Part C

Lecture 48 - Best Approximation of a Vector - Part A

Lecture 49 - Best Approximation of a Vector - Part B

Lecture 50 - Best Approximation of a Vector - Part C

Lecture 51 - Projection map and summary of Ax = b - Part A

Lecture 52 - Projection map and summary of Ax = b - Part B

Lecture 53 - Projection map and summary of Ax = b - Part C

Lecture 54 - Linear Differential Equations - Part A

Lecture 55 - Linear Differential Equations - Part B

Lecture 56 - Introduction to Eigen values and Eigen vectors - Part A

Lecture 57 - Introduction to Eigen values and Eigen vectors - Part B

Lecture 58 - Introduction to Eigen values and Eigen vectors - Part C

Lecture 59 - Singular Value Decomposition - Part A

Lecture 60 - Singular Value Decomposition - Part B

Lecture 61 - Singular Value Decomposition - Part C

Lecture 62 - Algebraic and geometric multiplicities - Part A

Lecture 63 - Algebraic and geometric multiplicities - Part B

Lecture 64 - A-Invariant Subspaces - Part A

Lecture 65 - A-Invariant Subspaces - Part B

Lecture 66 - A-Invariant Subspaces - Part C

Lecture 67 - Minimal Polynomial-I - Part A

Lecture 68 - Minimal Polynomial-I - Part B

Lecture 69 - Minimal Polynomial-I - Part C

Lecture 70 - Minimal Polynomial-I - Part D

Lecture 71 - Minimal Polynomial-II - Part A

Lecture 72 - Minimal Polynomial-II - Part B

Lecture 73 - Minimal Polynomial-II - Part C

Lecture 74 - Minimal Polynomial-II - Part D

Lecture 75 - Cayley Hamilton Theorem - Part A

Lecture 76 - Cayley Hamilton Theorem - Part B

Lecture 77 - Cayley Hamilton Theorem - Part C

Lecture 78 - Jordan Canonical Form - Part A

Lecture 79 - Jordan Canonical Form - Part B

Lecture 80 - Jordan Canonical Form - Part C

Lecture 81 - Algebraic Graph Theory and Consensus - Part A

Lecture 82 - Algebraic Graph Theory and Consensus - Part B

Lecture 83 - Algebraic Graph Theory and Consensus - Part C

Lecture 84 - Positive Matrices and Leontieff's Model - Part A

Lecture 85 - Positive Matrices and Leontieff's Model - Part B

NPTEL : NOC:Digital Communication using GNU Radio (Electrical Engineering)

Co-ordinators : Prof. Kumar Appaiah

Lecture 32 - End-to-end Digital Communication System Simulation in GNU Radio

Lecture 33 - Parameter Estimation for Practical Receivers - Part 1

Lecture 34 - Parameter Estimation for Practical Receivers - Part 2

Lecture 35 - Phase Locked Loop and Differential Modulation

Lecture 36 - Maximum Likelihood delay estimate for a single symbol in GNU Radio

Lecture 37 - Maximum Likelihood delay estimate for multiple symbols in GNU Radio

Lecture 38 - Phase offse estimation in GNU Radio

Lecture 39 - Phase Locked Loop in GNU Radio

Lecture 40 - Costas Loop and Differential PSK in GNU Radio

Lecture 41 - Channel Equalisation

Lecture 42 - Detection Strategy for Dispersive Channels

Lecture 43 - Maximum Likelihood sequence estimation: Viterbi Algorithm

Lecture 44 - Suboptimal Channel Equalisation: Zero-forcing Receiver

Lecture 45 - Zero forcing Receiver in GNU Radio

Lecture 46 - Suboptimal Channel Equalisation: Linear Minimum mean-square error receiver

Lecture 47 - LMMSE Receiver in GNU Radio

Lecture 48 - Parallelising Frequency Selective Channels

Lecture 49 - Orthogonal Frequency Division Multiplexing (OFDM)

Lecture 50 - OFDM in the prescence of dispersive channels

Lecture 51 - Equalisation using OFDM in GNU Radio

Lecture 52 - Error Control Coding: Parity Check Codes

Lecture 53 - Error Control Coding: Repetition Codes

Lecture 54 - Error Control Coding: Linear Block Codes

Lecture 55 - Repetition Codes in GNU Radio

Lecture 56 - Error Control Coding: Perfect Codes

Lecture 57 - Error Control Coding: Hamming Codes

Lecture 58 - (7,4) Hamming Code in GNU Radio

Lecture 59 - Rate and error-free Communication

Lecture 60 - Quantisation

Lecture 61 - Visualising Quantisation in GNU Radio

Lecture 62 - Course Summary

NPTEL : NOC:Network Security (Electrical Engineering)

Co-ordinators : Prof. Gaurav S. Kasbekar

NPTEL : NOC:Behavioural Theory of Systems with a View Toward Data Driven Control (Electrical Engineering)

Co-ordinators : Prof. Debasattam Pal

NPTEL : Circuit Theory (Electrical Engineering)

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

NPTEL : Control Engineering (Prof. M. Gopal) (Electrical Engineering)

Co-ordinators : Prof. M. Gopal

NPTEL : Embedded Systems (Electrical Engineering)

Co-ordinators : Prof. Santanu Chaudhary

Lecture 1 - Embedded Systems: Introduction

Lecture 2 - Embedded Hardware

Lecture 3 - PIC: Instruction Set

Lecture 4 - PIC Peripherals On Chip

Lecture 5 - ARM Processor

Lecture 6 - More ARM Instructions

Lecture 7 - ARM: Interrupt Processing

Lecture 8 - Digital Signal Processors

Lecture 9 - More on DSP Processors

Lecture 10 - System On Chip (SOC)

Lecture 11 - Memory

Lecture 12 - Memory Organization

Lecture 13 - Virtual Memory and Memory Management Unit

Lecture 14 - Bus Structure

Lecture 15 - Bus Structure - 2

Lecture 16 - Bus Structure - 3 Serial Interfaces

Lecture 17 - Serial Interfaces

Lecture 18 - Power Aware Architecture

Lecture 19 - Software for Embedded Systems

Lecture 20 - Fundamentals of Embedded Operating Systems

Lecture 21 - Scheduling Policies

Lecture 22 - Resource Management

Lecture 23 - Embedded - OS

Lecture 24 - Networked Embedded Systems - I

Lecture 25 - Networked Embedded Systems - II

Lecture 26 - Networked Embedded Systems - III

Lecture 27 - Networked Embedded Systems - IV

Lecture 28 - Designing Embedded Systems - I

Lecture 29 - Designing Embedded Systems - II

Lecture 30 - Designing Embedded Systems- III

Lecture 31 - Embedded System Design - IV

NPTEL : Power System Generation, Transmission and Distribution (Encapsulated from earlier Video) (Electrical Engineering)

Co-ordinators : Prof. D.P. Kothari

NPTEL : Power System Dynamics (Electrical Engineering)

Co-ordinators : Dr. M.L. Kothari

NPTEL : Analog Electronic Circuits (Electrical Engineering)

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

NPTEL : Digital Communication (Electrical Engineering)

Co-ordinators : Prof. Surendra Prasad

NPTEL : Introduction To Electronic Circuits (Electrical Engineering)

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

NPTEL : NOC:Analog Electronic Circuit (Electrical Engineering)

Co-ordinators : Dr. Shouribrata Chatterjee

NPTEL : NOC:Nonlinear and Adaptive Control (Electrical Engineering)

Co-ordinators : Prof. Shubhendu Bhasin

NPTEL : NOC:Information Theory, Coding and Cryptography (Electrical Engineering)

Co-ordinators : Prof. Ranjan Bose

NPTEL : Engineering Electromagnetics (Electrical Engineering)

Co-ordinators : Prof. Sheel Aditya

NPTEL : NOC:Principles of Digital Communications (2018) (Electrical Engineering)

Co-ordinators : Prof. Abhishek Dixit

NPTEL : NOC:Electric Vehicles - Part 1 (Electrical Engineering)

Co-ordinators : Prof. Amit Jain

NPTEL : NOC:Power Electronics (Electrical Engineering)

Co-ordinators : Prof. G.Bhuvaneshwari

NPTEL : NOC:Electrical Machines (Electrical Engineering)

Co-ordinators : Prof. G.Bhuvaneshwari

NPTEL : Special Electromechanical Systems (Electrical Engineering)

Co-ordinators : Prof. S.S. Murthy

NPTEL : NOC:High Power Multilevel Converters - Analysis, Design and Operational Issues (Electrical Engineering)

Co-ordinators : Prof. Anand Rup

NPTEL : NOC:Introduction to Embedded System Design (Electrical Engineering)

Co-ordinators : Prof. Badri N Subudhi, Prof.Dhananjay V. Gadre

NPTEL : NOC:Power Quality (Electrical Engineering)

Co-ordinators : Prof. Bhim Singh

NPTEL : NOC:Introduction to Electrical Engineering (Electrical Engineering)

Co-ordinators : Prof. Bhim Singh

Lecture 32

Lecture 33

Lecture 34

Lecture 35

Lecture 36

Lecture 37

Lecture 38

Lecture 39

Lecture 40

Lecture 41

Lecture 42

NPTEL : NOC:Transducers for Instrumentation (Electrical Engineering)

Co-ordinators : Ankur Gupta

NPTEL : NOC:Computer-Aided Design of Electrical Machines (Electrical Engineering)

Co-ordinators : Prof. Bhim Singh

NPTEL : NOC:Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software (Electrical Engineering)

Co-ordinators : Prof. Ankur Gupta

Lecture 1 - Introduction

Lecture 2 - Passive Circuit Elements: R, L and C

Lecture 3 - Resistor color coding, Surface mount capacitors and inductors on PCBs

Lecture 4 - Active Circuit Elements: MOSFET, BJTs

Lecture 5 - Network Analysis: Kirchoff's Laws

Lecture 6 - Network Theorems: Thevenin, Norton, Maximum Power Transfer etc

Lecture 7 - Circuit Simulations using SPICE : Operating point analysis

Lecture 8 - DC Simulations and Importing Third-Party Models

Lecture 9 - Small-Signal Simulations, Transient Simulations

Lecture 10 - PCB Substrate and layers

Lecture 11 - Interconnect design

Lecture 12 - CMOS inverter basics

Lecture 13 - CMOS inverter design

Lecture 14 - Combinational Circuit Design - Part 1

Lecture 15 - Combinational Circuit Design - Part 2

Lecture 16 - Dynamic Logic Circuit Design

Lecture 17 - Sequential Logic Circuit Design

Lecture 18 - Digital Design : Boolean Algebra

Lecture 19 - Logic Families, Component Datasheets

Lecture 20 - TTL/CMOS logic Interfacing Constraints

Lecture 21 - Hardware Description Languages : VHDL and Verilog

Lecture 22 - Introduction to Verilog Simulations Software

Lecture 23 - Combinational Circuit Simulation using iVerilog

Lecture 24 - Adders, Multiplexer Simulation using iVerilog

Lecture 25 - High-Speed PCBs

Lecture 26 - Signal Integrity in PCBs

Lecture 27 - Signal Cross-Talk, Skews and Jitter in PCBs

Lecture 28 - KiCad Software Workflow

Lecture 29 - KiCad Design Modules

Lecture 30 - KiCad Schematic Design Steps

Lecture 31 - KiCad PCB Design Steps

NPTEL : NOC:Advance Power Electronics (Electrical Engineering)

Co-ordinators : Prof. Bhim Singh

Lecture 1 - Introduction

Lecture 2 - Power Semiconductor Devices

Lecture 3 - Power Module and Gate Circuits

Lecture 4 - Thermal Design and DSP Application

Lecture 5 - Choppers

Lecture 6 - Non-Isolated DC-DC Converters

Lecture 7 - Isolated DC-DC Converter

Lecture 8 - Switch Mode Power Supplies

Lecture 9 - AC-DC Converters

Lecture 10 - Three-Phase AC-DC Converter

Lecture 11 - Lighting and Welding Systems

Lecture 12 - EV Charger Types, Design and various Topologies

Lecture 13 - Power Quality

Lecture 14 - Power Quality Definitions

Lecture 15 - Introduction to High Voltage DC (HVDC) Transmission

Lecture 16 - Harmonics Generation, Analysis and Elimination in HVDC

Lecture 17 - Multi-pulse and Multilevel VSC Based Flexible HVDC System

Lecture 18 - Single Phase Voltage Source Inverter

Lecture 19 - Three Phase Voltage Source Inverter

Lecture 20 - Current Source Inverter

Lecture 21 - Multi-Pulse Converters

Lecture 22 - Multi-Pulse Converters (Continued...)

Lecture 23 - Multilevel Inverters

Lecture 24 - Modular Multilevel Converters

Lecture 25 - Introduction to Inductor Motor Drive and their Power Quality Improvement

Lecture 26 - Power Quality Improvement in Multi-Pulse Converter Fed Multilevel Inverter Based Induction Motor Drives

Lecture 27 - Introduction and Operating Principle of Resonant Converter

Lecture 28 - Resonant Inverters

Lecture 29 - Class E Resonant Converters and Zero Voltage Switching Converters

Lecture 30 - Zero Current Switching Converters

Lecture 31 - LLC, Multi-Resonant and Phase Controlled Resonant Converters

NPTEL : Advanced Control Systems (Electrical Engineering)

Co-ordinators : Prof. S. Majhi

NPTEL : NOC:Optimization Techniques for Digital VLSI Design (Electrical Engineering)

Co-ordinators : Dr. Santosh Biswas, Prof. Chandan Karfa

NPTEL : NOC:Advanced Topics in Probability and Random Processes (Electrical Engineering)

Co-ordinators : Prof. Prabin K Bora

NPTEL : NOC:Microwave Engineering (Electrical Engineering)

Co-ordinators : Dr. Ratnajit Bhattacharjee

NPTEL : NOC:Microprocessors and Interfacing (Electrical Engineering)

Co-ordinators : Prof. Shaik Rafi Ahamed

NPTEL : NOC:Statistical Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Prabin Kumar Bora

NPTEL : NOC:Computer Vision and Image Processing - Fundamentals and Applications (Electrical Engineering)

Co-ordinators : Prof. M. K. Bhuyan

NPTEL : NOC:System Design through VERILOG (Electrical Engineering)

Co-ordinators : Prof. Shaik Rafi Ahamed

NPTEL : NOC:Usability Engineering (Electrical Engineering)

Co-ordinators : Prof. Debayan Dhar

Lecture 1 - Introduction to Usability

Lecture 2 - Usability - Historical Foundations

Lecture 3 - Standard Terminologies

Lecture 4 - Elements of User Experience

Lecture 5 - Usability in software development - I

Lecture 6 - Usability in software development - II

Lecture 7 - User Centered Design Process - I

Lecture 8 - User Centered Design Process - II

Lecture 9 - User Centered Design Process - III

Lecture 10 - Requirement Analysis - I (A)

Lecture 11 - Requirement Analysis - I (B)

Lecture 12 - Requirement Analysis - I (C)

Lecture 13 - Requirement Analysis - I (D)

Lecture 14 - Requirement Analysis - I (E)

Lecture 15 - Requirement Analysis - I (F)

Lecture 16 - Requirement Analysis - II (A)

Lecture 17 - Requirement Analysis - II (B)

Lecture 18 - Requirement Analysis - II (C)

Lecture 19 - Requirement Analysis - II (D)

Lecture 20 - Requirement Analysis - III (A)

Lecture 21 - Eye Tracker

Lecture 22 - Demonstration of an Eye tracking device

Lecture 23 - Requirement Analysis - III (B)

Lecture 24 - Mapping Experiences

Lecture 25 - Cognitive Issues - I

Lecture 26 - Cognitive Issues - II

Lecture 27 - Cognitive Issues - III

Lecture 28 - Cognitive Issues - IV

Lecture 29 - Competitive analysis and preparing for design briefing - I

Lecture 30 - Competitive analysis and preparing for design briefing - II

Lecture 31 - Conceptualization and Prototyping - I (A)

Lecture 32 - Conceptualization and Prototyping - I (B)

Lecture 33 - Conceptualization and Prototyping - I (C)

Lecture 34 - Conceptualization and Prototyping - II (A)

Lecture 35 - Conceptualization and Prototyping - II (B)

Lecture 36 - Usability heuristics and testing - I

Lecture 37 - Usability heuristics and testing - II

Lecture 38 - Usability heuristics and testing - III

Lecture 39 - Usability Testing (A)

Lecture 40 - Usability Testing (B)

Lecture 41 - Usability Testing (C)

Lecture 42 - UI/UX design based on Garret model: a case study

Lecture 43 - Effective contextual enquiry

Lecture 44 - Contextual enquiry: case study

NPTEL : NOC:Probability and Random Processes (Electrical Engineering)

Co-ordinators : Prof. Ribhu, Prof. Rohit Sinha

NPTEL : NOC:Simulation of Communication Systems using Matlab (Electrical Engineering)

Co-ordinators : Dr. Ribhu

NPTEL : NOC:Machine Learning and Deep Learning - Fundamentals and Applications (Electrical Engineering)

Co-ordinators : Prof. M.K. Bhuyan

NPTEL : NOC:Integrated Circuits and Applications (Electrical Engineering)

Co-ordinators : Prof. Shaik Rafi Ahamed

Lecture 1 - Introduction to Integrated Circuits

Lecture 2 - Summing and Difference Amplifiers

Lecture 3 - Instrumentation Amplifier

Lecture 4 - Integrator and Diffrentiator

Lecture 5 - Precision Half Wave and Full Wave Rectifiers

Lecture 6 - Clipper and Clamper circuits

Lecture 7 - Logarithmic and Anti-logarithmic Amplifiers

Lecture 8 - DC Characteristics (Offset Currents and Voltages)

Lecture 9 - AC Charcterstics (Frequency Response)

Lecture 10 - AC Charcterstics (Compensation Techniques and Slew Rate)

Lecture 11 - Examples on Design of Adder and Subtractor Circuits

Lecture 12 - Examples on Transfer Function Computation

Lecture 13 - Examples on Instrumentation Amplifier

Lecture 14 - Examples on CMRR Computation

Lecture 15 - First Order Low Pass Filter

Lecture 16 - Second Order Low Pass Filter

Lecture 17 - Design of Butterworth Low Pass Filter

Lecture 18 - Design of Butterworth High Pass Filter

Lecture 19 - Design of Band Pass Filter

Lecture 20 - Design of Band Stop Filter

Lecture 21 - All Pass Filter

Lecture 22 - RC Phase Shift Oscillator

Lecture 23 - Wien Bridge, Colpitt's and Hartley Oscillators

Lecture 24 - Comparator and Schmitt Trigger Circuits

Lecture 25 - Square Wave and Triangular Waveform Generators

Lecture 26 - Monostable operation

Lecture 27 - Monostable applications - I

Lecture 28 - Monostable applications - II

Lecture 29 - Astable operation

Lecture 30 - Phase detectors

Lecture 31 - Voltage Controlled oscillator

NPTEL : NOC:Photonic Crystals: Fundamentals and Applications (Electrical Engineering)

Co-ordinators : Prof. Debabrata Sikdar

Lecture 1 - Motivation and Introduction to Photonic Crystals

Lecture 2 - Overview of Photonic Crystal technology

Lecture 3 - Fundamentals of EM theory of Light

Lecture 4 - Electromagnetic Properties of Materials

Lecture 5 - Scaling Properties of Maxwell's Equaltions

Lecture 6 - Electromagnetism as an Eigenvalue Problem

Lecture 7 - Symmetries for Classification of EM Modes

Lecture 8 - Real and Reciprocal lattices

Lecture 9 - Photonic band Structure: Computation and Analysis

Lecture 10 - Fundamentals of 1D Photonic Crystal

Lecture 11 - Analysis and Engineering of 1D Photonic Band Structure

Lecture 12 - Applications of 1D Photonic Crystal

Lecture 13 - Fundamentals of 2D photonic crystals

Lecture 14 - Analysis and Engineering of 2D Photonic Band Structure

Lecture 15 - Applications of 2D photonic crystals

Lecture 16 - Overview of different 3D Photonic Crystals

Lecture 17 - Crystals with complete bandgap

Lecture 18 - Applications of 2D and 3D photonic crystals

Lecture 19 - Overview and Modelling of Periodic Dielectric Waveguides

Lecture 20 - Point Defects in Periodic Dielectric Waveguides and Q-factors of Lossy Cavities

Lecture 21 - Applications: Fiber Bragg Grating

Lecture 22 - Overview of Photonic Crystal Slabs

Lecture 23 - Different types of defects in Photonic Cruystal Slabs

Lecture 24 - Engineering High-Q resonant Cavity

Lecture 25 - Overview of photonic crystal fibers

Lecture 26 - Index-guiding photonic crystal fibers

Lecture 27 - Band-gap guidance in Holey Fibers

Lecture 28 - Overview of Bragg Fibers

Lecture 29 - Losses in Hollow-core Fibers

Lecture 30 - Applications of Photonic Crystal Fibers

Lecture 31 - Designing a mirror, waveguide, acavity

NPTEL : Advanced Electric Drives (Electrical Engineering)

Co-ordinators : Dr. S.P. Das

NPTEL : High Voltage DC Transmission (Electrical Engineering)

Co-ordinators : Dr. S.N. Singh

Lecture 1 - High Voltage DC Transmission

Lecture 2 - High Voltage DC Transmission

Lecture 3 - High Voltage DC Transmission

Lecture 4 - High Voltage DC Transmission

Lecture 5 - High Voltage DC Transmission

Lecture 6 - High Voltage DC Transmission

Lecture 7 - High Voltage DC Transmission

Lecture 8 - High Voltage DC Transmission

Lecture 9 - High Voltage DC Transmission

Lecture 10 - High Voltage DC Transmission

Lecture 11 - High Voltage DC Transmission

Lecture 12 - High Voltage DC Transmission

Lecture 13 - High Voltage DC Transmission

Lecture 14 - High Voltage DC Transmission

Lecture 15 - High Voltage DC Transmission

Lecture 16 - High Voltage DC Transmission

Lecture 17 - High Voltage DC Transmission

Lecture 18 - High Voltage DC Transmission

Lecture 19 - High Voltage DC Transmission

Lecture 20 - High Voltage DC Transmission

Lecture 21 - High Voltage DC Transmission

Lecture 22 - High Voltage DC Transmission

Lecture 23 - High Voltage DC Transmission

Lecture 24 - High Voltage DC Transmission

Lecture 25 - High Voltage DC Transmission

Lecture 26 - High Voltage DC Transmission

Lecture 27 - High Voltage DC Transmission

Lecture 28 - High Voltage DC Transmission

Lecture 29 - High Voltage DC Transmission

Lecture 30 - High Voltage DC Transmission

Lecture 31 - High Voltage DC Transmission

NPTEL : Intelligent Systems and Control (Electrical Engineering)

Co-ordinators : Prof. Laxmidhar Behera

Lecture 32 - Linear controllers using T-S fuzzy model

NPTEL : Power Systems Operation and Control (Electrical Engineering)

Co-ordinators : Dr. S.N. Singh

NPTEL : NOC:Electromagnetic theory (Electrical Engineering)

Co-ordinators : Dr. Pradeep Kumar K

Lecture 32 - Solution of LaplaceÂ's equation-IV

Lecture 33 - Introduction of magnetic field

Lecture 34 - Biot savart law and its application

Lecture 35 - Biot savart lawandits application-II

Lecture 36 - Magnetic vector potential

Lecture 37 - Magnetic force, torque and dipole

Lecture 38 - Magnetic force, torque and dipole (Continued...)

Lecture 39 - Magnetic materials-I

Lecture 40 - Magnetic materials-I (Continued...) and Magnetic moment

Lecture 41 - Magnetic materials-I (Continued...) and Boundary condition for Magnetic fields

Lecture 42 - Inductor and calculation of inductance for different shapes

Lecture 43 - Inductor and calculation of inductance for different shapes (Continued...)

Lecture 44 - Faradays law and its application-I

Lecture 45 - Faradays law and its application-II

Lecture 46 - Displacement current

Lecture 47 - MaxwellÂ's equation

Lecture 48 - Wave propagation

Lecture 49 - Solution of Helmholtz equation

Lecture 50 - Uniform plane waves

Lecture 51 - Polarization and Poynting Vector

Lecture 52 - Wave reflections (Normal incidence)

Lecture 53 - Waves in imperfect dielectrics and Good conductors

Lecture 54 - Skin depth/effect

Lecture 55 - Oblique incidence of waves

Lecture 56 - Oblique incidence of waves (Continued...)

Lecture 57 - Transmission line

Lecture 58 - Transmission line model

Lecture 59 - Steady state sinusoidal response of T-line-I

Lecture 60 - Steady state sinusoidal response of T-line-II

Lecture 61 - Steady state sinusoidal response of T-line-IIand Smith chart

Lecture 62 - Application of smith chart-I

Lecture 63 - Application of smith chart-II

Lecture 64 - Impedance matching

NPTEL : NOC:Principles of Communication - Part 1 (Electrical Engineering)

Co-ordinators : Prof. Aditya K. Jagannatham

Lecture 31 - Indirect Method for Generation of FM Signals - Generation of Wideband FM Signal through Frequency Multiplication

Lecture 32 - Spectrum of Frequency Modulated (FM) Signals

Lecture 33 - Bandwidth of Frequency Modulated (FM) Signals - Carson's Rule

Lecture 34 - Demodulation of Frequency Modulated (FM) Signals, Condition of Envelope Detection

Lecture 35 - Analog to Digital Conversion of Signals and Introduction to Sampling

Lecture 36 - Spectrum of Sampled Signal, Aliasing and Nyquist Sampling Theorem

Lecture 37 - Ideal Impluse Train Sampling, Reconstruction of Original Signal from Samples, Sinc Interpolation

Lecture 38 - Introduction to Pulse Amplitude Modulation (PAM), Sample and Hold, Flat Top Sampling

Lecture 39 - Pulse Amplitude Modulation (PAM), Spectrum of PAM Signal , Reconstruction of Original Signal from PAM Signal, Equalization

Lecture 40 - Introduction to Quantization, Uniform Quantizer, Mid- Tread Quantizer

Lecture 41 - Quantization, Mid- Rise Quantizer, PDF and Power of Quantization Noise, Quantization Noise Power versus Quantizer Resolution

Lecture 42 - Introduction to Lloyd- Max Quantization Algorithm, Optimal Quantizer Design

Lecture 43 - Lloyd- Max Quantization Algorithm, Iterative Computation of Optimal Quantization Levels and Intervals

Lecture 44 - Companding for Non- Uniform Quantization, Mu-law Compressor, A- Law Compressor

Lecture 45 - Introduction to Delta Modulation, One-bit Quantizer

Lecture 46 - Signal Reconstruction in Delta Modulation, Schematic Diagrams, Slope Overload Distortion and Granular Noise

Lecture 47 - Differential Pulse Coded Modulation (DPCM), DPCM Signal Reconstruction and Schematic Diagram

Lecture 48 - Frequency Mixing and Translation in Communication Systems, Heterodyne and Super Heterodyne Receivers

Lecture 49 - Frequency Translation and Super Heterodyne Receivers, Problem of Image Frequency

Lecture 50 - Frequency Division Multiplexing (FDM), Carrier Spacing in FDM

Lecture 51 - Time Division Multiplexing (TDM), Operation of TDM, Sample Spacing in TDM

Lecture 52 - Bandwidth Requirements for Time Division Multiplexing (TDM), The T1 TDM System : A Case Study

NPTEL : NOC:An Introduction to Coding Theory (Electrical Engineering)

Co-ordinators : Dr. Adrish Banerjee

NPTEL : NOC:Principles of Communication Systems - Part II (Electrical Engineering)

Co-ordinators : Prof. Aditya K. Jagannatham

Lecture 29 - Maximum Entropy of Source with M-ary Alphabet, Concave/Convex Functions and Jensens Inequality

Lecture 30 - Joint Entropy , Definition of Joint Entropy of Two Sources and Simple Examples for Joint Entropy Computation

Lecture 31 - Properties of Joint Entropy and Relation between Joint Entropy and Marginal Entropies

Lecture 32 - Conditional Entropy, Example of Conditional Entropy and Properties of Conditional Entropy

Lecture 33 - Mutual Information, Diagrammatic Representation and Properties of Mutual Information

Lecture 34 - Simple Example of Mutual Information and Practical Example of Mutual Information-Binary Symmetric Channel

Lecture 35 - Channel Capacity, Implications of Channel Capacity, Claude E. Shannon- Father of Information Theory and Example of Capacity of Binary Symmetric Channel

Lecture 36 - Differential Entropy and Example for Uniform Probability Density function

Lecture 37 - Differential Entropy of Gaussian Source and Insights

Lecture 38 - Joint Conditional/ Differential Entropies and Mutual Information

Lecture 39 - Capacity of Gaussian channel - Part I

Lecture 40 - Capacity of Gaussian Channel - Part-II, Practical Implications and Maximum rate in bits\sec

Lecture 41 - Introduction to Source Coding and Data Compression, Variable Length codes and Unique Decodability

Lecture 42 - Uniquely Decodable Codes, Prefix-free code, Instantaneous Code and Average Code length

Lecture 43 - Binary Tree Representation of Code, Example and Kraft Inequality

Lecture 44 - Lower Bound on Average Code Length and Kullback-Leibler Divergence

Lecture 45 - Optimal Code length, Constrained Optimization and Morse Code Example

Lecture 46 - Approaching Lower Bound on Average code length and Block Coding

Lecture 47 - Huffman Code, Algorithm, Example and Average Code Length

Lecture 48 - Introduction to channel coding, Rate of Code, Repetition Code and Hamming Distance

Lecture 49 - Introduction to Convolutional Codes, Binary Field Arithmetic and Linear Codes

Lecture 50 - Example of Convolutional Code Output and Convolution Operation for Code generation

Lecture 51 - Matrix Representation of Convolutional Codes, Generator Matrix, Transform Domain Representation and Shift Register Architecture

Lecture 52 - State Diagram Representation of Convolutional Code, State transitions and Example of Code Generation using State transitions

Lecture 53 - Trellis Representation of Convolutional Code and Valid Code Words

Lecture 54 - Decoding of the Convolutional Code, Minimum Hamming distance and Maximum Likelihood Codeword Estimate

Lecture 55 - Principle of Decoding of Convolutional code

Lecture 56 - Viterbi Decoder for Maximum Likelihood Decoding of Convolutional Code Using Trellis Representation, Branch Metric Calculation, State Metric Calculation and Example

NPTEL : NOC:Applied Engineering Electromagnetics (Electrical Engineering)

Co-ordinators : Dr. Pradeep Kumar K

NPTEL : NOC:Principles of Signals and Systems (Electrical Engineering)

Co-ordinators : Prof. Aditya K. Jagannatham

Lecture 31 - Z-Transform Examples - IV

Lecture 32 - Inverse Z-Transform

Lecture 33 - Fourier Analysis Introduction

Lecture 34 - Complex Exponential and Trigonometric FS

Lecture 35 - Conditions for Existence of FS

Lecture 36 - Fourier Transform (FT) Introduction

Lecture 37 - Properties of Fourier Transform - I

Lecture 38 - Properties of Fourier Transform - II

Lecture 39 - Fourier Transform - Parsevalâ€™s Relation

Lecture 40 - Fourier Transform of LTI Systems

Lecture 41 - FT- Ideal and Non-Ideal Filters

Lecture 42 - Fourier Analysis Examples - I

Lecture 43 - Fourier Analysis Examples - II

Lecture 44 - Fourier Analysis Examples - III

Lecture 45 - Fourier Analysis Examples - IV

Lecture 46 - Fourier Analysis Examples - V

Lecture 47 - Fourier Analysis Examples - VI

Lecture 48 - Fourier Analysis Bode Plot - I

Lecture 49 - Fourier Analysis Bode Plot - II

Lecture 50 - Fourier Transform Examples: Filtering - Ideal Low Pass Filter

Lecture 51 - Fourier Transform Problems: Unit Step Response of RC Circuit, Sampling of Continuous Signal

Lecture 52 - Sampling: Spectrum of Sampled Signal, Nyquist Criterion

Lecture 53 - Sampling: Reconstruction from Sampled Signal

Lecture 54 - Fourier Analysis of Discrete Time Signals and Systems - Introduction

Lecture 55 - Fourier Analysis of Discrete Time Signals - Duality, Parsevalâ€™s Theorem

Lecture 56 - Discrete Time Fourier Transform: Definition, Inverse DTFT, Convergence, Relation between DTFT and z-Transform, DTFT of Common Signals

Lecture 57 - Discrete Time Fourier Transform: Properties of DTFT - Linearity, Time Shifting, Frequency Shifting, Conjugation, Time-Reversal, Duality

Lecture 58 - Discrete Time Fourier Transform: Properties of DTFT - Differentiation in Frequency, Difference in Time, Convolution, Multiplication, Parsevalâ€™s Relation

Lecture 59 - DTFT: Discrete Time LTI Systems - LTI Systems Characterized by Difference Equations

Lecture 60 - Discrete Fourier Transform - Definition, Inverse DFT, Relation between DFT and DFS, Relation between DFT and DTFT, Properties - Linearity, Time Shifting

Lecture 61 - Discrete Fourier Transform: Properties - Conjugation, Frequency Shift, Duality, Circular Convolution, Multiplication, Parsevalâ€™s Relation, Example Problems for Fourier Analysis of Discrete Time Signals

NPTEL : NOC:Applied Optimization for Wireless, Machine Learning, Big Data (Electrical Engineering)

Co-ordinators : Prof. Aditya K. Jagannatham

Lecture 32 - Examples on Test for Convexity, Quasi-Convexity

Lecture 33 - Examples on Convex Functions

Lecture 34 - Practical Application: Beamforming in Multi-antenna Wireless Communication

Lecture 35 - Practical Application: Maximal Ratio Combiner for Wireless Systems

Lecture 36 - Practical Application: Multi-antenna Beamforming with Interfering User

Lecture 37 - Practical Application: Zero-Forcing (ZF) Beamforming with Interfering User

Lecture 38 - Practical Application: Robust Beamforming With Channel Uncertainity for Wireless Systems

Lecture 39 - Practical Application: Robust Beamformer Design for Wireless Systems

Lecture 40 - Practical Application: Detailed Solution for Robust Beamformer Computation in Wireless Systems Text

Lecture 41 - Linear modeling and Approximation Problems: Least Squares

Lecture 42 - Geometric Intuition for Least Squares

Lecture 43 - Practical Application: Multi antenna channel estimation

Lecture 44 - Practical Application:Image deblurring

Lecture 45 - Least Norm Signal Estimation

Lecture 46 - Regularization: Least Squares + Least Norm

Lecture 47 - Convex Optimization Problem representation: Canonical form, Epigraph form

Lecture 48 - Linear Program Practical Application: Base Station Co-operation

Lecture 49 - Stochastic Linear Program,Gaussian Uncertainty

Lecture 50 - Practical Application: Multiple Input Multiple Output (MIMO) Beamforming

Lecture 51 - Practical Application: Multiple Input Multiple Output (MIMO) Beamformer Design

Lecture 52 - Practical Application: Co-operative Communication, Overview and various Protocols used

Lecture 53 - Practical Application: Probability of Error Computation for Co-operative Communication

Lecture 54 - Practical Application:Optimal power allocation factor determination for Co-operative Communication

Lecture 55 - Practical Application: Compressive Sensing

Lecture 56 - Practical Application

Lecture 57 - Practical Application- Orthogonal Matching Pursuit (OMP) algorithm for Compressive Sensing

Lecture 58 - Example Problem: Orthogonal Matching Pursuit (OMP) algorithm

Lecture 59 - Practical Application : L1 norm minimization and regularization approach for Compressive Sensing Optimization problem

Lecture 60 - Practical Application of Machine Learning and Artificial Intelligence:Linear Classification, Overview and Motivation

Lecture 61 - Practical Application: Linear Classifier (Support Vector Machine) Design

Lecture 62 - Practical Application: Approximate Classifier Design

Lecture 63 - Concept of Duality

Lecture 64 - Relation between optimal value of Primal and Dual Problems, concepts of Duality gap and Strong Duality

NPTEL : NOC:Fiber-Optic Communication Systems and Techniques (Electrical Engineering)

Co-ordinators : Dr. Pradeep Kumar K

NPTEL : NOC:Electromagnetic Waves in Guided and Wireless Media (Electrical Engineering)

Co-ordinators : Dr. Pradeep Kumar K

NPTEL : NOC:Basic Electric Circuits (Electrical Engineering)

Co-ordinators : Prof. Ankush Sharma

NPTEL : NOC:Fundamentals of Electric Drives (Electrical Engineering)

Co-ordinators : Prof. Shyama Prasad Das

NPTEL : NOC:Fuzzy Sets, Logic and Systems and Applications (Electrical Engineering)

Co-ordinators : Prof. Nishchal K Verma

NPTEL : NOC:Peer to Peer Networks (Electrical Engineering)

Co-ordinators : Prof. Yatindra N Singh

NPTEL : NOC:Applied Linear Algebra for Signal Processing, Data Analytics and Machine Learning (Electrical Engineering)

Co-ordinators : Prof. Aditya K. Jagannatham

Lecture 1 - Vector Properties: Addition, Linear Combination, Inner Product, Orthogonality, Norm

Lecture 2 - Vectors: Unit Norm Vector, Cauchy-Schwarz inequality, Radar Application

Lecture 3 - Inner Product Application: Beamforming in Wireless Communication Systems

Lecture 4 - Matrices, Definition, Addition and Multiplication of Matrices

Lecture 5 - Matrix: Column Space, Linear Independence, Rank of Matrix, Gaussian Elimination

Lecture 6 - Matrix: Determinant, Inverse Computation, Adjoint, Cofactor Concepts

Lecture 7 - Applications of Matrices: Solution of System of Linear equations, MIMO Wireless Technology

Lecture 8 - Applications of Matrices: Electric Circuits, Traffic flows

Lecture 9 - Applications of Matrices: Graph Theory, Social Networks, Dominance Directed Graph, Influential Node

Lecture 10 - Null Space of Matrix: Definition, Rank-Nullity Theorem, Application in Electric Circuits

Lecture 11 - Gram-Schmidt Orthogonalization

Lecture 12 - Gaussian Random Variable: Definition, Mean, Variance, Multivariate Gaussian, Covariance Matrix

Lecture 13 - Linear Transformation of Gaussian Random Vectors

Lecture 14 - Machine Learning Application: Gaussian Classification

Lecture 15 - Eigenvalue: Definition, Characteristic Equation, Eigenvalue Decomposition

Lecture 16 - Special Matrices: Rotation and Unitary Matrices, Application: Alamouti Code

Lecture 17 - Positive Semi-definite (PSD) Matrices: Definition, Properties, Eigenvalue Decomposition

Lecture 18 - Positive Semidefinite Matrix: Example and Illustration of Eigenvalue Decomposition

Lecture 19 - Machine Learning Application: Principle Component Analysis (PCA)

Lecture 20 - Computer Vision Application: Face Recognition, Eigenfaces

Lecture 21 - Least Squares (LS) Solution, Pseudo-Inverse Concept

Lecture 22 - Least Squares (LS) via Principle of Orthogonality, Projection Matrix, Properties

Lecture 23 - Application: Pseudo-Inverse and MIMO Zero Forcing (ZF) Receiver

Lecture 24 - Wireless Application: Multi-Antenna Channel Estimation

Lecture 25 - Machine Learning Application: Linear Regression

Lecture 26 - Computation Mathematics Application: Polynomial Fitting

Lecture 27 - Least Norm Solution

Lecture 28 - Wireless Application: Multi-user Beamforming

Lecture 29 - Singular Value Decomposition (SVD): Definition, Properties, Example

Lecture 30 - SVD Application in MIMO Wireless Technology: Spatial-Multiplexing and High Data Rates

Lecture 31 - SVD for MIMO wireless optimization, water-filling algorithm, optimal power allocation

NPTEL : NOC:Economic Operations and Control of Power Systems (Electrical Engineering)

Co-ordinators : Prof. Gururaj Mirle Vishwanath, Prof. Narayana Prasad Padhy

NPTEL : NOC:Digital Switching (Electrical Engineering)

Co-ordinators : Prof. Yatindra N Singh

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

NPTEL : NOC:Analog VLSI Design (Electrical Engineering)

Co-ordinators : Prof. Imon Mondal

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

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Lecture 19

Lecture 20

Lecture 21

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Lecture 29

Lecture 30

Lecture 31

Lecture 32

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Lecture 34

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Lecture 36

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Lecture 56

Lecture 57

Lecture 58

Lecture 59

Lecture 60

Lecture 61

Lecture 62

Lecture 63

Lecture 64

Lecture 65

NPTEL : Electrical Machines I (Electrical Engineering)

Co-ordinators : Dr. D. Kastha

Lecture 1 - Introduction

Lecture 2 - Operating Principles and Construction of Single Phase Transformers

Lecture 3 - Modeling of Single Phase Transformers

Lecture 4 - Equivalent Circuits of Single Phase Transformers

Lecture 5 - Testing of Single Phase Transformers

Lecture 6 - Efficiency of Single Phase Transformers

Lecture 7 - Voltage Regulation of Single Phase Transformers

Lecture 8 - Parallel Operation of Single Phase Transformers

Lecture 9 - Harmonics and Switching Transients in Single Phase Transformers

Lecture 10 - Introduction to Three Phase Transformer

Lecture 11 - Construction of Three Phase Transformers

Lecture 12 - Three Phase Transformer Connections

Lecture 13 - Three Phase Transformer Phase Groups Part - I

Lecture 14 - Three Phase Transformer Phase Groups Part - II

Lecture 15 - Analysis and Testing of Three Phase Transformers

Lecture 16 - Operation of Three Phase Transformers

Lecture 17 - Auto Transformers

Lecture 18 - Three Winding Transformers

Lecture 19 - Scott Connected Transformers

Lecture 20 - Potential and Current Transformers

Lecture 21 - Operating Principles of DC Machines

Lecture 22 - Constructional Features of DC Machines

Lecture 23 - Generated EMF and Torque in DC Machines

Lecture 24 - Armature Reaction

Lecture 25 - Commutation in DC Machines

Lecture 26 - Separately Excited DC Generators

Lecture 27 - DC Shunt Generators

Lecture 28 - Compound DC Generators

Lecture 29 - Interconnected DC Generators

Lecture 30 - Characteristics of DC Shunt Motors

Lecture 31 - Starting of DC Shunt Motors

NPTEL : Optimal Control (Electrical Engineering)

Co-ordinators : Prof. G.D. Ray

NPTEL : Chaos, Fractals and Dynamic Systems (Electrical Engineering)

Co-ordinators : Prof. S. Banerjee

Lecture 32 - Non-Smooth Bifurcations

Lecture 33 - Normal from for Piecewise Smooth 2D Maps

Lecture 34 - Bifurcations in Piecewise Linear 2D Maps

Lecture 35 - Bifurcations in Piecewise Linear 2D Maps

Lecture 36 - Multiple Attractor Bifurcation and Dangerous

Lecture 37 - Dynamics of Discontinuous Maps

Lecture 38 - Introduction to Floquet Theory

Lecture 39 - The Monodromy Matrix and the Saltation Matrix

Lecture 40 - Control of Chaos

NPTEL : Digital Signal Processing (Electrical Engineering)

Co-ordinators : Prof. T.K. Basu

NPTEL : Dynamics of Physical Systems (Electrical Engineering)

Co-ordinators : Prof. S. Banerjee

NPTEL : Energy Resources and Technology (Electrical Engineering)

Co-ordinators : Prof. S. Banerjee

NPTEL : Estimation of Signals and Systems (Electrical Engineering)

Co-ordinators : Prof. S. Mukhopadhyay

Lecture 1 - Introduction

Lecture 2 - Probability Theory

Lecture 3 - Random Variables

Lecture 4 - Function of Random Variable Joint Density

Lecture 5 - Mean and Variance

Lecture 6 - Random Vectors Random Processes

Lecture 7 - Random Processes and Linear Systems

Lecture 8 - Some Numerical Problems

Lecture 9 - Miscellaneous Topics on Random Process

Lecture 10 - Linear Signal Models

Lecture 11 - Linear Mean Sq.Error Estimation

Lecture 12 - Auto Correlation and Power Spectrum Estimation

Lecture 13 - Z-Transform Revisited Eigen Vectors/Values

Lecture 14 - The Concept of Innovation

Lecture 15 - Last Squares Estimation Optimal IIR Filters

Lecture 16 - Introduction to Adaptive Filters

Lecture 17 - State Estimation

Lecture 18 - Kalman Filter-Model and Derivation

Lecture 19 - Kalman Filter-Derivation (Continued...)

Lecture 20 - Estimator Properties

Lecture 21 - The Time-Invariant Kalman Filter

Lecture 22 - Kalman Filter-Case Study

Lecture 23 - System identification Introductory Concepts

Lecture 24 - Linear Regression-Recursive Least Squares

Lecture 25 - Variants of LSE

Lecture 26 - Least Square Estimation

Lecture 27 - Model Order Selection Residual Tests

Lecture 28 - Practical Issues in Identification

Lecture 29 - Estimation Problems in Instrumentation and Control

Lecture 30 - Conclusion

NPTEL : Illumination Engineering (Electrical Engineering)

Co-ordinators : Prof. N.K. Kishore

NPTEL : Industrial Automation and Control (Electrical Engineering)

Co-ordinators : Prof. S. Sen, Prof. S. Mukhopadhyay

Lecture 32 - DC Motor Drives

Lecture 33 - DC and BLDC Servo Drives

Lecture 34 - Induction Motor Drives

Lecture 35 - Step Motor Drives BLDC Drives

Lecture 36 - Embedded Systems

Lecture 37 - The Fieldbus Network - I

Lecture 38 - The Fieldbus Network - II

Lecture 39 - Higher Level Automation Systems

Lecture 40 - Course Review and Conclusion

NPTEL : Industrial Instrumentation (Electrical Engineering)

Co-ordinators : Prof. Alok Barua

NPTEL : Networks Signals and Systems (Electrical Engineering)

Co-ordinators : Prof. T.K. Basu

Lecture 1 - Introduction to Network Elements and Sources

Lecture 2 - Introduction to Linearity and Nonlinearity

Lecture 3 - Distributed & Lumped Parameters 2-port Networks

Lecture 4 - Two-port Parameters Short Circuit,Open Circuit

Lecture 5 - Tutorial

Lecture 6 - Locus Diagram - Introduction to Signals

Lecture 7 - Signals (Continued.) Laplace Transforms

Lecture 8 - Laplace Transform (Continued.)

Lecture 9 - Tutorial on Laplace Transform

Lecture 10 - Frequency Response Bode Plot

Lecture 11 - Bode Plot (Continued.)

Lecture 12 - Bode Plot (Continued.) - Poles & Zeros

Lecture 13 - Driving Point Immittance Functions - Realisability Conditions

Lecture 14 - Two - Element Synthesis

Lecture 15 - Two - Element Synthesis (Continued.)

Lecture 16 - Tutorial

Lecture 17 - Tutorial

Lecture 18 - Graph Theory

Lecture 19 - Graph Theory (Continued.)

Lecture 20 - Graph Theory (Continued.)

Lecture 21 - Graph Theory (Continued.)

Lecture 22 - Image Impedance, Iterative Impedance

Lecture 23 - Image Impedance, Iterative Impedance

Lecture 24 - Characteristic Impedance and Design of Filters

Lecture 25 - Analysis of Resistive Networks Computer Aided

Lecture 26 - R-L-C Two-Terminal Network

Lecture 27 - Parts of Network Functions

Lecture 28 - Parts of Network Functions (Continued.)

Lecture 29 - Tutorial

Lecture 30 - Tutorial (Continued.)

Lecture 31 - Tutorial

NPTEL : Power System Analysis (Electrical Engineering)

Co-ordinators : Prof. A.K. Sinha

NPTEL : NOC:Industrial Automation and Control (Electrical Engineering)

Co-ordinators : Prof. S. Mukhopadhyay

Lecture 1 - Introduction

Lecture 2 - Introduction (Continued...)

Lecture 3 - Architecture of Industrial Automation Systems

Lecture 4 - Architecture of Industrial Automation Systems (Continued...)

Lecture 5 - Measurement Systems Characteristics

Lecture 6 - Measurement Systems Characteristics (Continued...)

Lecture 7 - Data Acquisition Systems

Lecture 8 - Data Acquisition Systems (Continued...)

Lecture 9 - Introduction to Automatic Control

Lecture 10 - Introduction to Automatic Control (Continued...)

Lecture 11 - P-I-D Control

Lecture 12 - P-I-D Control (Continued...)

Lecture 13 - PID Controller Tuning

Lecture 14 - PID Controller Tuning (Continued...)

Lecture 15 - Feedforward Control Ratio Control

Lecture 16 - Feedforward Control Ratio Control (Continued...)

Lecture 17 - Time Delay Systems and Inverse Response Systems

Lecture 18 - Time Delay Systems and Inverse Response Systems (Continued...)

Lecture 19 - Special Control Structures

Lecture 20 - Special Control Structures (Continued...)

Lecture 21 - Concluding Lesson on Process Control (Self-study)

Lecture 22 - Introduction to Sequence Control, PLC, RLL

Lecture 23 - Introduction to Sequence Control, PLC, RLL (Continued...)

Lecture 24 - Sequence Control, Scan Cycle, Simple RLL Programs

Lecture 25 - Sequence Control, Scan Cycle, Simple RLL Programs (Continued...)

Lecture 26 - Sequence Control, More RLL Elements, RLL Syntax

Lecture 27 - Sequence Control, More RLL Elements, RLL Syntax (Continued...)

Lecture 28 - A Structured Design Approach to Sequence Control

Lecture 29 - A Structured Design Approach to Sequence Control (Continued...)

Lecture 30 - PLC Hardware Environment

Lecture 31 - PLC Hardware Environment (Continued...)

NPTEL : NOC:Medical Image Analysis (Electrical Engineering)

Co-ordinators : Prof. Debdoot Sheet

NPTEL : NOC:Biomedical Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Sudipta Mukhopadhyay

NPTEL : NOC:Microprocessors and Microcontrollers (Electrical Engineering)

Co-ordinators : Prof. Santanu Chattopadhyay

NPTEL : NOC:Deep Learning For Visual Computing (Electrical Engineering)

Co-ordinators : Prof. Debdoot Sheet

Lecture 1 - Introduction to Visual Computing

Lecture 2 - Feature Extraction for Visual Computing

Lecture 3 - Feature Extraction with Python

Lecture 4 - Neural Networks for Visual Computing

Lecture 5 - Classification with Perceptron Model

Lecture 6 - Introduction to Deep Learning with Neural Networks

Lecture 7 - Introduction to Deep Learning with Neural Networks

Lecture 8 - Multilayer Perceptron and Deep Neural Networks

Lecture 9 - Multilayer Perceptron and Deep Neural Networks

Lecture 10 - Classification with Multilayer Perceptron

Lecture 11 - Autoencoder for Representation Learning and MLP Initialization

Lecture 12 - MNIST handwritten digits classification using autoencoders

Lecture 13 - Fashion MNIST classification using autoencoders

Lecture 14 - ALL-IDB Classification using autoencoders

Lecture 15 - Retinal Vessel Detection using autoencoders

Lecture 16 - Stacked Autoencoders

Lecture 17 - MNIST and Fashion MNIST with Stacked Autoencoders

Lecture 18 - Denoising and Sparse Autoencoders

Lecture 19 - Sparse Autoencoders for MNIST classification

Lecture 20 - Denoising Autoencoders for MNIST classification

Lecture 21 - Cost Function

Lecture 22 - Classification cost functions

Lecture 23 - Optimization Techniques and Learning Rules

Lecture 24 - Gradient Descent Learning Rule

Lecture 25 - SGD and ADAM Learning Rules

Lecture 26 - Convolutional Neural Network Building Blocks

Lecture 27 - Simple CNN Model: LeNet

Lecture 28 - LeNet Definition

Lecture 29 - Training a LeNet for MNIST Classification

Lecture 30 - Modifying a LeNet for CIFAR

Lecture 31 - Convolutional Autoencoder and Deep CNN

NPTEL : NOC:Power System Engineering (Electrical Engineering)

Co-ordinators : Prof. Debapriya Das

Lecture 32 - Load flow of radial distribution networks (Continued...)

Lecture 33 - Load flow of radial distribution networks (Continued...)

Lecture 34 - Load flow of radial distribution networks (Continued...)

Lecture 35 - Load flow of radial distribution networks (Continued...)

Lecture 36 - Load flow of radial distribution networks (Continued...)

Lecture 37 - Load flow of radial distribution networks (Continued...), Voltage stability of distribution network

Lecture 38 - Voltage stability of distribution network, Approximate method

Lecture 39 - Application of capacitors in distribution system

Lecture 40 - Application of capacitors in distribution system (Continued...)

Lecture 41 - Application of capacitors in distribution system (Continued...)

Lecture 42 - Application of capacitors in distribution system (Continued...)

Lecture 43 - Application of capacitors in distribution system (Continued...)

Lecture 44 - Application of capacitors in distribution system (Continued...), Load frequency control

Lecture 45 - Load frequency control (Continued...)

Lecture 46 - Load frequency control (Continued...)

Lecture 47 - Load frequency control (Continued...)

Lecture 48 - Load frequency control (Continued...)

Lecture 49 - Load frequency control (Continued...)

Lecture 50 - Load frequency control (Continued...)

Lecture 51 - Load frequency control (Continued...)

Lecture 52 - Load frequency control (Continued...)

Lecture 53 - Load frequency control (Continued...)

Lecture 54 - Load frequency control (Continued...)

Lecture 55 - Load frequency control (Continued...)

Lecture 56 - Load frequency control (Continued...)

Lecture 57 - Automatic generation control

Lecture 58 - Automatic generation control (Continued...)

Lecture 59 - Automatic generation control (Continued...), Unit commitment

Lecture 60 - Unit commitment (Continued...)

Lecture 61 - Live Session

NPTEL : NOC:Fundamentals of Electrical Engineering (Electrical Engineering)

Co-ordinators : Prof. Debapriya Das

Lecture 32 - First Order Circuits (Continued...)

Lecture 33 - First Order Circuits (Continued...)

Lecture 34 - First Order Circuits (Continued...)

Lecture 35 - First Order Circuits (Continued...)

Lecture 36 - First Order Circuits (Continued...)

Lecture 37 - Single phase AC circuits

Lecture 38 - Single phase AC circuits (Continued...)

Lecture 39 - Single phase AC circuits (Continued...)

Lecture 40 - Single phase AC circuits (Continued...)

Lecture 41 - Single phase AC circuits (Continued...)

Lecture 42 - Single phase AC circuits (Continued...)

Lecture 43 - Single phase AC circuits (Continued...)

Lecture 44 - Resonance and Maximum Power Transfer Theorem

Lecture 45 - Resonance and Maximum Power Transfer Theorem (Continued...)

Lecture 46 - Resonance and Maximum Power Transfer Theorem (Continued...)

Lecture 47 - Three phase circuits

Lecture 48 - Three phase circuits (Continued...)

Lecture 49 - Three phase circuits (Continued...)

Lecture 50 - Three phase circuits (Continued...)

Lecture 51 - Magnetic Circuits

Lecture 52 - Magnetic Circuits (Continued...)

Lecture 53 - Magnetic Circuits (Continued...)

Lecture 54 - Single Phase Transformer

Lecture 55 - Single Phase Transformer (Continued...)

Lecture 56 - Single Phase Transformer (Continued...)

Lecture 57 - Single Phase Transformer (Continued...)

Lecture 58 - Three phase Induction Motors

Lecture 59 - Three phase Induction Motors (Continued...)

Lecture 60 - Three phase Induction Motors (Continued...)

Lecture 61 - Three phase Induction Motors (Continued...)

Lecture 62 - DC Motors

Lecture 63 - DC Motors (Continued...)

Lecture 64 - DC Motors (Continued...)

NPTEL : NOC:Digital Circuits (Electrical Engineering)

Co-ordinators : Prof. Santanu Chattopadhyay

Lecture 32 - Sequential Circuits (Continued...)

Lecture 33 - Sequential Circuits (Continued...)

Lecture 34 - Sequential Circuits (Continued...)

Lecture 35 - Finite State Machine

Lecture 36 - Finite State Machine (Continued...)

Lecture 37 - Data Converters

Lecture 38 - Data Converters (Continued...)

Lecture 39 - Data Converters (Continued...)

Lecture 40 - Data Converters (Continued...)

Lecture 41 - Memory

Lecture 42 - Memory (Continued...)

Lecture 43 - Memory (Continued...)

Lecture 44 - FPGA

Lecture 45 - FPGA (Continued...)

Lecture 46 - VHDL

Lecture 47 - VHDL(Continued...)

Lecture 48 - 8085 Microprocessor

Lecture 49 - 8085 Microprocessor (Continued...)

Lecture 50 - 8085 Microprocessor (Continued...)

Lecture 51 - 8085 Microprocessor (Continued...)

Lecture 52 - 8085 Microprocessor (Continued...)

Lecture 53 - 8085 Microprocessor (Continued...)

Lecture 54 - 8085 Microprocessor (Continued...)

Lecture 55 - 8085 Microprocessor (Continued...)

Lecture 56 - 8085 Microprocessor (Continued...)

Lecture 57 - 8085 Microprocessor (Continued...)

Lecture 58 - 8085 Microprocessor (Continued...)

Lecture 59 - 8085 Microprocessor (Continued...)

Lecture 60 - 8085 Microprocessor (Continued...)

Lecture 61 - 8085 Microprocessor (Continued...)

Lecture 62 - 8085 Microprocessor (Continued...)

Lecture 63 - 8086 Microprocessor

Lecture 64 - 8086 Microprocessor (Continued...)

Lecture 65 - 8086 Microprocessor (Continued...)

NPTEL : NOC:Analysis and Design Principles of Microwave Antennas (Electrical Engineering)

Co-ordinators : Dr. Amitabha Bhattacharya

Lecture 1 - Concept of Scalar and Vector Potentials

Lecture 2 - Radiation From a Current Element (Hertzian Dipole)

Lecture 3 - Specific Properties of the Radiated Fields from a Current Element

Lecture 4 - General Properties of Radiated Fields from an Antenna

Lecture 5 - Farfield and Radiation Pattern of an Antenna

Lecture 6 - Directivity and Gain of an Antenna

Lecture 7 - Idea of Efficiency, Beamwidth, Polarisation and Bandwidth

Lecture 8 - Polarization of Antenna

Lecture 9 - Impedance of Antenna

Lecture 10 - Effective Aperture of an Antenna

Lecture 11 - Friss Transmission Equation and Antenna Temperature

Lecture 12 - Dipole And Monopole Antena

Lecture 13 - Dipole And Monopole Antena (Continued...)

Lecture 14 - BALUN

Lecture 15 - Loop Antenna

Lecture 16 - Folded Dipole Antenna

Lecture 17 - Introduction to Antenna Array

Lecture 18 - Antenna Array Theory

Lecture 19 - Broadside Uniform Linear Array

Lecture 20 - Endfire Linear Uniform Array

Lecture 21 - Parasitic Array and Log Periodic Antenna

Lecture 22 - Analysis Procedures of Aperture Antennas

Lecture 23 - Analysis Procedures of Aperture Antenna (Continued...)

Lecture 24 - Horn Antenna

Lecture 25 - Horn Antenna (Continued...)

Lecture 26 - Reflector Antennas

Lecture 27 - Paraboloid Reflector Antenna (Continued...)

Lecture 28 - Paraboloid Reflector Antenna (Continued...)

Lecture 29 - Dual Reflector Antenna

Lecture 30 - Generalised Analysis of Antenna

Lecture 31 - Solution of Wave Equation for Electric and Magnetic Current Densities

NPTEL : NOC:Architectural Design of Digital Integrated Circuits (Electrical Engineering)

Co-ordinators : Prof. Indranil Hatai

NPTEL : NOC:Electrical Machines-II (Electrical Engineering)

Co-ordinators : Prof.Tapas Kumar Bhattacharya

Lecture 65 - Introduction to Single Phase Induction Motor - Sequence Currents

Lecture 66 - Development of Equivalent Circuit

Lecture 67 - Development of Equivalent Circuit (Continued...)

Lecture 68 - Torque-slip Ch. of 1 ph. I-M Running on Single Winding

Lecture 69 - Introduction to Starting of 1ph. Induction Motor

Lecture 70 - Expression for Starting Torque and Need for Phase Splitting

Lecture 71 - Resistor Split 1 ph. Induction Motor

Lecture 72 - Capacitor Split 1 ph Induction Motor

Lecture 73 - Starting of 1 ph. Induction Motor (Continued...)

Lecture 74 - Synchronous Machine Construction

Lecture 75 - Synchronous Generator - Introduction

Lecture 76 - Synchronisation

Lecture 77 - Expression for Induced Voltage and O.C. Phasor Diagram

Lecture 78 - Loaded Synchronous Generator - Resultant Field

Lecture 79 - Armature Reaction and Synchronous Reactance. Basic Phasor Diagram

Lecture 80 - General Mode of Operation - Rotro Field, Stator Field and Resultant Field

Lecture 81 - Complete Phasor Diagram and Expression for Complex Power

Lecture 82 - Synchronous Motor Operation, Phasor Diagram and Power Expression

Lecture 83 - Effect of Variation of Field Current in Generator

Lecture 84 - Effect of Variation Field Current in Synchronous Motor, Introduction to Salient Pole Machine

Lecture 85 - Analysis of Salient Pole Synchronous Machine

Lecture 86 - Phasor Diagram of Salient Pole Synchronous Machine for Generator and Motor Mode

Lecture 87 - Expression for Load Angle and Expression for Power

Lecture 88 - Phasor Diagrams of Salient Pole Synchronous Generator under Various Conditions

Lecture 89 - Phasor Diagrams of Salient Pole Synchronous Motor under Various Conditions

Lecture 90 - O.C and S.C Test on Synchronous Generator

NPTEL : NOC:Digital Electronic Circuits (Electrical Engineering)

Co-ordinators : Prof. Goutam Saha

NPTEL : NOC:Power System Dynamics, Control and Monitoring (Electrical Engineering)

Co-ordinators : Prof. Debapriya Das

NPTEL : NOC:Evolution of Air Interface towards 5G (Electrical Engineering)

Co-ordinators : Prof. Suvra Sekhar Das

Lecture 1 - Evolution of wireless Communication

Lecture 2 - Evolution of wireless Communication Standards From 2G to 5G

Lecture 3 - Evolution of wireless Communication Standards From 2G to 5G (Continued...)

Lecture 4 - Evolution of wireless Communication Standards From 2G to 5G (Continued...)

Lecture 5 - Evolution of wireless Communication Standards From 2G to 5G (Continued...)

Lecture 6 - Requirements and operating scenarios of 5G

Lecture 7 - Requirements and operating scenarios of 5G (Continued....)

Lecture 8 - 5G scenarios

Lecture 9 - Ultra reliable low latency communication

Lecture 10 - Designing 5G new radio

Lecture 11 - Fundamental Framework for waveform analysis

Lecture 12 - Fundamental Framework for waveform analysis (Continued...)

Lecture 13 - Waveform Design Aspects of 2G

Lecture 14 - Waveforms in 3G

Lecture 15 - Waveforms in 3G (Continued...)

Lecture 16 - Waveform in 4G and 5G (OFDM)

Lecture 17 - Waveform in 4G and 5G (OFDM) (Continued...)

Lecture 18 - Waveform in 4G and 5G (OFDM) (Continued...)

Lecture 19 - Waveform in 4G and 5G (OFDMA)

Lecture 20 - Waveform in 4G and 5G (OFDMA, SCFDMA, SCFDE)

Lecture 21 - Waveform in 4G and 5G (SCFDMA Continued...)

Lecture 22 - Waveform in 5G

Lecture 23 - Waveform in 5G Numerology

Lecture 24 - Frame Structure in 5G NR

Lecture 25 - Numerology in 5G and adaptive subcarrier bandwidth

Lecture 26 - Numerology in 5G (Continued...)

Lecture 27 - Waveforms beyond 5G

Lecture 28 - Waveforms beyond 5G (Continued...)

Lecture 29 - Waveforms beyond 5G (Continued...)

Lecture 30 - Waveforms beyond 5G (Continued...)

Lecture 31 - Waveform beyond 5G (Precoded GFDM)

NPTEL : NOC:Electrical Measurement and Electronic Instruments (Electrical Engineering)

Co-ordinators : Prof. Avishek Chatterjee

NPTEL : NOC:Principles and Techniques of Modern Radar Systems (Electrical Engineering)

Co-ordinators : Dr. Amitabha Bhattacharya

Lecture 32 - Tutorial Problems on Search and Tracking Radar

Lecture 33 - Detection in Radar Receiver

Lecture 34 - Detection in Radar Receiver (Continued...)

Lecture 35 - Detection in Radar Receiver (Continued...)

Lecture 36 - Detection in Radar Receiver (Continued...)

Lecture 37 - Detection in Radar Receiver (Continued...)

Lecture 38 - Detection in Radar Receiver (Continued...)

Lecture 39 - Detection in Radar Receiver (Continued...)

Lecture 40 - Detection in Radar Receiver (Continued...)

Lecture 41 - Detection in Radar Receiver (Continued...)

Lecture 42 - Detection in Radar Receiver (Continued...)

Lecture 43 - Detection in Radar Receiver (Continued...)

Lecture 44 - Detection in Radar Receiver (Continued...)

Lecture 45 - Detection in Radar Receiver (Continued...)

Lecture 46 - Detection in Radar Receiver (Continued...)

Lecture 47 - Tutorial Problems on Detection in Radar Receiver

Lecture 48 - SAR Processing

Lecture 49 - SAR Processing (Continued...)

Lecture 50 - SAR Processing (Continued...)

Lecture 51 - SAR Processor

Lecture 52 - Tutorial

Lecture 53 - Statistical Detection Theory: Introduction

Lecture 54 - Statistical Detection Theory (Continued...)

Lecture 55 - Statistical Detection Theory (Continued...)

Lecture 56 - Statistical Detection Theory (Continued...)

Lecture 57 - Statistical Detection Theory (Continued...)

Lecture 58 - Tutorial

Lecture 59 - Ground Penetrating Radar

Lecture 60 - GPR Measurements and Microwave Tomography

NPTEL : NOC:Electrical Machines-I (Electrical Engineering)

Co-ordinators : Prof.Tapas Kumar Bhattacharya

Lecture 32 - Equivalent Circuit of an Auto Transformer

Lecture 33 - Polarity Test and Sumpner Test

Lecture 34 - 3 Phase Transformer Using 3 Single Phase Transformer

Lecture 35 - Various Connections of 3-Phase Transformer - I

Lecture 36 - Various Connections of 3-Phase Transformer - II

Lecture 37 - Vector Group of 3-Phase Transformer

Lecture 38 - Vector Group (Continued...)

Lecture 39 - Open Delta Connection

Lecture 40 - 3-Phase Cone Type and Shell Type Transformer

Lecture 41 - Zig Zag Connection

Lecture 42 - Effect 3rd Harmonic Exciting Current and Flux

Lecture 43 - Choosing Transformer Connection

Lecture 44 - Choosing Transformer Connection (Continued...)

Lecture 45 - Phase Conversion using Transformer: Scott Connection

Lecture 46 - Scott Connection (Continued...)

Lecture 47 - 3 Phase to 6 Phase Conversion O.C / S.C Test on 3 Phase Transformer

Lecture 48 - Parallel Operation of Transformers - I

Lecture 49 - Parallel Operation of Transformers - II

Lecture 50 - Parallel Operation of Transformers - III

Lecture 51 - Specific Magnetic and Electric Loadings

Lecture 52 - ooling of Transformer and Fillings of Transformer

Lecture 53 - Output Equation of 3- Phase Transformer

Lecture 54 - Introduction to D.C Machine

Lecture 55 - Single Conductor D.C Generator / Motor Operation

Lecture 56 - Homopolar D.C Generator

Lecture 57 - Homopolar D.C Motor

Lecture 58 - Introduction to Rotating D.C Machines

Lecture 59 - Armature Winding of D.C Machine - I

Lecture 60 - Armature Winding of D.C Machine - II

Lecture 61 - Armature Winding of D.C Machine - III

Lecture 62 - Generated Voltage Across the Armature

Lecture 63 - Electromagnetic Troque in D.C Machine

Lecture 64 - Generator and Motor Operation - Basics

NPTEL : NOC:VLSI Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Mrityunjay Chakraborty

Lecture 1 - Graphical Representation of Signals

Lecture 2 - Signal Flow Graph

Lecture 3 - Data Flow Graph, Critical Path

Lecture 4 - Dependence Graph, Basics of Retiming

Lecture 5 - Retiming Theorem

Lecture 6 - Forward Path and Loop Retiming

Lecture 7 - Loop Bound and Iteration Bound

Lecture 8 - Cutset Retiming

Lecture 9 - Retiming IIR Filters

Lecture 10 - Adaptive Filter Basics (LMS Algorithm)

Lecture 11 - Retiming LMS

Lecture 12 - Retiming Delayed LMS

Lecture 13 - Parallel Processing in DSP by Unfolding

Lecture 14 - Basic Unfolding Relation

Lecture 15 - Retiming for Unfolding

Lecture 16 - Loop Unfolding

Lecture 17 - Iteration bound for Loops

Lecture 18 - Bitserial, Digit serial and Word serial Structures

Lecture 19 - Unfolding a Switch

Lecture 20 - Unfolding Bit Serial Systems

Lecture 21 - Folding of DFG

Lecture 22 - Folding Examples - IIR Filter

Lecture 23 - Retiming for Folding

Lecture 24 - Introduction to Delay Optimization by Folding

Lecture 25 - Life Time Analysis of Storage Variables

Lecture 26 - Foward Backward Data Allocation

Lecture 27 - Life Time Analysis of Storage Variables in a Digital Filter

Lecture 28 - Delay Folded Realization of a Digital Filter

Lecture 29 - Polyphase Decomposition of Sequences

Lecture 30 - Hardware Efficient 2 - Parallel FIR Filters

Lecture 31 - Hardware Efficient 3 - Parallel FIR Filters

Lecture 32 - Introduction to First Level Architectures

Lecture 33 - 2's Complement Number Systems

Lecture 34 - Multiplication of Two Binary Numbers

Lecture 35 - Carry Ripple and Carry Save Array

Lecture 36 - Bit Serial Multipliers

Lecture 37 - Bit Serial Digital Filters

Lecture 38 - Baugh Wooley Multiplier

Lecture 39 - Distributed Arithmetic

NPTEL : NOC:Analog Electronic Circuits (Electrical Engineering)

Co-ordinators : Prof. Pradip Mandal

Lecture 1 - Introduction to the course

Lecture 2 - Introduction to the constituent topics of the course and the Layout

Lecture 3 - Revisit to pre-requisite topics

Lecture 4 - Revisit to pre-requisite topics (Continued...)

Lecture 5 - Analysis of Simple Non-Linear Circuit

Lecture 6 - Analysis of Simple Non-linear Circuit (Continued...)

Lecture 7 - Revisiting BJT Characteristic

Lecture 8 - Revisiting BJT Characteristics (Continued...)

Lecture 9 - Revisiting BJT Characteristics (Continued...)

Lecture 10 - Revisiting MOSFET

Lecture 11 - Revisiting MOSFET (Continued...)

Lecture 12 - Revisiting MOSFET (Continued...)

Lecture 13 - Revisiting MOSFET (Continued...)

Lecture 14 - Analysis of simple non-linear circuit containing a BJT

Lecture 15 - Analysis of simple non-linear circuit containing a BJT (Continued...)

Lecture 16 - Analysis of simple non-linear circuit containing a MOSFET

Lecture 17 - Analysis of simple non-linear circuit containing a MOSFET (Continued...)

Lecture 18 - Linearization of non-linear circuit containing BJT

Lecture 19 - Linearization of non-linear circuit containing BJT (Continued...)

Lecture 20 - Linearization of non-linear circuit containing MOSFET

Lecture 21 - Linearization of non-linear circuit containing MOSFET (Continued...)

Lecture 22 - Linear models of Amplifiers - Part A

Lecture 23 - Linear models of Amplifiers - Part B

Lecture 24 - Common Emitter Amplifier - Part A

Lecture 25 - Common Emitter Amplifier - Part B

Lecture 26 - Common Emitter Amplifier (Continued...) - Part A

Lecture 27 - Common Emitter Amplifier (Continued...) - Part B

Lecture 28 - Common Emitter Amplifier (Continued...) - Numerical examples - Part A

Lecture 29 - Common Emitter Amplifier (Continued...) - Numerical examples - Part B

Lecture 30 - Common Emitter Amplifier (Continued...) - Design guidelines - Part A

Lecture 31 - Common Emitter Amplifier (Continued...) - Design guidelines - Part B

NPTEL : NOC:Network Analysis (Electrical Engineering)

Co-ordinators : Prof. T.K. Bhattacharya

NPTEL : NOC:Power System Protection (Electrical Engineering)

Co-ordinators : Prof. Ashok Kumar Pradhan

Lecture 1 - Faults in Power System

Lecture 2 - Elements and Features of Protection Scheme

Lecture 3 - Fault Analysis Review - Sequence Components

Lecture 4 - Fault Analysis Review - Sequence Components (Continued...)

Lecture 5 - Numerical Relaying Concept

Lecture 6 - Discrete Fourier Transform

Lecture 7 - Recursive and Half Cycle DFT and Cosine Filter

Lecture 8 - Least Square Technique

Lecture 9 - Frequency Response of Phasor Estimation techniques

Lecture 10 - In the Presence of Decaying DC

Lecture 11 - Overcurrent Relay Characteristics

Lecture 12 - Overcurrent Relay Coordination

Lecture 13 - Relay Coordination with Fuse

Lecture 14 - Introduction to Directional Relaying

Lecture 15 - Positive Sequence Directional Relay

Lecture 16 - Negative and Zero Sequence Directional Relay

Lecture 17 - Superimposed Component Based Directional Relaying

Lecture 18 - Introduction to Distance Relay

Lecture 19 - Fault Classification

Lecture 20 - Apparent Impedance Calculation

Lecture 21 - Distance Relay Implementation

Lecture 22 - Application to Double Circuit Line

Lecture 23 - Multi-terminal Lines

Lecture 24 - Protection of series compensated lines - Part I

Lecture 25 - Protection of series compensated lines - Part II

Lecture 26 - Effect of Fault Resistance

Lecture 27 - Load Encroachment

Lecture 28 - Power Swing

Lecture 29 - Power Swing Detection Techniques - Part I

Lecture 30 - Power Swing Detection Techniques - Part II

Lecture 31 - Adaptive Distance Relaying

NPTEL : NOC:Signal Processing for mm Wave communication for 5G and beyond (Electrical Engineering)

Co-ordinators : Prof. Amit Kumar Dutta

NPTEL : NOC:Control and Tuning Methods in Switched Mode Power Converters (Electrical Engineering)

Co-ordinators : Prof. Santanu Kapat

NPTEL : NOC:Advanced Microwave Guided-Structures and Analysis (Electrical Engineering)

Co-ordinators : Prof. Bratin Ghosh

Lecture 1 - Scattering Matrix Concepts

Lecture 2 - Scattering Matrix Concepts (Continued...)

Lecture 3 - Scattering Matrix Concepts (Continued...)

Lecture 4 - Scattering Matrix Concepts (Continued...)

Lecture 5 - Scattering Matrix Concepts Tutorials

Lecture 6 - Scattering Matrix Concepts Tutorials (Continued...)

Lecture 7 - Scattering Matrix Concepts Tutorials (Continued...)

Lecture 8 - Instantaneous form of Maxwellâ€™s equations

Lecture 9 - Instantaneous form of Maxwellâ€™s equations (Continued....)

Lecture 10 - Instantaneous form of Maxwellâ€™s equations (Continued...)

Lecture 11 - Instantaneous form of Maxwellâ€™s equations (Continued...)

Lecture 12 - Instantaneous form of Maxwellâ€™s equations (Continued...)

Lecture 13 - Instantaneous form of Maxwellâ€™s equations Tutorials

Lecture 14 - Instantaneous form of Maxwellâ€™s equations Tutorials (Continued...)

Lecture 15 - Harmonic form of Maxwellâ€™s equations

Lecture 16 - Harmonic form of Maxwellâ€™s equations (Continued...)

Lecture 17 - Harmonic form of Maxwellâ€™s equations (Continued...)

Lecture 18 - Harmonic form of Maxwellâ€™s equations Tutorials

Lecture 19 - Wave Equation and Solution

Lecture 20 - Relation between wavenumbers

Lecture 21 - Radiation from an electric current source (Continued...)

Lecture 22 - Radiation from an electric current source (Continued...)

Lecture 23 - Radiation from an electric current source (Continued...)

Lecture 24 - Wave Equation and Solution Tutorials

Lecture 25 - Radiation from an electric current source Tutorials

Lecture 26 - Radiation from a magnetic current source

Lecture 27 - Radiation from a magnetic current source (Continued...)

Lecture 28 - Radiation from a magnetic current source (Continued...)

Lecture 29 - Application of the magnetic current source (Continued...)

Lecture 30 - Radiation from a magnetic current source Tutorials

Lecture 31 - Radiation from a magnetic current source Tutorials (Continued....)

NPTEL : NOC:Cognition and its Computation (Electrical Engineering)

Co-ordinators : Prof. Rajlakshmi Guha, Prof. Sharba Bandyopadhyay

NPTEL : NOC:Digital Control in Switched Mode Power Converters and FPGA-based Prototyping (Electrical Engineering)

Co-ordinators : Prof. Santanu Kapat

NPTEL : NOC:VLSI Interconnects (Electrical Engineering)

Co-ordinators : Prof. Sarang Pendharker

NPTEL : NOC:Semiconductor Device Modeling and Simulation (Electrical Engineering)

Co-ordinators : Prof. Vivek Dixit

Lecture 1 - Introduction

Lecture 2 - Introduction (Continued...)

Lecture 3 - Crystal Concept

Lecture 4 - Crystal Concept

Lecture 5 - Crystal Concept

Lecture 6 - Reciprocal Space

Lecture 7 - Problem Session - 1

Lecture 8 - Doping In Semiconductors

Lecture 9 - Bandstructure

Lecture 10 - Effective Mass

Lecture 11 - Density of States

Lecture 12 - Mobility

Lecture 13 - Problem Session - 2

Lecture 14 - Semiconductor statistics

Lecture 15 - Semiconductor statistics (Continued...)

Lecture 16 - P-N Junction

Lecture 17 - P-N Junction (Continued...)

Lecture 18 - P-N Junction (Continued...)

Lecture 19 - Problem Session - 3

Lecture 20 - BJT

Lecture 21 - Bipolar Junction Transistor

Lecture 22 - Bipolar Junction Transistor (Continued...)

Lecture 23 - Bipolar Junction Transistor (Continued...)

Lecture 24 - Problem Session - 4

Lecture 25 - Metal- Semiconductor Interface

Lecture 26 - Schottky junction

Lecture 27 - Field Effect Transistor

Lecture 28 - MOS Capacitor

Lecture 29 - MOS-CV

Lecture 30 - REAL MOS (Continued...)

Lecture 31 - MOSFET

NPTEL : NOC:RF and Microwave Networks (Electrical Engineering)

Co-ordinators : Prof. Bratin Ghosh

Lecture 1 - The network concept

Lecture 2 - One-port network

Lecture 3 - One-port network, Two-port network

Lecture 4 - Two-port network, Signal flow graph

Lecture 5 - Tutorial - 1

Lecture 6 - General analysis of cylindrical waveguides

Lecture 7 - TE to z mode analysis of cylindrical waveguides

Lecture 8 - TE to z mode analysis of cylindrical waveguides (Continued...), TM to z mode analysis

Lecture 9 - Normalization of mode vectors, Characteristics of eigen values and eigen functions

Lecture 10 - Wave impedance for TE and TM to z modes, Transmission line analogy for mode voltage

Lecture 11 - Transmission line equivalence for TE and TM modes, Power calculation using

Lecture 12 - Tutorial - 2

Lecture 13 - Modal expansion in cylindrical waveguides, Concept of mode orthogonality

Lecture 14 - Concept of mode orthogonality (continued), Determination of arbitrary mode

Lecture 15 - Power orthogonality in cylindrical waveguides

Lecture 16 - Tutorial - 3

Lecture 17 - Modal expansion of fields in rectangular waveguides

Lecture 18 - Modal expansion of fields in rectangular waveguides (Continued), Capacitive rectangular

Lecture 19 - Capacitive rectangular waveguide junction (Continued...)

Lecture 20 - Inductive rectangular waveguide junction (Continued...)

Lecture 21 - Inductive rectangular waveguide junction (Continued...), Construction of solutions

Lecture 22 - Cylindrical waveguide junctions (Continued...)

Lecture 23 - Cylindrical waveguide junctions (Continued...)

Lecture 24 - Cylindrical waveguide junctions (Continued...), Example of capacitive rectangular

Lecture 25 - Cylindrical waveguide junctions (Continued...), Example of capacitive rectangular

Lecture 26 - Example of inductive waveguide junction (Continued...), Alternative equivalent circuit

Lecture 27 - Tutorial - 4

Lecture 28 - Obstacles in waveguides

Lecture 29 - Obstacles in waveguides (Continued...)

Lecture 30 - Obstacles in waveguides (Continued...)

Lecture 31 - Small obstacles in waveguides

Lecture 32 - Small obstacles in waveguides (Continued...)

Lecture 33 - Small obstacles in waveguides, Reciprocity

Lecture 34 - Reciprocity

Lecture 35 - Reciprocity (Continued...)

Lecture 36 - Tutorial - 5

Lecture 37 - Posts in rectangular waveguide

Lecture 38 - Posts in rectangular waveguide (Continued...)

Lecture 39 - Posts in rectangular waveguide (Continued...)

Lecture 40 - Posts in rectangular waveguide (Continued...)

Lecture 41 - Diaphragms in waveguide

Lecture 42 - Diaphragms in waveguide (Continued...)

Lecture 43 - Diaphragms in waveguide (Continued...)

Lecture 44 - Diaphragms in waveguide (Continued...)

Lecture 45 - Tutorial - 6

Lecture 46 - Currents in Waveguides

Lecture 47 - Currents in Waveguides (Continued...)

Lecture 48 - Coaxial to waveguide junction with matched termination

Lecture 49 - Coaxial to waveguide feeds with arbitrary termination

Lecture 50 - Coaxial to waveguide feeds with arbitrary termination (Continued...)

Lecture 51 - Coaxial to waveguide feeds with arbitrary termination (Continued...)

Lecture 52 - Coaxial to waveguide feeds with arbitrary termination (Continued...)

Lecture 53 - Tutorial - 7

Lecture 54 - Apertures in the ground plane

Lecture 55 - Apertures in the ground plane (Continued...)

Lecture 56 - Apertures in the ground plane (Continued...)

Lecture 57 - Apertures in the ground plane (Continued...), Plane current sheets

Lecture 58 - Plane current sheets (Continued...)

Lecture 59 - Tutorial - 8

Lecture 60 - Excitation of Apertures

Lecture 61 - Tutorial - 9

Lecture 62 - Modal expansion in cavities

Lecture 63 - Probes in cavities

Lecture 64 - Tutorial - 10

NPTEL : NOC:Introduction to Adaptive Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Mrityunjoy Chakraborty

NPTEL : NOC:Nanobiophotonics: Touching Our Daily Life (Electrical Engineering)

Co-ordinators : Dr. Basudev Lahiri

NPTEL : NOC:EMI-EMC and Signal Integrity: Principles, Techniques and Applications (Electrical Engineering)

Co-ordinators : Prof. Amitabha Bhattacharya

Lecture 1 - Introduction to Electromagnetic Environment

Lecture 2 - Introduction to Electromagnetic Compatibility

Lecture 3 - EMC Standards

Lecture 4 - EMC Units and Signal Spectrum

Lecture 5 - Single Sided Spectrum

Lecture 6 - Response of Linear Systems to Periodic Input Signals

Lecture 7 - Important Computational Techniques

Lecture 8 - Fourier Coefficient for Piecewise Linear Periodic Waveforms

Lecture 9 - Fourier Coefficient for Piecewise Linear Periodic Waveforms (Continued...)

Lecture 10 - Trapezoidal Clock

Lecture 11 - Spectral Bounds for Trapezoidal Clock

Lecture 12 - Spectral estimation of trapezoidal clock

Lecture 13 - Effect of Rise/Fall Time on Spectral Bound of a Clock

Lecture 14 - Effect of Ringing on Spectral Bounds

Lecture 15 - Spectral Bounds for Linear System Output

Lecture 16 - Resolution Bandwidth of a Spectrum Analyser

Lecture 17 - Detector of Spectrum Analyser

Lecture 18 - Radiated Emission Model Subproblem - I

Lecture 19 - Farfield Characteristics of Current Element: Some Discussion

Lecture 20 - Farfield of Dipole Antena

Lecture 21 - Farfield models of wire antenna and current models

Lecture 22 - Differential mode current emission model

Lecture 23 - Differential mode current emission model (Continued...)

Lecture 24 - Common Mode Current Emission Model

Lecture 25 - Current Measurement

Lecture 26 - Radiated Susceptibility Models

Lecture 27 - Determination of Per Unit Length Inductance (Continued...)

Lecture 28 - Per Unit Length Parameters of Various Two Wire Lines

Lecture 29 - Radiated Susceptibility Model

Lecture 30 - Radiated Susceptibility Model (Continued...)

Lecture 31 - Radiated Susceptibility Model (Continued...)

NPTEL : NOC:Embedded Sensing, Actuation and Interfacing Systems (Electrical Engineering)

Co-ordinators : Prof. Banibrata Mukherjee

NPTEL : NOC:A Basic Course on Electric and Magnetic Circuits (Electrical Engineering)

Co-ordinators : Prof. Ashok Kumar Pradhan

Lecture 32 - Reluctance Equivalent magnetic circuit Solving Magnetic Circuits

Lecture 33 - Solving Magnetic Circuits

Lecture 34 - Hysteresis loop Hysteresis and Eddy Current loss

Lecture 35 - Self and Mutual inductances Dot Convention

Lecture 36 - Solving Magnetic Coupled Circuits

Lecture 37 - Magnetic Circuit applications

Lecture 38 - Transformer Basics, The emf equation

Lecture 39 - Ideal transformer, Impedance referred to primary

Lecture 40 - Practical transformer, Transformer equivalent circuit diagram

Lecture 41 - Voltage Drop and Voltage Regulation Calculation

Lecture 42 - Efficiency of Transformer

Lecture 43 - Transformer Tests, Transformer Applications

NPTEL : NOC:Deep Learning for Natural Language Processing (Electrical Engineering)

Co-ordinators : Prof. Pawan Goyal

Lecture 65 - Retrieval Augmented Generation

Lecture 66 - Tutorial 11

Lecture 67 - Model Interpretability

Lecture 68 - Model Interpretability - Multilingual

Lecture 69 - Model Interpretability - III

Lecture 70 - Trustworty LLMs : Taxonomy

Lecture 71 - Trustworty LLMs : Machine Unlearning

Lecture 72 - Tutorial 12

NPTEL : Modelling and Analysis of Electric Machines (Electrical Engineering)

Co-ordinators : Dr. Krishna Vasudevan

NPTEL : Analog ICs (Electrical Engineering)

Co-ordinators : Prof. K. Radhakrishna Rao

NPTEL : Digital Integrated Circuits (Electrical Engineering)

Co-ordinators : Prof. Amitava Dasgupta

NPTEL : Electromagnetic Fields (Electrical Engineering)

Co-ordinators : Prof. Harishankar Ramachandran

NPTEL : Networks and Systems (Electrical Engineering)

Co-ordinators : Prof. V.G.K. Murti

Lecture 1 - Introductory Concepts - 1

Lecture 2 - Introductory Concepts - 2

Lecture 3 - Introductory Concepts - 3

Lecture 4 - Introductory Concepts - 4

Lecture 5 - Introductory Concepts - 5

Lecture 6 - Introductory Concepts - 6

Lecture 7 - Fourier Series - 1

Lecture 8 - Fourier Series - 2

Lecture 9 - Fourier Series - 3

Lecture 10 - Fourier Series - 4

Lecture 11 - Fourier Series - 5

Lecture 12 - Fourier Series - 6

Lecture 13 - Fourier Transforms - 1

Lecture 14 - Fourier Transforms - 2

Lecture 15 - Fourier Transforms - 3

Lecture 16 - Fourier Transforms - 4

Lecture 17 - Fourier Transforms - 5

Lecture 18 - Fourier Transforms - 6

Lecture 19 - Fourier Transforms - 7

Lecture 20 - Laplace Transforms - 1

Lecture 21 - Laplace Transforms - 2

Lecture 22 - Laplace Transforms - 3

Lecture 23 - Laplace Transforms - 4

Lecture 24 - Laplace Transforms - 5

Lecture 25 - Laplace Transforms - 6

Lecture 26 - Application of Laplace Transforms - 1

Lecture 27 - Application of Laplace Transforms - 2

Lecture 28 - Application of Laplace Transforms - 3

Lecture 29 - Application of Laplace Transforms - 4

Lecture 30 - Network Functions - 1

Lecture 31 - Network Functions - 2

NPTEL : Probability Foundation for Electrical Engineers (Electrical Engineering)

Co-ordinators : Dr. Krishna Jagannathan

Lecture 1 - Introduction

Lecture 2 - Cardinality

Lecture 3 - Countability

Lecture 4 - Uncountable sets - 1

Lecture 5 - Uncountable sets - 2

Lecture 6 - Probability spaces - Introduction

Lecture 7 - Probability spaces - Algebra

Lecture 8 - Probability spaces - Ïƒ-algebra

Lecture 9 - Probability spaces - Measurable space

Lecture 10 - Properties of probability measures

Lecture 11 - Continuity of probability measure

Lecture 12 - Discrete probability space - finite and countably infinite sample space

Lecture 13 - Discrete probability space - Uncountable sample space

Lecture 14 - Generated Ïƒ-algebra, Borel Sets

Lecture 15 - Borel sets

Lecture 16 - Uniform probability measure on Borel sets-Lebesgue measure

Lecture 17 - CarathÃ©odoryâ€™s extension theorem

Lecture 18 - Lebesgue measure (Continued...)

Lecture 19 - Infinite coin toss model

Lecture 20 - Infinite coin toss model (Continued...)

Lecture 21 - Conditional probability

Lecture 22 - Properties of conditional probability

Lecture 23 - Independence of events

Lecture 24 - Independence of Ïƒ-algebras

Lecture 25 - Borel-Cantelli Lemma - 1

Lecture 26 - Borel-Cantelli Lemma - 2

Lecture 27 - Random Variables

Lecture 28 - Random Variables (Continued...)

Lecture 29 - Cumulative Distribution Function

Lecture 30 - Properties of CDF

Lecture 31 - Types of Random Variables

Lecture 32 - Examples of Random Variables

Lecture 33 - Continuous Random Variables - 1

Lecture 34 - Examples of Continuous Random Variables - 1

Lecture 35 - Continuous Random Variables - 2, Examples of Continuous RandomVariables - 2

Lecture 36 - Singular Random Variables

Lecture 37 - Several Random Variables - 1

Lecture 38 - Several Random Variables - 2

Lecture 39 - Independent Random Variables - 1

Lecture 40 - Independent Random Variables - 2

Lecture 41 - Conditional PMF, Jointly Continuous Random Variables - 1

Lecture 42 - Jointly Continuous Random Variables - 2

Lecture 43 - Jointly Continuous Random Variables - 3

Lecture 44 - Conditional CDF

Lecture 45 - Transformation of Random Variables - 1

Lecture 46 - Transformation of Random Variables - 2; Independent Random Variables

Lecture 47 - Sums of Discrete Random Variables

Lecture 48 - Sums of Jointly Continuous Random Variables

Lecture 49 - Sums of Random Number of Random Variables

Lecture 50 - General Transformations of Random Variables

Lecture 51 - Jacobian Formula

Lecture 52 - Examples Illustrating the use of Jacobian Formula

Lecture 53 - Introduction Integral and Expectation

Lecture 54 - Definition of the Abstract Integral

Lecture 55 - Simple Functions

Lecture 56 - Computing Expectation using Simple Functions, Properties of Integrals

Lecture 57 - Properties of Integrals (Continued....)

Lecture 58 - Inclusion Exclusion Formula using Indicator RVs and Expectation

Lecture 59 - Monotone Convergence Theorem - 1

Lecture 60 - Monotone Convergence Theorem - 2

Lecture 61 - Expectation of a Discrete Random Variable

Lecture 62 - Examples of Expectation of Discrete Random Variables

Lecture 63 - Expectation of Function of Random Variable

Lecture 64 - Some Examples of Computing Expectation

NPTEL : NOC:Analog Circuits (Electrical Engineering)

Co-ordinators : Dr. Nagendra Krishnapura

Lecture 1 - Introduction to the course

Lecture 2 - Obtaining power gain

Lecture 3 - Obtaining power gain using a linear two port?

Lecture 4 - One port (two terminal) nonlinear element

Lecture 5 - Nonlinear circuit analysis

Lecture 6 - Small signal incremental analysis - graphical view

Lecture 7 - Small signal incremental analysis

Lecture 8 - Incremental equivalent circuit

Lecture 9 - Large signal characteristics of a diode

Lecture 10 - Analysis of diode circuits

Lecture 11 - Small signal model of a diode

Lecture 12 - Two port nonlinearity

Lecture 13 - Small signal equivalent of a two port network

Lecture 14 - Small signal equivalent circuit of a two port network

Lecture 15 - Gain of a two port network

Lecture 16 - Constraints on small signal parameters to maximize the gain

Lecture 17 - Constraints on large signal characteristics to maximize the gain

Lecture 18 - Implications of constraints in terms of the circuit equivalent

Lecture 19 - MOS transistor-description

Lecture 20 - MOS transistor large signal characteristics

Lecture 21 - MOS transistor large signal characteristics - graphical view

Lecture 22 - MOS transistor small signal characteristics

Lecture 23 - Linear (Triode) region of the MOS transistor

Lecture 24 - Small signal amplifier using the MOS transistor

Lecture 25 - Basic amplifier structure

Lecture 26 - Problems with the basic structure

Lecture 27 - Adding bias and signal-ac coupling

Lecture 28 - Common source amplifier with biasing

Lecture 29 - Common source amplifier: Small signal equivalent circuit

Lecture 30 - Common source amplifier analysis: Effect of biasing components

Lecture 31 - Constraint on the input coupling capacitor

Lecture 98 - Large signal characteristics of pMOS CS amplifier with nMOS active load

Lecture 99 - Large signal characteristics of nMOS CS amplifier with pMOS active load

Lecture 100 - Large signal characteristics of a CMOS inverter

Lecture 101 - Active load amplifiers as digital gates

Lecture 102 - Sensitivity of output bias to input bias in a CMOS inverter

Lecture 103 - Self biasing a CMOS inverter

Lecture 104 - An application of self biased inverters

Lecture 105 - Current consumption of a self-biased inverter; Current biasing

Lecture 106 - Amplifying a difference signal; Differential pair

Lecture 107 - Differential pair-small signal basics

Lecture 108 - Biasing a differential pair

Lecture 109 - Differential pair with differential excitation

Lecture 110 - Differential pair with a current mirror load

Lecture 111 - Differential pair with a current mirror load - operating point

Lecture 112 - Differential pair with a current mirror load - Norton equivalent current

Lecture 113 - Differential pair with a current mirror load - Norton equivalent resistance

Lecture 114 - Common mode gain

Lecture 115 - Single stage opamp

Lecture 116 - Single stage opamp: Input common mode swing limits

Lecture 117 - Single stage opamp: Output swing limits

Lecture 118 - Which transistor type to use for the second stage?

Lecture 119 - Small signal gain

Lecture 120 - DC negative feedback biasing of all stages

Lecture 121 - DC negative feedback biasing of all stages (Continued...)

Lecture 122 - Small signal model

Lecture 123 - Swing limits

Lecture 124 - Systematic offset; How to eliminate it

Lecture 125 - Bipolar junction transistor(BJT): Large signal model

Lecture 126 - BJT model for calculating operating points

Lecture 127 - BJT small signal model

Lecture 128 - Biasing a BJT

Lecture 129 - Biasing a BJT, (Continued...)

Lecture 130 - Amplifiers using BJTs

Lecture 131 - PNP transistor

NPTEL : NOC:Introduction to Non Linear Dynamics (Electrical Engineering)

Co-ordinators : Prof. Gaurav Raina

NPTEL : NOC:Control Engineering (Electrical Engineering)

Co-ordinators : Prof. Ramkrishna.P

Lecture 1 - Introduction to Systems and Control

Lecture 2 - Modelling of Systems

Lecture 3 - Elements of Modelling

Lecture 4 - Examples of Modelling

Lecture 5 - Solving Problems in Modelling of Systems

Lecture 6 - Laplace Transforms

Lecture 7 - Inverse Laplace Transforms

Lecture 8 - Transfer Function of Modelling Block Diagram Representation

Lecture 9 - Solving Problems on Laplace Transforms and Transfer Functions

Lecture 10 - Block Diagram Reduction, Signal Flow Graphs

Lecture 11 - Solving Problems on Block Diagram Reduction, Signal Flow Graphs

Lecture 12 - Time Response Analyzsis of systems

Lecture 13 - Time Response specifications

Lecture 14 - Solving Problems on Time Response Analyzsis ans specifications

Lecture 15 - Stability

Lecture 16 - Routh Hurwitz Criterion

Lecture 17 - Routh Hurwitz Criterion T 1

Lecture 18 - Closed loop System and Stability

Lecture 19 - Root Locus Technique

Lecture 20 - Root Locus Plots

Lecture 21 - Root Locus Plots (Continued...)

Lecture 22 - Root Locus Plots (Continued...)

Lecture 23 - Root Locus Plots (Continued...)

Lecture 24 - Introduction to Frequency Response

Lecture 25 - Frequency Response Plots

Lecture 26 - Relative Stability

Lecture 27 - Bode plots

Lecture 28 - Basics of Control design Proportional, Integral and Derivative Actions

Lecture 29 - Basics of Control design Proportional, Integral and Derivative Actions

Lecture 30 - Problems on PID Controllers

Lecture 31 - Basics of Control design Proportional, Integral and Derivative Actions

NPTEL : NOC:Analog IC Design (Electrical Engineering)

Co-ordinators : Prof. S. Aniruddhan

NPTEL : NOC:Probability Foundations for Electrical Engineers (Electrical Engineering)

Co-ordinators : Prof. R.Aravind, Dr. Andrew Thangaraj

Lecture 32 - Marginal PMF

Lecture 33 - Trinomial joint PMF

Lecture 34 - Events and Conditioning with Two Random Variables

Lecture 35 - Example: compute marginal and conditional PMFs, probability of events

Lecture 36 - Independent random variables

Lecture 37 - More on independence

Lecture 38 - Example: IID Repetitions

Lecture 39 - Addition of Random Variables

Lecture 40 - Sum, Difference and Max of Two Random Variables

Lecture 41 - More Computations: Min of Two Random Variables

Lecture 42 - Example: X+Y, X-Y, min(X,Y), max(X,Y)

Lecture 43 - Real line as sample space

Lecture 44 - Probability density function (pdf)

Lecture 45 - Cumulative distribution function (CDF)

Lecture 46 - Continuous random variables

Lecture 47 - pdf and CDF of continuous random variables

Lecture 48 - Spinning pointer example

Lecture 49 - Important continuous distributions

Lecture 50 - More continuous distributions

Lecture 51 - Two-dimensional real sample space

Lecture 52 - Joint pdf and joint CDF

Lecture 53 - More on assigning probability to regions of x-y plain

Lecture 54 - Darts example and marginal pdfs

Lecture 55 - Independence to two continuous random variables

Lecture 56 - Examples: two independent continuous random variables

Lecture 57 - Prob[X > Y]: computation of probability of a non-rectangular region

Lecture 58 - Transformations of random variables

Lecture 59 - CDF method

Lecture 60 - pdf method

Lecture 61 - Examples

Lecture 62 - One-to-one transformations

Lecture 63 - Expected Value or Mean of a Random Variable

Lecture 64 - Properties of Expectation

NPTEL : NOC:Introduction to Photonics (Electrical Engineering)

Co-ordinators : Prof. Balaji Srinivasan

Lecture 32 - Semiconductor light Source and detector LED Characteristics

Lecture 33 - Lab Demonstration: Semiconductor Sources

Lecture 34 - Semiconductor light Source and detector Laser Characteristics

Lecture 35 - Semiconductor Detectors - 1

Lecture 36 - Semiconductor Detectors - 2

Lecture 37 - Semiconductor Detectors - 3

Lecture 38 - Lab Demonstration: Semiconductor Detectors

Lecture 39 - Semiconductor Detectors - 4

Lecture 40 - Light manipulation-Mallus' Law

Lecture 41 - Light manipulation-Birefringence

Lecture 42 - Light manipulation-Faraday Rotation

Lecture 43 - Lab Demonstration: Manipulation of Light Intensity and Polarization

Lecture 44 - Non-linear optics-Pockels effect

Lecture 45 - Non-linear optics-Kerr Effect

Lecture 46 - Lab Demonstration: Manipulation of Light Electro Optic Modulator (EOM)

Lecture 47 - Non-linear optics-stimulated Brillouin scattering

Lecture 48 - Non-linear optics-stimulated Raman scattering

NPTEL : NOC:Multirate DSP (Electrical Engineering)

Co-ordinators : Prof. David Kovil Pillai

Lecture 1 - Introduction to Multirate DSP - Part 1

Lecture 2 - Introduction to Multirate DSP - Part 2

Lecture 3 - Sampling and Nyquist criterion - Part 1

Lecture 4 - Sampling and Nyquist criterion - Part 2

Lecture 5 - Signal Reconstruction - Part 1

Lecture 6 - Signal Reconstruction - Part 2

Lecture 7 - Reconstruction filter - Part 1

Lecture 8 - Reconstruction filter - Part 2

Lecture 9 - Discrete time processing of continuous time signal - Part 1

Lecture 10 - Discrete time processing of continuous time signal - Part 2

Lecture 11 - DT processing of CT signal example

Lecture 12 - Time scaling- upsampler and downsampler - Part 1

Lecture 13 - Time scaling- upsampler and downsampler - Part 2

Lecture 14 - Upsampler and downsampler- continued - Part 1

Lecture 15 - Upsampler and downsampler- continued - Part 2

Lecture 16 - Decimator properties

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Lecture 40 - Study of All-pass lattice

Lecture 41 - All-pass decomposition, the study of Mth band and Nyquist filters

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Lecture 43 - First part name : Perfect Reconstruction Final Overview. Second part name : Introduction to OFDM- Motivation - Part 1

Lecture 44 - First part name : Perfect Reconstruction Final Overview. Second part name : Introduction to OFDM- Motivation - Part 2

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Lecture 64 - Orthogonal Frequency Division Multiplexing - Part 2

NPTEL : NOC:LDPC and Polar Codes in 5G Standard (Electrical Engineering)

Co-ordinators : Dr. Andrew Thangaraj

NPTEL : NOC:Electromagnetic Compatibility, EMC (Electrical Engineering)

Co-ordinators : Prof. Daniel Mansson, Prof. Rajeev Thottappillil

NPTEL : NOC:Mapping Signal Processing Algorithms to Architectures (Electrical Engineering)

Co-ordinators : Prof. Nitin Chandrachoodan

NPTEL : NOC:Linear System Theory (Electrical Engineering)

Co-ordinators : Prof. Ramakrishna Pasumarthi

NPTEL : NOC:Digital Signal Processing (Electrical Engineering)

Co-ordinators : C. S. Ramalingam

Lecture 65 - Linear Phase - 3

Lecture 66 - Linear Phase - 4, Sampling - 1

Lecture 67 - Linear Phase - 4, Sampling - 1

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Lecture 69 - Sampling - 2

Lecture 70 - Sampling - 3

Lecture 71 - Sampling - 4

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Lecture 73 - Sampling - 4

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Lecture 78 - The Discrete Fourier Transform - 3

Lecture 79 - The Discrete Fourier Transform - 3

Lecture 80 - The Discrete Fourier Transform - 4

Lecture 81 - The Discrete Fourier Transform - 4

Lecture 82 - The Discrete Fourier Transform - 4

NPTEL : NOC:Computational Electromagnetics (Electrical Engineering)

Co-ordinators : Prof. Uday Khankhoje

Lecture 32 - Linear Vector Spaces

Lecture 33 - Formulating Method of Moments

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Lecture 35 - Surface Integral Equations: Evaluating the Integrals - Part 1

Lecture 36 - Surface Integral Equations: Evaluating the Integrals - Part 2

Lecture 37 - Surface Integral Equations: Conclusion

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Lecture 39 - Volume Integral Equations:Solving - Part 1

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Lecture 43 - Surface v/s volume integral equations

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Lecture 45 - Computational Considerations

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NPTEL : NOC:Transmission Lines and Electromagnetic Waves (Electrical Engineering)

Co-ordinators : Dr. Ananth Krishnan

Lecture 1 - Transmission lines

Lecture 2 - LosslessTransmission lines: Wave Equations

Lecture 3 - Introduction to finite difference method

Lecture 4 - Octave simulation of wave equation

Lecture 5 - Octave simulation of Telegrapher's equation

Lecture 6 - Reflections and reflection coefficient

Lecture 7 - AC signals in loss-less transmission lines

Lecture 8 - Transmission lines with losses

Lecture 9 - Octave simulation of Transmission lines with losses

Lecture 10 - Voltage reflection coefficient and standing wave ratio

Lecture 11 - Graphical representation of reflection coefficient

Lecture 12 - Impedance matching using Smith chart

Lecture 13 - Demonstration of Impedance matching using VNA

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Lecture 15 - Maxwell's Curl Equation

Lecture 16 - Octave simulation of an Electromagnetic Wave Equation

Lecture 17 - Polarisation of an Electromagnetic Wave

Lecture 18 - Octave Simulation of different types of Polarisation

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Lecture 20 - Plane Waves

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Lecture 31 - Phase Velocity and Group velocity

NPTEL : NOC:Digital IC Design (Electrical Engineering)

Co-ordinators : Prof. Janakiraman

NPTEL : NOC:Power Management Integrated Circuits (Electrical Engineering)

Co-ordinators : Prof. Qadeer Ahmad Khan

NPTEL : NOC:DC Power Transmission Systems (Electrical Engineering)

Co-ordinators : Prof. Krishna S

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Lecture 17 - Commutation margin angle in a 6 pulse LCC neglecting inductance - Part 1

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Lecture 24 - 2 and 3 valve conduction mode of 6 pulse LCC: DC side voltage and voltage across a valve

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Lecture 35 - Characteristics of 6 pulse LCC - Part 1

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Lecture 50 - Applications of DC transmission

Lecture 51 - Types of DC link: Monopolar

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Lecture 54 - DC link control: Control variables

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Lecture 67 - Comparison of AC and DC transmission

NPTEL : NOC:Optical Engineering (Electrical Engineering)

Co-ordinators : Prof. Shanti Bhattacharya

NPTEL : NOC:Nonlinear System Analysis (Electrical Engineering)

Co-ordinators : Dr. Arun D. Mahindrakar, Prof. Ramkrishna Pasumarthy

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NPTEL : NOC:Signals and Systems (Electrical Engineering)

Co-ordinators : Prof. Kushal K. Shah

Lecture 32 - Overview of Systems and General Properties

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Lecture 38 - Frequency Domain Representation of LCCDE Systems

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Lecture 40 - Continuous-Time Convolution Integral

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Lecture 42 - Continuous-Time Convolution : Example II

Lecture 43 - Continuous-Time Convolution : Example III

Lecture 44 - LTI Systems : Commutative, Distributive and Associative

Lecture 45 - LTI Systems : Memorylessness and Invertibility

Lecture 46 - LTI Systems : Causality and Stability

Lecture 47 - Fourier Transform in Complex Frequency Domain

Lecture 48 - Laplace Transform : Poles and Zeros

Lecture 49 - Laplace Transform : Region of Convergence [ROC]

Lecture 50 - Laplace Transform : Examples I

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Lecture 52 - Laplace Analysis of LTI Systems

Lecture 53 - Laplace Analysis of RLC Circuits - I

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Lecture 80 - DTFT in Complex Frequency Domain

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Lecture 83 - Z-Transform Properties II: Conjugation and Convolution

Lecture 84 - Z-Transform Properties III: Causality and Stability

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Lecture 86 - Z-Transform : Examples II

Lecture 87 - Block Diagram Representation

NPTEL : NOC:Linear Dynamical Systems (Electrical Engineering)

Co-ordinators : Prof. Tushar Jain

NPTEL : NOC:A brief Introduction of Micro-Sensors (Electrical Engineering)

Co-ordinators : Prof. Santanu Talukder

NPTEL : NOC:Fiber Optic Communication Technology (Electrical Engineering)

Co-ordinators : Prof. Deepa Venkitesh

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Lecture 2 - Communication through the ages

Lecture 3 - Communication: Basics - 1

Lecture 4 - Communication: Basics - 2

Lecture 5 - Digital Communication for Optical Communication

Lecture 6 - Digital modulation: Basics - 2

Lecture 7 - Digital modulation: Basics - 3

Lecture 8 - Optical communication system

Lecture 9 - Assignment Discussion - Week 1

Lecture 10 - Optical Sources

Lecture 11 - Semiconductor gain media- structure, spectrum

Lecture 12 - Optical sources: LED

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Lecture 14 - Modulation Bandwidth of LED

Lecture 15 - Optical and Electrical Bandwidth of LED

Lecture 16 - Emission Pattern of LED

Lecture 17 - Optical Sources: Laser Diodes over LEDs

Lecture 18 - Laser Diodes: Resonator Concepts 1a

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Lecture 20 - Laser Diodes: Resonator Concepts 1c

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Lecture 23 - Laser Diodes: Photon life time

Lecture 24 - Laser rate equation: Steady State solution1

Lecture 25 - Laser rate equation: LI Chara

Lecture 26 - Laser power derivation

Lecture 27 - Modulation Response of Laser - 1

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Lecture 30 - Setbacks of direct modulation of laser: Modulation Chirp

Lecture 31 - Setbacks of direct modulation of laser: Transcient Chirp

NPTEL : NOC:Image Signal Processing (Electrical Engineering)

Co-ordinators : Prof. A. N. Rajagopalan

NPTEL : NOC:Fundamentals of Electric Vehicles: Technology and Economics (Electrical Engineering)

Co-ordinators : Prof. Ashok Jhunjhunwala, Prof. Prabhjot Kaur, Prof. Kaushal Kumar Jha, Prof. L Kannan

NPTEL : NOC:Applied Linear Algebra (Electrical Engineering)

Co-ordinators : Prof. Andrew Thangaraj

NPTEL : NOC:Basic Electrical Circuits (Electrical Engineering)

Co-ordinators : Dr. Nagendra Krishnapura

Lecture 98 - Example: Determining opamp sign for negative feedback

Lecture 99 - Analysis of circuits with opamps

Lecture 100 - More on opamps: Example circuits and additional topics

Lecture 101 - Inverting amplifier

Lecture 102 - Summing amplifier

Lecture 103 - Instrumentation amplifier

Lecture 104 - Negative resistance

Lecture 105 - Finding opamp signs for negative feedback-circuits with multiple opamps

Lecture 106 - Opamp supply voltages and saturation

Lecture 107 - KCL with an opamp and supply currents

Lecture 108 - Circuits with storage elements (capacitors and inductors)

Lecture 109 - First order circuit with zero input-natural response

Lecture 110 - First order RC circuit with zero input-Example

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Lecture 112 - General form of the first order circuit response

Lecture 113 - First order RC circuit with a constant input-Example

Lecture 114 - First order circuit with piecewise constant input

Lecture 115 - First order circuit with piecewise constant input-Example

Lecture 116 - First order circuit-Response of arbitrary circuit variables

Lecture 117 - Summary: Computing first order circuit response

Lecture 118 - Does a capacitor block DC?

Lecture 119 - Finding the order of a circuit

Lecture 120 - First order RC circuits with discontinuous capacitor voltages

Lecture 121 - Summary: Computing first order circuit response with discontinuities

Lecture 122 - First order RL circuits

Lecture 123 - First order RL circuit with discontinuous inductor current-Example

Lecture 124 - First order RC circuit with an exponential input

Lecture 125 - First order RC response to its own natural response

Lecture 126 - First order RC response to a sinusoidal input

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Lecture 128 - Summary: Linear circuit response to sinusoidal input via the complex exponential

Lecture 129 - Three methods of calculating the sinusoidal steady state response

Lecture 130 - Calculating the total response including initial conditions

NPTEL : NOC:Optical Fiber Sensors (Electrical Engineering)

Co-ordinators : Prof. Balaji Srinivasan

NPTEL : NOC:Introduction to Time - Varying Electrical Networks (Electrical 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 noise in electrical networks

Lecture 18 - Noise processed by a linear time-invariant system

Lecture 19 - kT/C noise in a sample-and-hold circuit

Lecture 20 - Noise in RLC networks

Lecture 21 - Total integrated noise in RLC Networks

Lecture 22 - Bode's Noise Theorem - Frequency domain

Lecture 23 - Input referred noise in electrical networks - Part 1

Lecture 24 - Input referred noise in electrical networks - Part 2

Lecture 25 - Input referred noise and the noise factor

Lecture 26 - Noise Factor Examples

Lecture 27 - Motivation to learn about time-varying circuits and systems - Part 1

Lecture 28 - Motivation to learn about time-varying circuits and systems - Part 2

Lecture 29 - Convolution integral for LTV systems

Lecture 30 - Frequency response of an LTV system

Lecture 31 - LTV system example : Time-varying RC filter

Lecture 32 - Linear Periodically Time-Varying Systems (LPTV)

Lecture 33 - Response of an LPTV system to a complex exponential input

Lecture 34 - Harmonic Transfer Functions

Lecture 35 - Zadeh expansion of an LPTV system

Lecture 36 - MNA analysis of LPTV networks

Lecture 37 - MNA stamp of a periodically time varying conductance

Lecture 38 - MNA stamp of a capacitor and a voltage source in an LPTV network

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Lecture 40 - Analysis of an example LPTV network - Part 2

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Lecture 42 - Impedance and admittance in LTI and LPTV networks

Lecture 43 - Thevenin and Norton's Theorems for LPTV networks

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Lecture 45 - N-path example

Lecture 46 - Time-domain intuition of the N-path principle

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Lecture 48 - Dc-dc converter as an LPTV system

Lecture 49 - N-path principle: Multiphase dc-dc converter

Lecture 50 - The N-path filter

Lecture 51 - Computing H_0(j2\pi f_s) for a 4-path filter

Lecture 52 - Input impedance of the 4-path filter at f_s

Lecture 53 - Computing H_0(j2\pi 2 f_s) for a 4-path filter

Lecture 54 - Determining H_0 for input frequency deviations from f_s

Lecture 55 - Reciprocity and Inter-reciprocity in LPTV networks : Part 1

Lecture 56 - Reciprocity and Inter-reciprocity in LPTV networks : Part 2, the transfer-function theorem

Lecture 57 - Why is the transfer-function theorem important?

Lecture 58 - The frequency-reversal theorem for inter-reciprocal (adjoint) LPTV networks : introduction

Lecture 59 - The frequency-reversal theorem for inter-reciprocal (adjoint) LPTV networks : derivation

Lecture 60 - Why is the frequency-reversal theorem important?

Lecture 61 - Inter-reciprocity in signal-flow graphs

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Lecture 63 - Applications of inter-reciprocity: analysis of chopped amplifiers (Continued...)

Lecture 64 - Applications of inter-reciprocity: chopping with square-wave modulation

Lecture 65 - Applications of inter-reciprocity: the switched-RC network

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Lecture 67 - Time-domain implications of inter-reciprocity and the adjoint network : Example calculation

Lecture 68 - LPTV networks with sampled outputs: Switched capacitor circuits

Lecture 69 - LPTV networks with sampled outputs: A continuous-time delta-sigma data converter

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Lecture 71 - Finding the equivalent LTI filter of a sampled LPTV system : example

Lecture 72 - Equivalent LTI filter for a switched-RC network

Lecture 73 - Finding the equivalent LTI filter of a sampled LPTV system : example of a continuous-time delta-sigma modulator

Lecture 74 - Finding the equivalent LTI filter of a sampled LPTV system with offset sampling

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Lecture 76 - Introduction to noise in LPTV Networks

Lecture 77 - Noise in LPTV networks with sampled outputs

Lecture 78 - Total integrated noise in networks with R,L,C and periodically operated switches

NPTEL : NOC:Digital System Design (Electrical Engineering)

Co-ordinators : Prof. Neeraj Goel

Lecture 32 - Ripple carry adder

Lecture 33 - Carry look ahead adder

Lecture 34 - Modeling BUS in Verilog

Lecture 35 - Fast adder:Carry select adder

Lecture 36 - Multiple operand adder

Lecture 37 - Multiplication

Lecture 38 - Iterative circuits - 1

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Lecture 40 - Introduction to sequential circuits

Lecture 41 - Latches

Lecture 42 - D-Flip-flops

Lecture 43 - More Flip-flops

Lecture 44 - Counters

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Lecture 51 - Derivation state graph

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Lecture 55 - State encoding

Lecture 56 - Multi-cycle adder design

Lecture 57 - Pipelined adder design

Lecture 58 - Multiplication design

Lecture 59 - Division hardware design

Lecture 60 - Interacting state machines

Lecture 61 - Register Transfer Level design

Lecture 62 - GCD computer at RTL Level

Lecture 63 - RTL Design - Bubble sort

Lecture 64 - RTL Design - Traffic light controller

NPTEL : NOC:Stochastic Modeling and the Theory of Queues (Electrical Engineering)

Co-ordinators : Prof. Krishna Jagannathan

Lecture 32 - Elementary Renewal Theorem

Lecture 33 - The Renewal Equation

Lecture 34 - The Renewal Equation (Continued...)

Lecture 35 - G/G/1 Queue and Little's theorem

Lecture 36 - Little's theorem

Lecture 37 - M/G/1 Queue

Lecture 38 - M/G/1 Queue and PK Formula

Lecture 39 - M/G/1 Queue and PK Formula (Continued...)

Lecture 40 - Ensemble rewards - Age and Duration

Lecture 41 - Ensemble rewards - Age and Duration (Continued...)

Lecture 42 - Key Renewal Theorem and Ensemble rewards

Lecture 43 - Introduction to finite state Discrete Time Markov Chains

Lecture 44 - Class and Types of Classes in a DTMC

Lecture 45 - Periodicity in a DTMC

Lecture 46 - Matrix Representation of a DTMC

Lecture 47 - The long term behaviour of a DTMC

Lecture 48 - Stationary Distribution and Long term behaviour of a DTMC - Part 1

Lecture 49 - Stationary Distribution and Long term behaviour of a DTMC - Part 2

Lecture 50 - Stationary Distribution and Long term behaviour of a DTMC - Part 3

Lecture 51 - Spectral Properties of Stochastic Matrices - Part 1

Lecture 52 - Spectral Properties of Stochastic Matrices - Part 2

Lecture 53 - The Short-term Behaviour of a DTMC

Lecture 54 - Introduction to Countable-state DTMC

Lecture 55 - Introduction to Countable-state DTMC (Continued...)

Lecture 56 - The Strong Markov Property

Lecture 57 - Renewal Theory applied to DTMC's

Lecture 58 - Stationary Distribution of a Countable State Space DTMC and Renewal Theory

Lecture 59 - Stationary Distribution of a Countable State Space DTMC and Renewal Theory (Continued...)

Lecture 60 - Stationary Distribution and The Steady State Behaviour of a Countable-state DTMC - Part 1

Lecture 61 - Stationary Distribution and The Steady State Behaviour of a Countable-state DTMC - Part 2

Lecture 62 - Convergence to Steady State of a Coutable-state DTMC (Stochastic Coupling)

Lecture 63 - The Birth-Death Markov Chains

Lecture 64 - The Reversibility Markov Chains

Lecture 65 - The Reversibility Markov Chains (Continued...)

Lecture 66 - Time Sampled M/M/1 Queue and The Burke's Theorem

Lecture 67 - Introduction to Continuous Time Markov Chains

Lecture 68 - Introduction to CTMC (Continued...)

Lecture 69 - The Steady State Behaviour of CTMC - Part 1

Lecture 70 - The Steady State Behaviour of CTMC - Part 2

Lecture 71 - The Steady State Behaviour of CTMC - Part 3

Lecture 72 - The Steady State Behaviour of CTMC - Part 4

Lecture 73 - The chapman-kolmogrov equations for CTMC's

Lecture 74 - The Birth-Death Continuous time Markov Chains

Lecture 75 - The Reversibility of Continuous time Markov Chains

Lecture 76 - Burke's Theorem and the Tandem Queues - Part 1

Lecture 77 - Burke's Theorem and the Tandem Queues - Part 2

Lecture 78 - The Jackson Networks - Part 1

Lecture 79 - The Jackson Networks - Part 2

Lecture 80 - Semi Markov Processes - Part 1

Lecture 81 - Semi Markov Processes - Part 2

NPTEL : NOC:Integrated Photonics Devices and Circuits (Electrical Engineering)

Co-ordinators : Prof. Bijoy Krishna Das

Lecture 1 - Course Background and Learning Outcome

Lecture 2 - Moore's Law and Interconnect Bottleneck

Lecture 3 - Progress in Optical Interconnect Technology and Beyond

Lecture 4 - Evolution of Silicon Photonics Platform

Lecture 5 - Fundamentals of Lightwaves: EM Waves: Maxwell Equations and Plane Wave Solutions

Lecture 6 - Fundamentals of Lightwaves: EM Waves: Wave Propagation in Lossy Dielectric Medium

Lecture 7 - Fundamentals of Lightwaves: EM Waves in Metals and Semiconductors

Lecture 8 - Fundamentals of Lightwaves: EM Waves: Plasma Dispersion

Lecture 9 - Fundamentals of Lightwaves: EM Waves Principle of Optical Waveguiding

Lecture 10 - Fundamentals of Lightwaves: 1-D Optical Waveguide: Ray Optics Model

Lecture 11 - Optical Waveguides: Theory and Design: TIR Based Eigen Mode Solutions for Slab Waveguides

Lecture 12 - Optical Waveguides: Theory and Design: TIR Based Design Solutions for Slab Waveguides

Lecture 13 - Optical Waveguides: Theory and Design: Guided ModeSolutions for Slab Waveguides

Lecture 14 - Optical Waveguides: Theory and Design: Guided ModeSolutions for Slab Waveguides cont

Lecture 15 - Optical Waveguides: Theory and Design: Guided Mode Dispersionand Power in Slab Waveguides

Lecture 16 - Optical Waveguides: Theory and Design: Optical Waveguide with 2D confinement

Lecture 17 - Optical Waveguides: Theory and Design: Dispersion and Polarization of Guided Modes

Lecture 18 - Optical Waveguides: Theory and Design: Orthogonalityof Guided Modes

Lecture 19 - Optical Waveguides: Theory and Design: Coupled Mode Theoryof Guided Modes

Lecture 20 - Optical Waveguides: Theory and Design: Coupled Mode Theory (Continued...)

Lecture 21 - Optical Waveguides: Theory and Design: Coupled Mode Theory (Continued...)

Lecture 22 - Integrated Optical Components: Y-Junction Power Splitter/Combiner and Mach-Zehnder Interferometer

Lecture 23 - Integrated Optical Components: Directional Coupler: Coupled Waveguides

Lecture 24 - Integrated Optical Components: Directional Coupler: Coupled Waveguides (Continued...)

Lecture 25 - Integrated Optical Components: Directional Coupler: Design and Modelling

Lecture 26 - Integrated Optical Components: DC based MZI and Microring Resonator (MRR)

Lecture 27 - Integrated Optical Components: Microring Resonator (MRR): Passive Characteristics

Lecture 28 - Integrated Optical Components: Distributed Bragg Reflector (DBR)

Lecture 29 - Integrated Optical Components: Distributed Bragg Reflector (DBR): Device Design - Part 1

Lecture 30 - Integrated Optical Components: Distributed Bragg Reflector (DBR): Device Design - Part 2

Lecture 31 - Tunable Devices and Reconfigurable Circuits: Phase Error Interference

NPTEL : NOC:Introduction to Semiconductor Devices (Electrical Engineering)

Co-ordinators : Prof. Naresh Kumar Emani

NPTEL : NOC:Electric Vehicles and Renewable Energy (Electrical Engineering)

Co-ordinators : Prof. Ashok Jhunjhunwala, Prof. Prabhjot Kaur, Prof. Kaushal Kumar Jha, Prof. L Kannan

Lecture 32 - Computation of Effective cost of battery - Part 2

Lecture 33 - Charging Batteries

Lecture 34 - Fundamentals of Battery Pack Design

Lecture 35 - Electrical Design of Battery Pack - Part 1

Lecture 36 - Electrical Design of Battery Pack - Part 2

Lecture 37 - Electrical Design of Battery Pack - Part 3

Lecture 38 - Mechanical Design of Battery Pack - Part 1

Lecture 39 - Mechanical Design of Battery Pack - Part 2

Lecture 40 - Mechanical Design of Battery Pack - Part 3

Lecture 41 - Mechanical Design of Battery Pack - Part 4

Lecture 42 - Thermal Design of Battery Pack - Part 1

Lecture 43 - Thermal Design of Battery Pack - Part 2

Lecture 44 - Thermal Design of Battery Pack - Part 3

Lecture 45 - Thermal Design of Battery Pack - Part 4

Lecture 46 - BMS Design and Embedded System - Part 1

Lecture 47 - BMS Design and Embedded System - Part 2

Lecture 48 - BMS Design and Embedded System - Part 3

Lecture 49 - BMS Design and Embedded System - Part 4

Lecture 50 - BMS Design and Embedded System - Part 5

Lecture 51 - Cell Testing and Characterization - Part 1

Lecture 52 - Cell Testing and Characterization - Part 2

Lecture 53 - EV Motors and Controllers - Vehicle Dynamics - Part 1

Lecture 54 - EV Motors and Controllers - Vehicle Dynamics - Part 2

Lecture 55 - EV Motors and Controllers - Understanding Flow - Part 1

Lecture 56 - EV Motors and Controllers - Understanding Flow - Part 2

Lecture 57 - Power and Efficiency

Lecture 58 - Torque Production - Part 1

Lecture 59 - Torque Production - Part 2

Lecture 60 - Torque Production - Part 3

Lecture 61 - Speed and Back EMF

Lecture 62 - The d-q Equivalent circuit - Part 1

Lecture 63 - The d-q Equivalent circuit - Part 2

Lecture 64 - Field-oriented Control

Lecture 65 - Three phase AC - Part 1

Lecture 66 - Three phase AC - Part 2

Lecture 67 - Thermal Design - Part 1

Lecture 68 - Thermal Design - Part 2

Lecture 69 - Thermal Design - Part 3

Lecture 70 - Engineering Considerations - Part 1

Lecture 71 - Engineering Considerations - Part 2

Lecture 72 - Engineering Considerations - Part 3 and Future Frontiers

Lecture 73 - EV Charger Introduction

Lecture 74 - Charger Paramaters and Types

Lecture 75 - Slow Fast chargers and Swapping

Lecture 76 - Swapping

Lecture 77 - Standardization and on board chargers

Lecture 78 - Public chargers

Lecture 79 - Public charger economics in Indian Context

Lecture 80 - Bulk Chargers, Swapping stations and data analytics

Lecture 81 - Introduction to Energy Scenario in India - Part 1

Lecture 82 - Introduction to Energy Scenario in India - Part 2

Lecture 83 - A novel Approach towards 100% RE in India - Part 1

Lecture 84 - A novel Approach towards 100% RE in India - Part 2

Lecture 85 - Going Beyond solar, wind, Li Ion and chilled water storage

Lecture 86 - Solar Photovoltaic

Lecture 87 - Solar Cell and its Characteristics

Lecture 88 - Solar Cells to Modules

Lecture 89 - Wind Energy

Lecture 90 - The War of Currents

Lecture 91 - The Birth of Solar - DC

Lecture 92 - Storage Options for Energy - Part 1

Lecture 93 - Storage Options for Energy - Part 2

Lecture 94 - Storage Options for Energy - Part 3

Lecture 95 - Storage Options for Energy - Part 4

Lecture 96 - The EV Ecosystem - Part 1

Lecture 97 - The EV Ecosystem - Part 2

NPTEL : Phase-locked loops (Electrical Engineering)

Co-ordinators : Dr. Saurabh Saxena

Lecture 65 - Course Summary

NPTEL : NOC:Fundamentals of Nano and Quantum Photonics (Electrical Engineering)

Co-ordinators : Prof. Naresh Kumar Emani

Lecture 32 - Introduction to Metamaterials

Lecture 33 - Metamaterials at GHz and THz frequecies

Lecture 34 - Negative index materials at optical frequencies

Lecture 35 - Plasmonic Metasurfaces

Lecture 36 - Dielectric Metasurfaces

Lecture 37 - Tunable and Active Metamaterials

Lecture 38 - Radiative Absorption and Emission

Lecture 39 - Miniaturization of Integrated Photonic Devices

Lecture 40 - Recent trends in nanoscale lasers

Lecture 41 - Non-Hermitian Systems

Lecture 42 - Resonant light-atom interactions

Lecture 43 - Experimental observation of Rabi oscillations

Lecture 44 - Atom-Cavity Interaction - Weak and strong coupling regimes

Lecture 45 - Experimental observation of weak and strong coupling

Lecture 46 - Fabrication of nanophotonic structures - 1

Lecture 47 - Fabrication of nanophotonic structures - 2

Lecture 48 - Measuring light quanta

Lecture 49 - Photon Statistics

Lecture 50 - Photodetection and shot noise limit

Lecture 51 - Second order correlation function

Lecture 52 - Hanbury Brown-Twiss Experiment with Photons

Lecture 53 - EM Waves as harmonic oscillator

Lecture 54 - Vacuum fluctuations

Lecture 55 - Coherent and squeezed states

Lecture 56 - Squeezed and photon number states

Lecture 57 - Application of squeezed states

Lecture 58 - Preliminaries for quantum theory of light

Lecture 59 - Quantum theory of light

Lecture 60 - Operator solution of quantum harmonic oscillator

Lecture 61 - Photon number states

Lecture 62 - Field quadratures and operators

Lecture 63 - Uncertainty relations for quantum light

Lecture 64 - Applications of quantum light - Quantum Key Distribution

NPTEL : NOC:Analog Electronic Circuits (IITM) (Electrical Engineering)

Co-ordinators : Prof. Shanthi Pavan

NPTEL : NOC:Modern Computer Vision (Electrical Engineering)

Co-ordinators : Prof. A. N. Rajagopalan

NPTEL : NOC:Optical Wireless Communications for Beyond 5G Networks and IoT (Electrical Engineering)

Co-ordinators : Prof. Anand Srivastava

Lecture 1 - Introduction to Optical Wireless Communications (OWC)

Lecture 2 - Basics of Lighting System

Lecture 3 - Optical Sources (LED)

Lecture 4 - Optical Sources (LASER)

Lecture 5 - Photodetecors

Lecture 6 - Photodetectors (Continued...)

Lecture 7 - SNR for PIN and APD

Lecture 8 - Indoor OWC channel modelling

Lecture 9 - Indoor OWC channel modelling (Continued...)

Lecture 10 - Channel model for single source

Lecture 11 - Channel model for multiple sources

Lecture 12 - MIMO channel

Lecture 13 - MIMO channel (Continued...)

Lecture 14 - Outdoor Optical Channel Modelling

Lecture 15 - Range equation of FSO link

Lecture 16 - Range equation of FSO link (Continued...)

Lecture 17 - Atmospheric Turbulence

Lecture 18 - Atmospheric Turbulence (Continued...)

Lecture 19 - Turbulence Mitigation techniques

Lecture 20 - Underwater OWC Channel Model

Lecture 21 - Underwater OWC Channel Model (Continued...)

Lecture 22 - Modulation Schemes for OWC, BER for OOK

Lecture 23 - BER of M-PPM, BER of L-PPM

Lecture 24 - Differential Pulse Interval Modulation (DPIM) and (DAPPM)

Lecture 25 - Variable Pulse Position Modulation (VPPM)

Lecture 26 - OFDM Basics

Lecture 27 - Cyclic Prefix (CP), OFDM with CP, BER of OFDM System

Lecture 28 - Frequency Offset in OFDM, PAPR in OFDM

Lecture 29 - OFDM in VLC, DCO-OFDM

Lecture 30 - ACO-OFDM

Lecture 31 - Color Shift Keying (CSK)

NPTEL : NOC:VLSI Design Flow: RTL to GDS (Electrical Engineering)

Co-ordinators : Prof. Sneh Saurabh

NPTEL : NOC:Fundamentals of Wireless Communication (Hindi) (Electrical Engineering)

Co-ordinators : Dr.Vivek Bohara

NPTEL : NOC:Sensor Technologies: Physics, Fabrication, and Circuits (Electrical Engineering)

Co-ordinators : Prof.Mitradip Bhattacharjee

Lecture 32 - Basics of Etching Techniques

Lecture 33 - Dry Etching Techniques

Lecture 34 - Optical and Electron Microscopy

Lecture 35 - Other Microscopy Techniques

Lecture 36 - Sensor System: Basic Circuits

Lecture 37 - Amplifier Circuits

Lecture 38 - Instrumentation Amplifier

Lecture 39 - Filter Circuits

Lecture 40 - Sensor System: Experimental Demonstration

NPTEL : NOC:Advanced topics in Wireless Communication (Hindi) (Electrical Engineering)

Co-ordinators : Prof. Vivek Ashok Bohara

Lecture 1 - Overview of Advanced Topics in Wireless Communication System - Part A

Lecture 2 - Overview of Advanced Topics in Wireless Communication System - Part B

Lecture 3 - Revision of Wireless Fundamentals - Part A

Lecture 4 - Revision of Wireless Fundamentals - Part B

Lecture 5 - Revision of Wireless Fundamentals - Part C

Lecture 6 - Revision of Wireless Fundamentals - Part D

Lecture 7 - Revision of Wireless Fundamentals - Part E

Lecture 8 - Channel Capacity in AWGN channel

Lecture 9 - Channel Capacity in flat fading channel

Lecture 10 - Channel Capacity with Optimal Power Adaptation

Lecture 11 - Tutorial 1 - MATLAB Tutorial: Channel Capacity

Lecture 12 - Introduction to Channel Coding

Lecture 13 - Channel Coding: Uncoded and Coded Performnace

Lecture 14 - Introduction to Linear Block Codes

Lecture 15 - Tutorial 2 - MATLAB Tutorial: Linear Block Codes

Lecture 16 - Linear Block Codes: Error Detection

Lecture 17 - Linear Block Codes: Error Correction

Lecture 18 - Examples of Linear Block Codes

Lecture 19 - Introduction to Convolution Codes

Lecture 20 - Convolution Code: Decoder-Viterbi Algorithm

Lecture 21 - Tutorial 3 - MATLAB Tutorial: Syndrome Identification and Correction

Lecture 22 - Convolution Codes: State Diagram and Transfer Function

Lecture 23 - Turbo codes

Lecture 24 - Low Density Parity Check (LDPC) Codes: Encoding

Lecture 25 - Low Density Parity Check (LDPC) Codes: Decoding

Lecture 26 - Introduction to Polar Codes

Lecture 27 - Polar Codes: Encoding and Decoding

Lecture 28 - Introduciton to MIMO systems

Lecture 29 - Spatial Diversity Techniques

Lecture 30 - Introduction to Space Time Block Codes

Lecture 31 - Tutorial 4 - Convolution Codes: Hard and Soft Decoding

NPTEL : NOC:State Space Approach to Control System Analysis and Design (Electrical Engineering)

Co-ordinators : Prof A P Tiwari

NPTEL : NOC:Optimization Theory and Algorithms (Electrical Engineering)

Co-ordinators : Prof. Uday K Khankhoje

Lecture 32 - Implementation of an optimization algorithm in MATLAB

Lecture 33 - Conjugate Gradient Methods - Introduction and Proof

Lecture 34 - Visualizing Quadratic Forms

Lecture 35 - Orthogonality and Conjugacy

Lecture 36 - Conjugate Directions Method - Introduction and Proof

Lecture 37 - Discussion on doubts

Lecture 38 - More on Conjugate Directions Method

Lecture 39 - Ways of Generating Conjugate Directions

Lecture 40 - Expanding Subspace Theorem

Lecture 41 - Discussion on doubts

Lecture 42 - Conjugate Gradient Method

Lecture 43 - MATLAB implementation on CGM

Lecture 44 - Discussion on doubts

Lecture 45 - Preconditioned Conjugate Gradient - Part 1

Lecture 46 - Preconditioned Conjugate Gradient - Part 2

Lecture 47 - Preconditioned Conjugate Gradient - Part 3

Lecture 48 - Non Linear Conjugate Gradient method

Lecture 49 - Intro to Newton methods

Lecture 50 - Newton methods and convergence

Lecture 51 - Checks for positive definite matrices

Lecture 52 - Hessian Modification

Lecture 53 - Quasi newton methods

Lecture 54 - BFGS method

Lecture 55 - Least squares problems

Lecture 56 - Linear least squares - Part 1

Lecture 57 - Linear least squares - Part 2

Lecture 58 - Solving least squares using SVD

Lecture 59 - Non linear least squares

Lecture 60 - Constrained Optimisation

Lecture 61 - Single equality constraint

Lecture 62 - Single inequality constraint - Part 1

Lecture 63 - Single inequality constraint - Part 2

Lecture 64 - Two inequality constraints example

Lecture 65 - Linearised feasible directions

Lecture 66 - Feasible sequences and tangent cone

Lecture 67 - LICQ conditions

Lecture 68 - KKT conditions (First order necessary conditions)

Lecture 69 - Proof sketch for KKT conditions - Part 1

Lecture 70 - Proof sketch for KKT conditions - Part 2

Lecture 71 - Introduction to Projected gradient descent

Lecture 72 - Projected gradient descent and proof of convergence

Lecture 73 - Proof of convergence - Part 2

Lecture 74 - Subgradients and Subdifferential

Lecture 75 - Projection onto l1 ball

Lecture 76 - Soft thresholding example

Lecture 77 - Recap of Projection onto l1 ball

Lecture 78 - KKT and duality introduction

Lecture 79 - Intuition of duality and dual problem

Lecture 80 - Proof of concavity of the dual problem - Part 1

Lecture 81 - Proof of concavity of the dual problem - Part 2

Lecture 82 - Proof of concavity of the dual problem - Part 3

NPTEL : NOC:Power Electronics with Wide Band Gap Devices (Electrical Engineering)

Co-ordinators : Prof. Moumita Das

Lecture 32 - Introduction to PCB Design

Lecture 33 - PCB Design

Lecture 34 - WBG Applications - IMD

Lecture 35 - WBG Applications - Renewable Energy Sources

Lecture 36 - WBG Applications - Reliability Analysis

NPTEL : NOC:Enabling Technologies for 6G Communications Networks (Hindi) (Electrical Engineering)

Co-ordinators : Prof. Vivek Ashok Bohara

NPTEL : NOC:Optimal Control (Electrical Engineering)

Co-ordinators : Prof. Barjeev Tyagi

Lecture 32 - Discrete-Time Optimal Control Systems (Continued...)

Lecture 33 - Matrix Discrete Riccati Equation

Lecture 34 - Analytical Solution of Matrix Difference Riccati Equation

Lecture 35 - Analytical Solution of Matrix Difference Riccati Equation (Continued...)

Lecture 36 - Optimal Control using Dynamic Programming

Lecture 37 - The Hamilton-Jacobi-Bellman (HJB) Equation

Lecture 38 - LQR System Using HJB Equation

Lecture 39 - Time Optimal Control System - Constrained Input

Lecture 40 - Time Optimal Control System (Continued...)

NPTEL : NOC:Basics of Software Defined Radios and Practical Applications (Electrical Engineering)

Co-ordinators : Dr. Meenakshi Rawat

NPTEL : NOC:Electrical Distribution System Analysis (Electrical Engineering)

Co-ordinators : Prof. N P Padhy, Late Prof. G. B. Kumbhar

NPTEL : NOC:Introduction to Smart Grid (Electrical Engineering)

Co-ordinators : Prof. Premalata Jena, Prof. N.P. Padhy

NPTEL : NOC:Facts Devices (Electrical Engineering)

Co-ordinators : Prof. Avik Bhattacharya

NPTEL : NOC:Advanced Linear Continuous Control Systems: Applications with MATLAB Programming and Simulink (Electrical Engineering)

Co-ordinators : Prof. Yogesh Vijay Hote

NPTEL : NOC:Computer Aided Power System Analysis (Electrical Engineering)

Co-ordinators : Prof. Biswarup Das

Lecture 1 - Modeling of Power System Components

Lecture 2 - Modeling of Power System Components (Continued...)

Lecture 3 - Bus Admittance Matrix

Lecture 4 - Bus Admittance Matrix with Mutual Impedance

Lecture 5 - Bus Admittance Matrix with mutual impedance (Continued...)

Lecture 6 - Power flow equations and classification of buses

Lecture 7 - Basic Gauss - Seidel Numerical Method

Lecture 8 - Gauss - Seidel Load Flow (GSLF)

Lecture 9 - GSLF with Multiple Generators

Lecture 10 - Example of GSLF

Lecture 11 - Basics of Newton Raphson Numerical Method

Lecture 12 - Newton - Raphson Load Flow (NRLF) in Polar Co-Ordinate

Lecture 13 - NRLF in polar co-ordinate (Continued...)

Lecture 14 - NRLF in polar co-ordinate (Continued...)

Lecture 15 - NRLF (Polar) Algorithm and Example

Lecture 16 - NRLF in rectangular coordinate

Lecture 17 - NRLF in rectangular coordinate (Continued...)

Lecture 18 - NRLF in rectangular coordinate (Continued...)

Lecture 19 - Example of NRLF (Rectangular) Method

Lecture 20 - Fast decoupled load flow (FDLF)

Lecture 21 - FDLF (Continued...)

Lecture 22 - FDLF (Continued...)

Lecture 23 - AC- DC Load Flow

Lecture 24 - AC- DC Load Flow (Continued...)

Lecture 25 - AC- DC Load Flow (Continued...)

Lecture 26 - Sparsity and Gaussian Elimination

Lecture 27 - Gaussian Elimination Method

Lecture 28 - Example of Gaussian Elimination Method

Lecture 29 - Gaussian Elimination and Optimal Ordering

Lecture 30 - Triangular Factorization

Lecture 31 - LU Decomposition

NPTEL : NOC:Advance Power Electronics and Control (Electrical Engineering)

Co-ordinators : Prof. Avik Bhattacharya

NPTEL : NOC:CMOS Digital VLSI Design (Electrical Engineering)

Co-ordinators : Prof. Sudeb Dasgupta

NPTEL : NOC:Microelectronics: Devices to Circuits (Electrical Engineering)

Co-ordinators : Prof. Sudeb Dasgupta

NPTEL : NOC:DC Microgrid (Electrical Engineering)

Co-ordinators : Prof. Avik Bhattacharya

NPTEL : NOC:Power Quality Improvement Technique (Electrical Engineering)

Co-ordinators : Prof. Avik Bhattacharya

NPTEL : NOC:Power System Protection and Switchgear (Electrical Engineering)

Co-ordinators : Prof. Bhaveshkumar R. Bhalja

Lecture 1 - Fundamentals of Protective Relaying - I

Lecture 2 - Fundamentals of Protective Relaying - II

Lecture 3 - Fundamentals of Protective Relaying - III

Lecture 4 - Fundamentals of Protective Relaying - IV

Lecture 5 - Fundamentals of Protective Relaying - V

Lecture 6 - Current based Relaying Scheme - I

Lecture 7 - Current based Relaying Scheme - II

Lecture 8 - Current based Relaying Scheme - III

Lecture 9 - Current based Relaying Scheme - IV

Lecture 10 - Current based Relaying Scheme - V

Lecture 11 - Current based Relaying Scheme - VI

Lecture 12 - Current based Relaying Scheme - VII

Lecture 13 - Current based Relaying Scheme - VIII

Lecture 14 - Protection of Transmission Lines using Distance Relays - I

Lecture 15 - Protection of Transmission Lines using Distance Relays - II

Lecture 16 - Protection of Transmission Lines using Distance Relays - III

Lecture 17 - Protection of Transmission Lines using Distance Relays - IV

Lecture 18 - Protection of Transmission Lines using Distance Relays - V

Lecture 19 - Carrier Aided Schemes for Transmission Lines - I

Lecture 20 - Carrier Aided Schemes for Transmission Lines - II

Lecture 21 - Carrier Aided Schemes for Transmission Lines - III

Lecture 22 - Carrier Aided Schemes for Transmission Lines - IV

Lecture 23 - Auto-reclosing and Synchronizing - I

Lecture 24 - Auto-reclosing and Synchronizing - II

Lecture 25 - Auto-reclosing and Synchronizing - III

Lecture 26 - Protection of Transformers - I

Lecture 27 - Protection of Transformers - II

Lecture 28 - Protection of Generators - I

Lecture 29 - Protection of Generators - II

Lecture 30 - Protection of Induction Motors

Lecture 31 - Protection of Busbars

NPTEL : NOC:RF Transceiver of Design (Electrical Engineering)

Co-ordinators : Prof. Darshak Bhatt

NPTEL : NOC:VLSI Physical Design with Timing Analysis (Electrical Engineering)

Co-ordinators : Prof. Bishnu Prasad Das

Lecture 32 - Placement Algorithms

Lecture 33 - Placement algorithms and legalization

Lecture 34 - Introduction to Clock Tree Synthesis

Lecture 35 - Clock Routing Algorithms - I

Lecture 36 - Clock Routing Algorithms - II

Lecture 37 - Clock Routing Algorithms - III

Lecture 38 - Introduction and Optimization Goals - Global Routing

Lecture 39 - Single net routing (Rectilinear routing)

Lecture 40 - Global Routing in the connectivity graph

Lecture 41 - Finding Shortest Paths with Dijkstra's Algorithm

Lecture 42 - Full-Netlist Routing

Lecture 43 - Introduction: Detailed Routing

Lecture 44 - Channel Routing Algorithms - I

Lecture 45 - Channel Routing Algorithms - II

Lecture 46 - Switchbox and Over the cell routing

Lecture 47 - Timing Constraints in latch based system

Lecture 48 - Timing Constraints in Pulsed Latch-based System

Lecture 49 - Time Borrowing in Latch

Lecture 50 - Crosstalk Analysis

Lecture 51 - Standard Cell Library

Lecture 52 - Low Power Cells in Standard Cell Library

Lecture 53 - Sub-threshold Standard Cell Library

Lecture 54 - Timing Library for Standard Cells

Lecture 55 - PDK and Other files

Lecture 56 - Open-Source Tool Installation and Qflow

Lecture 57 - Open-Source tool - YOSYS

Lecture 58 - OpenSTA Static Timing Analyzer

Lecture 59 - OpenROAD Physical Synthesis Flow - I

Lecture 60 - OpenROAD Physical Synthesis Flow - II

NPTEL : NOC:Modeling, Analysis and Estimation of Three Phase Unbalanced Power Network (Electrical Engineering)

Co-ordinators : Prof. Biswarup Das

Lecture 1 - Introduction

Lecture 2 - Carsonâ€™s Line

Lecture 3 - Carsonâ€™s Line (Continued...)

Lecture 4 - Three-phase Transmission Line - 1

Lecture 5 - Three-phase Transmission Line - 2

Lecture 6 - Three-phase Transmission Line (Continued...)

Lecture 7 - Three-phase Transmission Line (Continued...)

Lecture 8 - Three-phase Transmission Line (Continued...)

Lecture 9 - Transposition of Transmission Line

Lecture 10 - Transposition of Transmission Line (Continued...)

Lecture 11 - Sequence impedance of Transmission Line

Lecture 12 - Sequence impedance of Transmission Line (Continued...)

Lecture 13 - Impedance of Transmission Line

Lecture 14 - Impedance of Transmission Line (Continued...)

Lecture 15 - Impedance of Transmission Line (Continued...)

Lecture 16 - Impedance of Transmission Line (Continued...)

Lecture 17 - Impedance of Transmission Line (Continued...)

Lecture 18 - Impedance of Transmission Line (Continued...)

Lecture 19 - Impedance of Transmission Line (Continued...)

Lecture 20 - Impedance of Transmission Line (Continued...)

Lecture 21 - Capacitance of Transmission Line

Lecture 22 - Capacitance of Transmission Line (Continued...)

Lecture 23 - Capacitance of Transmission Line (Continued...)

Lecture 24 - Capacitance of Transmission Line (Continued...)

Lecture 25 - Transformer Modeling (Introduction, YgYg0)

Lecture 26 - Transformer Modeling (YgYg0, YgYg4)

Lecture 27 - Transformer Modeling (YgD1)

Lecture 28 - Transformer Modeling (YgD1, YD1)

Lecture 29 - Transformer Modeling (YD1) (Continued...)

Lecture 30 - Transformer Modeling (YD1) (Continued...)

Lecture 31 - Transformer Modeling (YYg0, Dd0)

Lecture 32 - Transformer Modeling (Dd0, Overall Summary)

Lecture 33 - Three-Phase Load Flow (Network Modelling)

Lecture 34 - Three-Phase Load Flow (Formation of bus admittance matrix)

Lecture 35 - Three-Phase Load Flow (Formation of bus admittance matrix) (Continued...)

Lecture 36 - Three-Phase Load Flow (Formation of bus admittance matrix) (Continued...)

Lecture 37 - Three-Phase Load Flow (General expression of bus admittance matrix)

Lecture 38 - Three-Phase Load Flow (General expression of bus injected current)

Lecture 39 - Three-Phase Load Flow (Derivation of power flow equations)

Lecture 40 - Three-Phase Load Flow (Concept of Generator Internal Bus)

Lecture 41 - Three-Phase Load Flow (Unknown Quantities)

Lecture 42 - Three-Phase Load Flow (Classification of Unknown Quantities)

Lecture 43 - Three-Phase Load Flow (Classification of Known Quantities)

Lecture 44 - Three-Phase Load Flow (Equations Relating Known and Unknown Quantities)

Lecture 45 - Three-Phase Load Flow (NRLF Polar Method)

Lecture 46 - Three-Phase Load Flow (General Definitions and Dimensions of Jacobian Submatrices)

Lecture 47 - Three-Phase Load Flow (Derivation of J1)

Lecture 48 - Three-Phase Load Flow (Derivation of J1) (Continued...)

Lecture 49 - Three-Phase Load Flow (Derivation of J2)

Lecture 50 - Three-Phase Load Flow (Derivation of J3)

Lecture 51 - Three-Phase Load Flow (Derivation of J3) (Continued...)

Lecture 52 - Three-Phase Load Flow (Derivation of J4, J5, J6, J7, J8)

Lecture 53 - Three-Phase Load Flow (Derivation of J9)

Lecture 54 - Three-Phase Load Flow (Derivation of J9, J10)

Lecture 55 - Three-Phase Load Flow (Derivation of J11, J12)

Lecture 56 - Three-Phase Load Flow (Derivation of J13, J14, J15 and J16, Algorithm and Example)

Lecture 57 - Three-Phase State Estimation (Revision of WLS State Estimation Method for Balanced Systems)

Lecture 58 - Three-Phase State Estimation (Derivation of Measurement Functions for Unbalanced Systems)

Lecture 59 - Three-Phase State Estimation (Derivation of Measurement Functions for Unbalanced Systems)

Lecture 60 - Three-Phase State Estimation (General Structure of Jacobian Matrix, Example)

NPTEL : NOC:Semiconductor Devices for Next Generation Field Effect Transistors (More than Moore): A Physics Perspective (Electrical Engineering)

Co-ordinators : Prof. Sudeb Dasgupta

Lecture 1 - Introduction to Subject

Lecture 2 - Introduction of MOS and Energy Band Diagram - I

Lecture 3 - Introduction of MOS and Energy Band Diagram - II

Lecture 4 - Introduction of MOS

Lecture 5 - Introduction of MOS (3 Terminal)

Lecture 6 - MOS Capacitor - I

Lecture 7 - MOS Capacitor - II

Lecture 8 - Introduction to MOSFET

Lecture 9 - I-V Characteristics of MOSFETs - I

Lecture 10 - I-V Characteristics of MOSFETs - II

Lecture 11 - Capacitance Modeling for High and Low Frequency - I

Lecture 12 - Capacitance Modeling for High and Low Frequency - II

Lecture 13 - Capacitance Modeling for High and Low Frequency - III

Lecture 14 - High Frequency Modeling of MOSFET

Lecture 15 - Application of MOSFET

Lecture 16 - MOSFET Switch and Amplifier

Lecture 17 - Introduction to Spice

Lecture 18 - Spice sub Circuit Models

Lecture 19 - Spice Installation Setup

Lecture 20 - Spice Model Equations - I

Lecture 21 - Spice Model Equations - II

Lecture 22 - Spice Model Equations - III

Lecture 23 - Spice Models Some Examples

Lecture 24 - Carriers and Transportation

Lecture 25 - Introduction to Semiconductor Heterostructures - I

Lecture 26 - Introduction to Semiconductor Heterostructures - II

Lecture 27 - Introduction to Semiconductor Heterostructures - III

Lecture 28 - Band Diagram of Heterostructure

Lecture 29 - P N Heterojunction Diode

Lecture 30 - Leakage in MOSFET

Lecture 31 - DIBL, GIDL, Channel Length Modulation, Source/Drain Series Resistance - I

Lecture 32 - DIBL, GIDL, Channel Length Modulation, Source/Drain Series Resistance - II

Lecture 33 - Velocity Saturation Effect, Velocity Overshoot, Ballistic Transport

Lecture 34 - Mobility Effects and Self Heating Effects

Lecture 35 - Introduction to Double Gate MOSFET

Lecture 36 - SOI MOSFET, Partially and Fully Depleted MOSFET

Lecture 37 - Subthreshold Swing and Transconductance

Lecture 38 - Small and Large Signal Modeling and Juntionless Transistors

Lecture 39 - Introduction to FinFETs Structure

Lecture 40 - Fabrication of FinFETs and HF Modeling

Lecture 41 - High-Frequency Small Signal Modeling

Lecture 42 - RLC FinFET Modeling

Lecture 43 - Gate All Around FETs, Device-Design Perspective

Lecture 44 - Gate All Around FETs

Lecture 45 - Nanosheet FET

Lecture 46 - Process Variation in Nanosheet FET

Lecture 47 - Negative Capacitance: Improved Subthreshold Swing - I

Lecture 48 - Negative Capacitance: Improved Subthreshold Swing - II

Lecture 49 - Introduction to Forksheet FET

Lecture 50 - Challenges of Forksheet FET

Lecture 51 - CFET Advancements and Industry Adoption

Lecture 52 - Design Challenges and CFET Optimization for Semiconductor Scaling

Lecture 53 - Introduction to Compound Semiconductor Materials

Lecture 54 - III-V Materials and Their Role for High-Speed Devices

Lecture 55 - IIIâ€“V HEMT and its Modeling - I

Lecture 56 - IIIâ€“V HEMT and its Modeling - II

Lecture 57 - IIIâ€“V HEMT and its Modeling - III

Lecture 58 - Vertical High Electron Mobility Transistor

Lecture 59 - Introduction to 2D Semiconductor Materials

Lecture 60 - 2D Semiconductor Materials

NPTEL : NOC:Intelligent Control of Robotic Systems (Electrical Engineering)

Co-ordinators : Prof. M. Felix Orlando

NPTEL : An Introduction to Electronics Systems Packaging (Electrical Engineering)

Co-ordinators : Prof. G.V. Mahesh

NPTEL : Power Electronics and Distributed Generation (Electrical Engineering)

Co-ordinators : Dr. Vinod John

NPTEL : Pulse width Modulation for Power Electronic Converters (Electrical Engineering)

Co-ordinators : Dr. G. Narayanan

NPTEL : Switched Mode Power Conversion (Electrical Engineering)

Co-ordinators : Prof. L. Umanand, Prof. V. Ramanarayanan

NPTEL : Basic Electrical Technology (Electrical Engineering)

Co-ordinators : Prof. L. Umanand

Lecture 1 - Basic Electrical Technology

Lecture 2 - Passive Components

Lecture 3 - Sources

Lecture 4 - Kirchoff's Law

Lecture 5 - Modelling of Circuit - Part 1

Lecture 6 - Modelling of Circuit - Part 2

Lecture 7 - Analysis Using MatLab

Lecture 8 - Sinusoidal steady state

Lecture 9 - Transfer Function and Pole Zero domain

Lecture 10 - Transfer function & pole zero

Lecture 11 - The Sinusoid

Lecture 12 - Phasor Analysis - Part 1

Lecture 13 - Phasor Analysis - Part 2

Lecture 14 - Power Factor

Lecture 15 - Power ports

Lecture 16 - Transformer Basics - Part 1

Lecture 17 - Transformer Basics - Part 2

Lecture 18 - Transformer Basics - Part 3

Lecture 19 - The Practical Transformer - Part 1

Lecture 20 - The Practical Transformer - Part 2

Lecture 21 - The Practical Transformer - Part 3

Lecture 22 - DC Machines - Part 1

Lecture 23 - DC Machines - Part 2

Lecture 24 - DC Generators - Part 1

Lecture 25 - DC Generators - Part 2

Lecture 26 - DC Motors - Part 1

Lecture 27 - DC Motors - Part 2

Lecture 28 - DC Motors - Part 3

Lecture 29 - Three Phase System - Part 1

Lecture 30 - Three Phase System - Part 2

Lecture 31 - Three Phase System - Part 3

NPTEL : Industrial Drives - Power Electronics (Electrical Engineering)

Co-ordinators : Prof. K. Gopakumar

NPTEL : NOC:Design for Internet of Things (Electrical Engineering)

Co-ordinators : Prof. T.V. Prabhakar

Lecture 1 - Introduction to IOTs - Part I

Lecture 2 - Introduction to IOTs - Part II

Lecture 3 - Introduction to IOTs - Examples

Lecture 4 - IOT applications - I

Lecture 5 - IOT applications - II

Lecture 6 - Power management in IOT device

Lecture 7 - Introduction to LDO

Lecture 8 - Design with an LDO

Lecture 9 - Introduction to switching regulators

Lecture 10 - Designing with LDO's, switching regulators and case studies - Part I

Lecture 11 - Designing with LDO's, switching regulators and case studies - Part II

Lecture 12 - Designing with LDO's, switching regulators and case studies - Part II

Lecture 13 - Designing with LDO's, switching regulators and case studies - Part IV

Lecture 14 - Power Conditioning with Energy Harvesters - I

Lecture 15 - Power Conditioning with Energy Harvesters - II

Lecture 16 - Power Conditioning with Energy Harvesters - III

Lecture 17 - Battery less power supply and battery life calculation for embedded devices - I

Lecture 18 - Battery less power supply and battery life calculation for embedded devices - II

Lecture 19 - Battery less power supply and battery life calculation for embedded devices - III

Lecture 20 - Introduction to MQTT

Lecture 21 - Quality of Service in MQTT

Lecture 22 - Standards and Security in MQTT

Lecture 23 - Introduction and Implementation of AMQP

Lecture 24 - Implementation of CoAP and MDNS

Lecture 25 - Basics of RFID

Lecture 26 - RFID protocol and applications

Lecture 27 - BLE Security

Lecture 28 - LPWAN technologies

Lecture 29 - Choice of Microcontrollers

Lecture 30 - Case Study 1 - Joule Jotter

Lecture 31 - Case Study 2 - Cloud Based Systems

NPTEL : NOC:Advances in UHV Transmission and Distribution (Electrical Engineering)

Co-ordinators : Prof Subba Reddy B

NPTEL : NOC:Mathematical Methods and Techniques in Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Shayan Srinivasa Garani

Lecture 1 - Introduction to signal processing

Lecture 2 - Basics of signals and systems

Lecture 3 - Linear time-invariant systems

Lecture 4 - Modes in a linear system

Lecture 5 - Introduction to state space representation

Lecture 6 - State space representation

Lecture 7 - Non-uniqueness of state space representation

Lecture 8 - Introduction to vector space

Lecture 9 - Linear independence and spanning set

Lecture 10 - Unique representation theorem

Lecture 11 - Basis and cardinality of basis

Lecture 12 - Norms and inner product spaces

Lecture 13 - Inner products and induced norm

Lecture 14 - Cauchy Schwartz inequality

Lecture 15 - Orthonormality

Lecture 16 - Problem on sum of subspaces

Lecture 17 - Linear independence of orthogonal vectors

Lecture 18 - Hilbert space and linear transformation

Lecture 19 - Gram Schmidt orthonormalization

Lecture 20 - Linear approximation of signal space

Lecture 21 - Gram Schmidt orthogonalization of signals

Lecture 22 - Problem on orthogonal complement

Lecture 23 - Problem on signal geometry (4-QAM)

Lecture 24 - Basics of probability and random variables

Lecture 25 - Mean and variance of a random variable

Lecture 26 - Introduction to random process

Lecture 27 - Statistical specification of random processes

Lecture 28 - Stationarity of random processes

Lecture 29 - Problem on mean and variance

Lecture 30 - Problem on MAP Detection

Lecture 31 - Fourier transform of dirac comb sequence

NPTEL : NOC:Electronics Enclosures Thermal Issues (Electrical Engineering)

Co-ordinators : Prof. N. V Chalapathi Rao

NPTEL : NOC:Integrated Circuits, MOSFETs, Op-Amps and their Applications (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

Lecture 1 - Introduction to Integrated Circuits (IC) Technology

Lecture 2 - Introduction to fabrication of IC: Substrates

Lecture 3 - Introduction to IC fabrication

Lecture 4 - Introduction to IC fabrication (Continued...)

Lecture 5 - Introduction to the fabrication of sensors

Lecture 6 - Introduction to fabrication technology

Lecture 7 - Introduction to fabrication technology (Continued...)

Lecture 8 - Introduction to fabrication technology (Continued...)

Lecture 9 - Introduction to fabrication technology (Continued...)

Lecture 10 - Introduction to fabrication technology (Continued...)

Lecture 11 - Process flow for Fabrication of MOSFETs

Lecture 12 - Operation of Enhancement type MOSFET

Lecture 13 - Operation of Depletion type MOSFET

Lecture 14 - MOSFETs Characteristics and Applications (Current Mirrors)

Lecture 15 - Introduction to Operational Amplifiers

Lecture 16 - Operational Amplifier Characteristics

Lecture 17 - Operational Amplifier Characteristics (Continued...)

Lecture 18 - Characteristics of an op-amp (Continued...)

Lecture 19 - Operational Amplifier Configarations

Lecture 20 - Operational Amplifier Configarations (Continued...)

Lecture 21 - Applications of Operational Amplifier: Differential Amplifier

Lecture 22 - Applications of Operational Amplifier: Integerator

Lecture 23 - Applications of Operational Amplifier: Differentiator

Lecture 24 - Introduction to Passive and Active Filters and op-amp as Low Pass Filter

Lecture 25 - Operational Amplifier as a High Pass Filter

Lecture 26 - Operational Amplifier as a Band Pass and Band Reject Filter

Lecture 27 - Introduction to Oscillator

Lecture 28 - RC Phase Shift Oscillator using Op-amp

Lecture 29 - Wein Bridge Oscillator using Op-amp

Lecture 30 - Hartley and Colpitts Oscillator using Op-amp

Lecture 31 - Working of Crystal Oscillators

NPTEL : NOC:Semiconductor Devices and Circuits (Electrical Engineering)

Co-ordinators : Prof. Sanjiv Sambandan

NPTEL : NOC:Fabrication Techniques for MEMs-based Sensors: Clinical Perspective (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

NPTEL : NOC:Op-Amp Practical Applications: Design, Simulation and Implementation (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

NPTEL : NOC:Physical Modelling for Electronics Enclosures using Rapid prototyping (Electrical Engineering)

Co-ordinators : Prof. N. V Chalapathi Rao

Lecture 1 - Products prototyping

Lecture 2 - Prototype concepts

Lecture 3 - Physical simulation

Lecture 4 - Rapid Prototyping

Lecture 5 - Products detailing

Lecture 6 - Advantages of Design Modelling

Lecture 7 - Sample product concept

Lecture 8 - Product sample exercise 1

Lecture 9 - Exercise in product sample 2

Lecture 10 - Integration of components 1

Lecture 11 - Components integration in models

Lecture 12 - 3D printing detail 1

Lecture 13 - 3D printing detail 2

Lecture 14 - 3D print assembly design

Lecture 15 - Heat spreader to 3D print

Lecture 16 - Metallic, 3D, build up 1

Lecture 17 - 3D build up 2

Lecture 18 - 3D design 1 from Photo snap

Lecture 19 - 3D design 2 from Photo snap

Lecture 20 - 3D Laser cuts 1, prints

Lecture 21 - 3D Laser cuts 2, open source public prints

Lecture 22 - Demo of 3D Part print

Lecture 23 - Building a model 1

Lecture 24 - Building a model 2

Lecture 25 - Common place objects

Lecture 26 - Materials

Lecture 27 - Future 3D In biology

Lecture 28 - Product clamp variants

Lecture 29 - Product clamp build up

Lecture 30 - Multi direction features

Lecture 31 - Multi direction features (Continued...)

NPTEL : NOC:Recent Advances in Transmission Insulators (Electrical Engineering)

Co-ordinators : Prof Subba Reddy B

NPTEL : NOC:Fundamentals of Semiconductor Devices (Electrical Engineering)

Co-ordinators : Prof. Digbijoy N. Nath

NPTEL : NOC:Advanced IOT Applications (Electrical Engineering)

Co-ordinators : Prof. T V Prabhakar

NPTEL : NOC:Electronic Systems for Cancer Diagnosis (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

Lecture 1 - Tissue and Cell Culture Techniques: Introduction

Lecture 2 - Tissue and Cell Culture Techniques: Methods

Lecture 3 - Tissue and Cell Culture Techniques: Devices

Lecture 4 - Cleanroom Equipments

Lecture 5 - Cleanroom Equipments (Continued...)

Lecture 6 - Introduction to photolithography

Lecture 7 - Photolithography: Mask Aligner

Lecture 8 - Photolithography: Designing Mask Aligner

Lecture 9 - Micromachining Techniques

Lecture 10 - Breast Cancer and Oral Cancer Statistics

Lecture 11 - Fabrication of MEMs-based Biochip for cancer diagnosis

Lecture 12 - Fabrication of MEMs-based Biochip for cancer diagnosis (Continued...)

Lecture 13 - Fabrication of Piezoresistive Sensor

Lecture 14 - Fabrication of Piezoresistive Sensor (Continued...)

Lecture 15 - Fabrication of SU-8 pillar on piezoresistive Sensor

Lecture 16 - Portable Cancer Diagnostic Tool Using a Disposable MEMS-Based Biochip

Lecture 17 - Mechanical Phenotyping of Breast Cancer using MEMS

Lecture 18 - Electrical characterization of Breast Tissue Cores

Lecture 19 - Fabrication of MEMS-based sensor for electro-mechanical phenotyping of breast cancer

Lecture 20 - Fabrication of electro-mechanical sensor (Continued...)

Lecture 21 - Assemby of the electro-mechanical sensor

Lecture 22 - Silicon substrate devices for breast cancer diagnosis

Lecture 23 - Understanding the methods and mechanism to study cell morphology

Lecture 24 - Cytology - A detail study on Spin Coater and Cytospin

Lecture 25 - Techniques in oral cytology studies

Lecture 26 - Techniques in cell morphology analysis

Lecture 27 - Comparitive study on diagnostic tools for oral cancer screening

Lecture 28 - Basic building blocks of Electronics System: Amplifiers

Lecture 29 - Basic building blocks of Electronics System: Amplifiers (Continued...)

Lecture 30 - Basic building blocks of Electronics System: Amplifiers (Continued...)

Lecture 31 - Basic building blocks of Electronics System: Filters

NPTEL : NOC:Electronic Modules for Industrial Applications using Op-Amps (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

NPTEL : NOC:Sensors and Actuators (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

NPTEL : NOC:Neural Networks for Signal Processing-I (Electrical Engineering)

Co-ordinators : Prof. Shayan Srinivasa Garani

NPTEL : NOC:Electronics Equipment Integration and Prototype Building (Electrical Engineering)

Co-ordinators : Prof. N.V.Chalapathi Rao

NPTEL : NOC:Design and Simulation of Power Conversion using Open Source Tools (Electrical Engineering)

Co-ordinators : Prof. L. Umanand

Lecture 32 - Pushpull converter - simulation

Lecture 33 - Half bridge converter - review

Lecture 34 - Half bridge converter - simulation

Lecture 35 - Full bridge converter - review

Lecture 36 - Full bridge converter - simulation

Lecture 37 - Close loop operation

Lecture 38 - Close loop with feed forward control

Lecture 39 - NgSpice simulation of close loop control

Lecture 40 - Battery charging with current control

Lecture 41 - Slope compensation for current control

Lecture 42 - NgSpice simulation of battery charging

Lecture 43 - Single phase PWM for single phase inverter

Lecture 44 - NgSpice simulation of single phase PWM

Lecture 45 - 2-axes theory for 3-phase systems

Lecture 46 - Transformations for 2 and 3 axes systems

Lecture 47 - Maximum power point tracking - NgSpice

Lecture 48 - Space vector PWM - digital

Lecture 49 - Space vector PWM - analog

Lecture 50 - SVPWM analog - NgSpice simulation

Lecture 51 - Induction motor model

Lecture 52 - Induction motor simulation in Octave

Lecture 53 - V/F control of induction motor - NgSpice

NPTEL : NOC:Introductory Neuroscience and Neuro-Instrumentation (Electrical Engineering)

Co-ordinators : Prof. Mahesh Jayachandra

Lecture 1 - Cellular (Microscopic) Structure of the Central Nervous System (CNS)

Lecture 2 - Anatomical (Macroscopic) structure of the CNS

Lecture 3 - Introduction to Cleanroom and IC Fabrication Techniques

Lecture 4 - Introduction to EEG applications for Hearing Loss

Lecture 5 - Electrophysiological Recordings

Lecture 6 - Neocortical Circuits

Lecture 7 - The resting Membrane Potential

Lecture 8 - Applications of MEMS Fabrication Technologies

Lecture 9 - Fundamentals of biopotentials and applications

Lecture 10 - Fundamentals of EEG and applications

Lecture 11 - The Action Potential (1)

Lecture 12 - The Action Potential (2)

Lecture 13 - Axonology, Neuronal Biophysics (1)

Lecture 14 - Axonology, Neuronal Biophysics (2)

Lecture 15 - Experimental Setup for EEG Recording

Lecture 16 - Introduction to Cleanroom Protocols and Demonstration of Gowning Procedure

Lecture 17 - Electromagnetic Stimulation of the Brain (1)

Lecture 18 - Electromagnetic Stimulation of the Brain (2)

Lecture 19 - Introduction to Event Related Potentials

Lecture 20 - Introduction to 3D Printing

Lecture 21 - 3D Printing: Applications and Demonstrations

Lecture 22 - Introduction to Event Related Potentials (2)

Lecture 23 - Different Event Related Potentials (1)

Lecture 24 - Different Event Related Potentials (2)

Lecture 25 - Introduction to Silicone Wafer Processing Techniques

Lecture 26 - Basics of Silicone Dioxide: Oxidation, Characterization and Applications

Lecture 27 - Inverse Problem, EEG source localization (1)

Lecture 28 - Inverse Problem, EEG source localization (2)

Lecture 29 - Introduction to Brain Computer Interfaces

Lecture 30 - Signal Conditioning Circuit for EEG Bioamplifiers

Lecture 31 - Basics of BCI Experimentation: Introdcution BCI Applications

Lecture 32 - Different Brain Computer Interfaces

Lecture 33 - Introduction to EEGLAB, ERPLAB and AEP Demonstration (1)

Lecture 34 - Introduction to EEGLAB, ERPLAB and AEP Demonstration (2)

Lecture 35 - Introduction to Photolithography

Lecture 36 - Basics of BCI Experimentation: Stimuli Generation and Insertion

Lecture 37 - MMN Demonstration with EEGLAB and ERPLAB (1)

Lecture 38 - MMN Demonstration with EEGLAB and ERPLAB (2)

Lecture 39 - Introduction to Photolithography (2)

Lecture 40 - Basics of Instrumentation Amplifier and Online Simulation

Lecture 41 - Basics of BCI Experimentation: Experimental Setup and Biopotential Acquisition

Lecture 42 - P300 Demonstration with EEGLAB/ERPLAB (1)

Lecture 43 - P300 Demonstration with EEGLAB/ERPLAB (2)

Lecture 44 - Wavelet Analysis with VEP (1)

Lecture 45 - Details of Lithography, E-beam Lithography and Mask Aligner

Lecture 46 - Basics of BCI Experimentation: Signal Acquisition using MATLAB (EEGLAB)

Lecture 47 - Wavelet Analysis with VEP (2)

Lecture 48 - Demonstration: Resting Membrane Potential

Lecture 49 - Demonstration: Membrane Time Constant (Ï„)

Lecture 50 - Photoresist (SU-8) and soft lithography

Lecture 51 - Physical Vapour Deposition: Thermal Evaporation

Lecture 52 - Introduction to Epilepsy and Classification

Lecture 53 - Epileptogenisis

Lecture 54 - Demonstration: Membrane Length Constant (Î»)

Lecture 55 - Demonstration: Action Potential

Lecture 56 - Demonstration: Voltage Clamp

Lecture 57 - Demonstration: Synaptic Potentials & Current

Lecture 58 - Physical Vapour Deposition: E-beam Evaporation

Lecture 59 - Physical Vapour Deposition: Sputtering

Lecture 60 - Recent Trends: Epilepsy Classification using EEG data

Lecture 61 - Demonstration: Wireless EEG with dry electrodes

Lecture 62 - Basics of EEG, ERP and acquisition

Lecture 63 - Photolithography with example

Lecture 64 - Stress Tissue Analysis using COMSOL Multiphysics

Lecture 65 - Recent Trends: Microelectrode Arrays and Deep Brain Stimulation

NPTEL : NOC:Information Theory (Electrical Engineering)

Co-ordinators : Prof. Himanshu Tyagi

Lecture 32 - Shape of measures of information

Lecture 33 - Data processing inequality

Lecture 34 - Midyear Review

Lecture 35 - Proof of Fano's inequality

Lecture 36 - Variational formulae

Lecture 37 - Capacity as information radius

Lecture 38 - Proof of Pinsker's inequality

Lecture 39 - Continuity of entropy

Lecture 40 - Lower bound for compression

Lecture 41 - Lower bound for hypothesis testing

Lecture 42 - Review 7

Lecture 43 - Lower bound for random number generation

Lecture 44 - Strong converse

Lecture 45 - Lower bound for minmax statistical estimation

Lecture 46 - Variable length source codes

Lecture 47 - Review 8

Lecture 48 - Kraft's inequality

Lecture 49 - Shannon code

Lecture 50 - Huffman code

Lecture 51 - Minmax Redundancy

Lecture 52 - Type based universal compression

Lecture 53 - Review 9

Lecture 54 - Arithmetic code

Lecture 55 - Online probability assignment

Lecture 56 - Compression of databases: A scheme

Lecture 57 - Compression of databases: A lower bound

Lecture 58 - Repetition code

Lecture 59 - Channel capacity

Lecture 60 - Sphere packing bound for BSC

Lecture 61 - Random coding bound for BSC

Lecture 62 - Random coding bound for general channel

Lecture 63 - Review 11

Lecture 64 - Converse proof for channel coding theorem

NPTEL : NOC:Photonic Integrated Circuit (Electrical Engineering)

Co-ordinators : Prof. Shankar Kumar Selvaraja

NPTEL : NOC:Design for Internet of Things (2021) (Electrical Engineering)

Co-ordinators : Prof. T V Prabhakar

NPTEL : NOC:Mathematical Aspects of Biomedical Electronic System Design (Electrical Engineering)

Co-ordinators : Prof. Chandramani Singh

NPTEL : NOC:Concentration Inequalities (Electrical Engineering)

Co-ordinators : Prof. Himanshu Tyagi

NPTEL : NOC:Real-Time Digital Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Rathna G N

NPTEL : NOC:Advanced Neural Science for Engineers (Electrical Engineering)

Co-ordinators : Prof. Vikas V

NPTEL : NOC:Design of Electric Motors (Electrical Engineering)

Co-ordinators : Dr. Prathap Reddy

Lecture 1 - History Prospect of Electrical Machines

Lecture 2 - Electric Fields

Lecture 3 - Magnetic Fields - 1

Lecture 4 - Magnetic Fields - 2

Lecture 5 - Electric and Magnetic Circuits Interface

Lecture 6 - Magnetic Materials and Concepts of BH Curves

Lecture 7 - Analysis of Magnetic Circuits With and Without Air Gaps

Lecture 8 - Example Problems of Magnetic Circuits

Lecture 9 - Magnetic Circuits with Multiple Windings and Permanent Magnets

Lecture 10 - Force Equations in Electromechanical Systems - 1

Lecture 11 - Force Equations in Electromechanical Systems - 2

Lecture 12 - Design of Electromagnetic Systems

Lecture 13 - Realization of Electrical Machines - 1

Lecture 14 - Realization of Electrical Machines - 2

Lecture 15 - Magnetic Fields in DC Machines - 1

Lecture 16 - Magnetic Fields in AC Machines - 1

Lecture 17 - Magnetic Fields in AC Machines - 2

Lecture 18 - Magnetic Fields in AC Machines - 3

Lecture 19 - MMFDistribution ofAC Machines

Lecture 20 - Basics of Electrical Machine Windings

Lecture 21 - Stator winding design-single layer winding

Lecture 22 - Stator winding design-double layer winding

Lecture 23 - Stator Winding Design-Fractional Slot Double Layer Winding

Lecture 24 - Variable Pole Machine Stator Winding Design (Pole-Phase Modulation) - 1

Lecture 25 - Variable Pole Machine Stator Winding Design (Pole-Phase Modulation) - 2

Lecture 26 - Importance of Motor Design and Standards of Electric Motors

Lecture 27 - Electric Machine Sizing Equations-Output Power and Volume (D2L) Product Equation

Lecture 28 - Lab Session on Re-winding of Induction Motor (Example: Double Layer Winding)

Lecture 29 - The Figure of Merits for Electric Motors and Aspect Ratio to Decouple the D2L Product

Lecture 30 - Electric Machine Sizing Equations-Output Power Equation in terms of D3L Product - 1

Lecture 31 - Electric Machine Sizing Equations-Output Power Equation in terms of D3L Product - 2

NPTEL : NOC:Basics of Semiconductor Microwave Devices (Electrical Engineering)

Co-ordinators : Prof Digbijoy N Nath