NPTEL Video Course - Electrical Engineering - Nonlinear Dynamical Systems

Subject Co-ordinator - Prof. Harish K. Pillai, Prof. Madhu N. Belur

Co-ordinating Institute - IIT - Bombay

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

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
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 linear
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
Lecture 28 - Describing
Lecture 29 - Describing

Lecture 30 - Describing functions
Lecture 31 - Describing functions
Lecture 32 - Describing functions for nonlinearities
Lecture 33 - Ideal relay with Hysteresis and dead zone
Lecture 34 - Dynamical systems on manifolds-1
Lecture 35 - Dynamical systems on manifolds-2

NPTEL Video Course - Electrical Engineering - Power System Dynamics and Control

Subject Co-ordinator - Dr. A.M. Kulkarni

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Introduction
Lecture 2 - Introduction
Lecture 3 - Analysis of Dynamical Systems
Lecture 4 - Analysis of Dynamical Systems (Continued.)
Lecture 5 - Analysis of LINEAR Time Invariant Dynamical Systems
Lecture 6 - Analysis of LINEAR Time Invariant Dynamical Systems (Continued.)
Lecture 7 - Stiff Systems, Multi Time Scale Modeling
Lecture 8 - Numerical Integration
Lecture 9 - Numerical Integration (Continued.)
Lecture 10 - Numerical Integration (Continued.)
Lecture 11 - Modeling of Synchronous Machines
Lecture 12 - Modeling of Synchronous Machines (Continued.)
Lecture 13 - Modeling of Synchronous Machines (Continued.)
Lecture 14 - Modeling of Synchronous Machines. dq0 transformation (Continued.)
Lecture 15 - Modeling of Synchronous Machines. Standard Parameters
Lecture 16 - Modeling of Synchronous Machines. Standard Parameters
Lecture 17 - Synchronous Generator Models using Standard Parameters
Lecture 18 - Synchronous Generator Models using Standard Parameters. PER UNIT REPRESENTATION
Lecture 19 - Open Circuit Response of a Synchronous Generator
Lecture 20 - Synchronous Machine Modeling. Short Circuit Analysis (Continued.)
Lecture 21 - Synchronous Machine Modeling. Short Circuit Analysis (Continued.) Synchronization of a Synchrono
Lecture 22 - Synchronization of a Synchronous Machine (Continued.)
Lecture 23 - Simplified Synchronous Machine Models
Lecture 24 - Excitation Systems
Lecture 25 - Excitation System Modeling
Lecture 26 - Excitation System Modeling. Automatic Voltage Regulator
Lecture 27 - Excitation System Modeling. Automatic Voltage Regulator (Continued.)
Lecture 28 - Excitation System Modeling. Automatic Voltage Regulator (Simulation)
Lecture 29 - Excitation System Modeling. Automatic Voltage Regulator (Simulation) â (Continued.)

Lecture 30 - Excitation System Modeling. Automatic Voltage Regulator. Linearized Analysis
Lecture 31 - Load Modeling
Lecture 32 - Induction Machines, Transmission Lines
Lecture 33 - Transmission Lines. Prime Mover Systems
Lecture 34 - Transmission Lines (Continued.) Prime Mover Systems
Lecture 35 - Prime Mover Systems. Stability in Integrated Power System
Lecture 36 - Stability in Integrated Power System
Lecture 37 - Two Machine System (Continued.)
Lecture 38 - Stability in Integrated Power System
Lecture 39 - Frequency/Angular Stability Programs. Stability Phenomena
Lecture 40 - Voltage Stability Example (Continued.). Fast Transients
Lecture 41 - Torsional Transients
Lecture 42 - Sub-Synchronous Resonance. Stability Improvement
Lecture 43 - Stability Improvement
Lecture 44 - Stability Improvement. Power System Stabilizers
Lecture 45 - Stability Improvement (Large Disturbance Stability)

NPTEL Video Course - Electrical Engineering - Control Engineering (Prof. S.D. Agashe)

Subject Co-ordinator - Prof. S.D. Agashe

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - The Control Problem
Lecture 2 - Some More Examples
Lecture 3 - Different Kinds of Control Systems
Lecture 4 - History of Feedback
Lecture 5 - Modern Control Problems
Lecture 6 - DC Motor Speed Control
Lecture 7 - System Modelling, Analogy
Lecture 8 - Causes of System Error
Lecture 9 - Calculation of Error
Lecture 10 - Control System Sensitivity
Lecture 11 - Automatic Control of DC Motor
Lecture 12 - Proportional Control
Lecture 13 - Non-Unity Feedback
Lecture 14 - Signal-Flow Graph
Lecture 15 - Mason's Gain Formula
Lecture 16 - Signal-Flow Graph for DC Motor Control
Lecture 17 - Steady-State Calculations
Lecture 18 - Differential Equation Model and Laplace Transformation Model
Lecture 19 - D-Operator Method
Lecture 20 - Second-Order System Response
Lecture 21 - Frequency Response
Lecture 22 - Laplace Transformation Theorems
Lecture 23 - Final Value Theorem
Lecture 24 - Transfer Function and Pole-Zero Diagram
Lecture 25 - 'Good' Poles and 'Bad' Poles
Lecture 26 - Signal Flow Graph with Transfer Functions
Lecture 27 - s-Domain and t-Domain
Lecture 28 - Second-Order System Response in s-Domain
Lecture 29 - Integral Feedback

Lecture 30 - Root-Locus Method
Lecture 31 - Root-Locus Rules
Lecture 32 - Asymptotes of Root Locus
Lecture 33 - Routh Array
Lecture 34 - Singular Cases
Lecture 35 - Closed Loop Poles
Lecture 36 - Controller in the Forwarded Path
Lecture 37 - Mapping of Control in the Complex-Plane
Lecture 38 - Encirclement by a Curve
Lecture 39 - Nyquist Criterion
Lecture 40 - Application of the Nyquist Criterion
Lecture 41 - Polar Plot and Bode Plots
Lecture 42 - Logarithmic Scale for Frequency
Lecture 43 - 'Asymptotic' DB Gain
Lecture 44 - Compensating Network
Lecture 45 - Nichols' Chart
Lecture 46 - Time Domain Methods of Analysis and Design
Lecture 47 - State-Variable Equations

NPTEL Video Course - Electrical Engineering - Power Electronics

Subject Co-ordinator - Prof. Kishore Chatterjee, Prof. B.G. Fernandes

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Power Electronics
Lecture 2 - Power Electronics
Lecture 3 - Power Electronics
Lecture 4 - Power Electronics
Lecture 5 - Power Electronics
Lecture 6 - Power Electronics
Lecture 7 - Power Electronics
Lecture 8 - Power Electronics
Lecture 9 - Power Electronics
Lecture 10 - Power Electronics
Lecture 11 - Power Electronics
Lecture 12 - Power Electronics
Lecture 13 - Power Electronics
Lecture 14 - Power Electronics
Lecture 15 - Power Electronics
Lecture 16 - Power Electronics
Lecture 17 - Power Electronics
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Lecture 30 - Power Electronics
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Lecture 32 - Power Electronics
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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 Video Course - Electrical Engineering - Fabrication of Silicon VLSI Circuits using the MOS technology

Subject Co-ordinator - Prof. A.N. Chandorkar

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Introduction Micro to Nano A Journey into Intergrated Circuit Technology
Lecture 2 - Introduction Micro to Nano A Journey into Intergrated Circuit Technology
Lecture 3 - Crystal Properties and Silico Growth
Lecture 4 - Crystal Properties and Silico Growth (Continued...)
Lecture 5 - IC Fab Labs and Fabrication of IC
Lecture 6 - Diffusion
Lecture 7 - Diffusion (Continued...)
Lecture 8 - Solid State Diffusion
Lecture 9 - Solid State Diffusion (Continued...)
Lecture 10 - Solid State Diffusion (Continued...)
Lecture 11 - Thermal Oxidation of Silicons
Lecture 12 - Thermal Oxidation of Silicons
Lecture 13 - Thermal Oxidation of Silicons
Lecture 14 - Thermal Oxidation of Silicons (Continued...)
Lecture 15 - Thermal Oxidation of Silicons (Continued...)
Lecture 16 - Lithography
Lecture 17 - Lithography
Lecture 18 - Lithography
Lecture 19 - ION Implantation
Lecture 20 - ION Implantation
Lecture 21 - ION Implantation and Silicon IC Processing Flow for CMOS Technology
Lecture 22 - ION Implantation and Silicon IC Processing Flow for CMOS Technology
Lecture 23 - Silicon IC Processing Flow for CMOS Technology
Lecture 24 - Thin Film Deposition
Lecture 25 - Thin Film Deposition
Lecture 26 - Thin Film Deposition
Lecture 27 - Thin Film Deposition and Etching in VLSI Processing
Lecture 28 - Etching in VLSI Processing and Back -End Technology

NPTEL Video Course - Electrical Engineering - NOC:Computational Electromagnetics and Applications

Subject Co-ordinator - Prof.Krish Sankaran

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Lecture 1
Lecture 2 - Lecture 2
Lecture 3 - Lecture 3
Lecture 4 - Exercise 1
Lecture 5 - Exercise 2
Lecture 6 - Exercise 3
Lecture 7 - Lab Tour 1
Lecture 8 - Summary week 1
Lecture 9 - Lecture 4
Lecture 10 - Lecture 5
Lecture 11 - Exercise 4
Lecture 12 - Exercise 5
Lecture 13 - Exercise 6
Lecture 14 - Summary Week 2
Lecture 15 - Lecture 6
Lecture 16 - Lecture 7
Lecture 17 - Lecture 8
Lecture 18 - Exercise 7
Lecture 19 - Exercise 8
Lecture 20 - Summary Week 3
Lecture 21 - Lecture 9
Lecture 22 - Lecture 10
Lecture 23 - Lecture 11
Lecture 24 - Lecture 12
Lecture 25 - Lecture 13
Lecture 26 - Lecture 14
Lecture 27 - Exercise 9
Lecture 28 - Lab Tour - 2
Lecture 29 - Summary Week 4

Lecture 30 - Lecture 15
Lecture 31 - Lecture 16
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
Lecture 65 - Lecture 33
Lecture 66 - Lecture 34
Lecture 67 - Lecture 35
Lecture 68 - Exercise 20

Lecture 69 - Lab tour 5
Lecture 70 - Summary week 10
Lecture 71 - Lecture 36
Lecture 72 - Lecture 37
Lecture 73 - Lecture 38
Lecture 74 - Lecture 39
Lecture 75 - Lecture 40
Lecture 76 - Summary week 11
Lecture 77 - Lecture 41
Lecture 78 - Lecture 42
Lecture 79 - Lecture 43
Lecture 80 - Lecture 44
Lecture 81 - Exercise 21
Lecture 82 - Exercise 22
Lecture 83 - Summary week 12

NPTEL Video Course - Electrical Engineering - NOC:Basic Electronics

Subject Co-ordinator - Prof. Mahesh B. Patil

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - A brief history of electronics
Lecture 2 - Superposition
Lecture 3 - Useful circuit techniques - 1
Lecture 4 - Useful circuit techniques - 2
Lecture 5 - Phasors - 1
Lecture 6 - Phasors - 2
Lecture 7 - RC/RL circuits in time domain - 1
Lecture 8 - RC/RL circuits in time domain - 2
Lecture 9 - RC/RL circuits in time domain - 3
Lecture 10 - RC/RL circuits in time domain - 4
Lecture 11 - RC/RL circuits in time domain - 5
Lecture 12 - Simulation of RC circuit
Lecture 13 - Diode circuits - 1
Lecture 14 - Diode circuits - 2
Lecture 15 - Diode circuits - 3
Lecture 16 - Diode circuits - 4
Lecture 17 - Diode circuits - 5
Lecture 18 - Diode circuits - 6
Lecture 19 - Diode rectifiers - 1
Lecture 20 - Diode rectifiers - 2
Lecture 21 - Diode rectifiers - 3
Lecture 22 - Bipolar Junction Transistor - 1
Lecture 23 - Bipolar Junction Transistor - 2
Lecture 24 - Bipolar Junction Transistor - 3
Lecture 25 - BJT amplifier - 1
Lecture 26 - BJT amplifier - 2
Lecture 27 - BJT amplifier - 3
Lecture 28 - BJT amplifier - 4
Lecture 29 - BJT amplifier - 5

Lecture 30 - BJT amplifier - 6
Lecture 31 - BJT amplifier - 7
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
Lecture 65 - Shift registers
Lecture 66 - Counters - 1
Lecture 67 - Counters - 2
Lecture 68 - Simulation of a synchronous counter

Lecture 69 - 555 timer
Lecture 70 - Digital-to-analog conversion - 1
Lecture 71 - Digital-to-analog conversion - 2
Lecture 72 - Analog-to-digital conversion

NPTEL Video Course - Electrical Engineering - NOC:Antennas

Subject Co-ordinator - Prof. Girish Kumar

Co-ordinating Institute - IIT - Bombay

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

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 Video Course - Electrical Engineering - NOC:Fundamentals of Wavelets, Filter Banks and Time Frequency A

Subject Co-ordinator - Prof. V.M. Gadre

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Module 1 - Lecture 1 - Introduction
Lecture 2 - Module 1 - Lecture 2 - Origin of Wavelets
Lecture 3 - Module 1 - Lecture 3 - Haar Wavelet
Lecture 4 - Module 2 - Lecture 1 - Dyadic Wavelet
Lecture 5 - Module 2 - Lecture 2 - Dilates and Translates of Haar Wavelets
Lecture 6 - Module 2 - Lecture 3 - L2 Norm of a Function
Lecture 7 - Module 3 - Lecture 1 - Piecewise Constant Representation of a Function
Lecture 8 - Module 3 - Lecture 2 - Ladder of Subspaces
Lecture 9 - Module 3 - Lecture 3 - Scaling Function for Haar Wavelet Demo
Lecture 10 - Demonstration 1
Lecture 11 - Module 4 - Lecture 1 - Vector Representation of Sequences
Lecture 12 - Module 4 - Lecture 2 - Properties of Norm
Lecture 13 - Module 4 - Lecture 3 - Parseval's Theorem
Lecture 14 - Module 5 - Lecture 1 - Equivalence of sequences and functions
Lecture 15 - Module 5 - Lecture 2 - Angle between Functions and their Decomposition
Lecture 16 - Demonstration 2
Lecture 17 - Module 6 - Lecture 1 - Introduction to filter banks
Lecture 18 - Module 6 - Lecture 2 - Haar Analysis Filter Bank in Z-domain
Lecture 19 - Module 6 - Lecture 3 - Haar Synthesis Filter Bank in Z-domain
Lecture 20 - Module 7 - Lecture 1 - Moving from Z-domain to frequency domain
Lecture 21 - Module 7 - Lecture 2 - Frequency Response of Haar Analysis Low pass Filter bank
Lecture 22 - Module 7 - Lecture 3 - Frequency Response of Haar Analysis High pass Filter bank
Lecture 23 - Module 8 - Lecture 1 - Ideal two-band filter bank
Lecture 24 - Module 8 - Lecture 2 - Disqualification of Ideal filter bank
Lecture 25 - Module 8 - Lecture 3 - Realizable two-band filter bank
Lecture 26 - Demonstration 3
Lecture 27 - Module 9 - Lecture 1 - Relating Fourier transform of scaling function to filter bank
Lecture 28 - Module 9 - Lecture 2 - Fourier transform of scaling function
Lecture 29 - Module 9 - Lecture 3 - Construction of scaling and wavelet functions from filter bank

Lecture 30 - Demonstration 4
Lecture 31 - Module 10 - Lecture 1 - Introduction to upsampling and down sampling as Multirate operations
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
Lecture 54 - Module 17 - Lecture 4 - Variance from a slightly different perspective
Lecture 55 - Module 18 - Lecture 1 - Signal transformations
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 f
Lecture 63 - Module 20 - Lecture 3 - More insights about Time-Bandwidth product
Lecture 64 - Module 20 - Lecture 4 - Time-frequency plane
Lecture 65 - Module 20 - Lecture 5 - Tiling the Time-frequency plane
Lecture 66 - Module 21 - Lecture 1 - STFT
Lecture 67 - Module 21 - Lecture 2 - STFT
Lecture 68 - Module 21 - Lecture 3 - STFT

Lecture 69 - Module 21 - Lecture 4 - Continuous Wavelet Transform (CWT)
Lecture 70 - Demonstration 5
Lecture 71 - StudentÂ s Presentation

NPTEL Video Course - Electrical Engineering - NOC:Analog Circuits (2017)

Subject Co-ordinator - Prof. Jayanta Mukherjee

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Module 1 - Introduction
Lecture 2 - Module 2 - Poles and zeros
Lecture 3 - Module 3 - OP-AMPs
Lecture 4 - Module 4 - Application of Op-Amps
Lecture 5 - Module 5 - Inverting amplifier and Non Inverting amplifier
Lecture 6 - Module 1 - Non Idealities in Op-AMP (Finite Gain, Finite Bandwidth and Slew Rate)
Lecture 7 - Module 2 - Non Idealities in Op-AMP (Offset Voltage and Bias Current)
Lecture 8 - Module 3 - Bode Plot
Lecture 9 - Module 4 - Frequency Response
Lecture 10 - Module 1 - Frequency Response (High Frequency Response)
Lecture 11 - Module 2 - Frequency Response example
Lecture 12 - Module 3 - Feedback
Lecture 13 - Module 4 - Effects of Feedback
Lecture 14 - Tutorial 1 and 2
Lecture 15 - Module 1 - Effect of feedback and stability
Lecture 16 - Module 2 - Stability
Lecture 17 - Module 3 - Stability and pole location
Lecture 18 - Module 4 - Stability and Pole location continuation
Lecture 19 - Tutorial 3
Lecture 20 - Module 1 - Gain Margin Â An example
Lecture 21 - Module 2 - Frequency Compensation
Lecture 22 - Module 3 - Filters
Lecture 23 - Module 4 - Filter prototypes
Lecture 24 - Tutorial 4
Lecture 25 - Tutorial 5
Lecture 26 - Tutorial 6
Lecture 27 - Module 1 - Chebyshev Prototype, Filter transformation
Lecture 28 - Module 2 - Filter Transformations (Continued....)
Lecture 29 - Module 3 - Active Filters

Lecture 30 - Module 4 - Non Linear Applications of OPAMPS
Lecture 31 - Module 5 - Limiter, Diodes
Lecture 32 - Module 1 - Oscillators
Lecture 33 - Module 2 - Oscillator Amplitude Control , Quadrature Oscillator
Lecture 34 - Module 3 - Multivibators
Lecture 35 - Module 4 - Multivibrators (Continued...)
Lecture 36 - Module 5 - Monostable Multivibator
Lecture 37 - Module 1 - Zener Effect, Rectifiers
Lecture 38 - Module 2 - Rectifiers
Lecture 39 - Module 3 - Clamper, Peak Rectifier, Super diodes
Lecture 40 - Module 4 - BJT DC Circuits
Lecture 41 - Module 5 - Current Mirror

NPTEL Video Course - Electrical Engineering - NOC:Microwave Theory and Techniques

Subject Co-ordinator - Prof. Girish Kumar

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Microwave Theory and Techniques Introduction - I
Lecture 2 - Microwave Theory and Techniques Introduction - II
Lecture 3 - Microwave Theory and Techniques Introduction - III
Lecture 4 - Effects of Microwaves on Human Body - I
Lecture 5 - Effects of Microwaves on Human Body - II
Lecture 6 - Waveguides - I
Lecture 7 - Waveguides - II
Lecture 8 - Waveguides - III
Lecture 9 - Transmission Lines - I
Lecture 10 - Transmission Lines - II
Lecture 11 - Smith Chart and Impedance Matching - I
Lecture 12 - Smith Chart and Impedance Matching - II
Lecture 13 - Smith Chart and Impedance Matching - III
Lecture 14 - ABCD - Parameters
Lecture 15 - S - Parameters
Lecture 16 - Power Dividers - I
Lecture 17 - Power Dividers - II
Lecture 18 - Microwave Couplers - I
Lecture 19 - Microwave Couplers - II
Lecture 20 - Microwave Couplers - III
Lecture 21 - Microwave Filters - I
Lecture 22 - Microwave Filters - II
Lecture 23 - Microwave Filters - III
Lecture 24 - Microwave Filters - IV
Lecture 25 - Microwave Filters - V
Lecture 26 - Microwave Diodes
Lecture 27 - Microwave Attenuators
Lecture 28 - Microwave RF Switches
Lecture 29 - Series and Shunt SPDT Switches and Introduction to Phase Shifters

Lecture 30 - Microwave Phase Shifters
Lecture 31 - Microwave Transistors
Lecture 32 - Microwave Amplifiers - I
Lecture 33 - Microwave Amplifiers - II
Lecture 34 - Microwave Amplifiers - III
Lecture 35 - Low Noise Amplifiers - I
Lecture 36 - Low Noise Amplifiers - II
Lecture 37 - Power Amplifiers
Lecture 38 - Microwave Tubes - I
Lecture 39 - Microwave Tubes - II
Lecture 40 - Microwave Tubes - III
Lecture 41 - Microwave Oscillators - I
Lecture 42 - Microwave Oscillators - II
Lecture 43 - Microwave Mixers - I
Lecture 44 - Microwave Mixers - II
Lecture 45 - Microwave Mixers - III
Lecture 46 - Fundamentals of Antennas
Lecture 47 - Dipole, Monopole, loop and Slot Antennas
Lecture 48 - Linear and Planar Arrays
Lecture 49 - Microstrip Antennas
Lecture 50 - Horn and Helical Antennas
Lecture 51 - Yagi - Uda, Log-Periodic and Reflector Antennas
Lecture 52 - RF MEMS and Microwave Imaging
Lecture 53 - Microwave Systems
Lecture 54 - Microwave Measurements and Lab Demonstration
Lecture 55 - CST Software Introduction with Filter Design
Lecture 56 - Power Divider and Combiner Design in CST
Lecture 57 - Hybrid Coupler Design
Lecture 58 - Antenna Design and Amplifier Simulation in CST
Lecture 59 - Mixer Design in NI AWR Software - I
Lecture 60 - Mixer Design in NI AWR Software - II

NPTEL Video Course - Electrical Engineering - NOC:Principles of Digital Communications

Subject Co-ordinator - Prof. S.N. Merchant

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Course Overview
Lecture 2 - Introduction to Information Theory
Lecture 3 - Entropy and its properties
Lecture 4 - Lossless Source Coding Theorem
Lecture 5 - Prefix Codes and Kraftâ s Inequality
Lecture 6 - Huffman Coding
Lecture 7 - Discrete Memory-less Channels
Lecture 8 - Channel Capacity - I
Lecture 9 - Channel Capacity - II
Lecture 10 - Channel Coding Theorem
Lecture 11 - Differential Entropy - I
Lecture 12 - Differential Entropy - II
Lecture 13 - Channel Capacity - III
Lecture 14 - Channel Capacity - IV
Lecture 15 - Summary of Information Theory
Lecture 16 - Signal Space Representations - I
Lecture 17 - Signal Space Representations - II
Lecture 18 - Vector Representation of a Random Process
Lecture 19 - AWGN Vector Channel
Lecture 20 - Basics of Signal Detection
Lecture 21 - ML,MAP Detectors for AWGN Channel
Lecture 22 - Optimal Receiver
Lecture 23 - Probability of error for Optimal Receiver
Lecture 24 - Probability of Error for M-ary Scheme
Lecture 25 - Pulse Code Modulation
Lecture 26 - Uniform Quantizer
Lecture 27 - Step Size and Quantization Noise
Lecture 28 - Non-uniform Quantizer (Lloyd-Max Quantizer)
Lecture 29 - Companded Quantization - I

Lecture 30 - Companded Quantization - II
Lecture 31 - Differential Pulse Code Modulation DPCM - I
Lecture 32 - DPCM-II (Linear Prediction)
Lecture 33 - Delta Modulation
Lecture 34 - M-ary PCM/PAM - I
Lecture 35 - M-ary PCM/PAM - II
Lecture 36 - Line Coding - I
Lecture 37 - Line Coding - II
Lecture 38 - Line Coding - III
Lecture 39 - Pulse Shaping for Zero ISI - I
Lecture 40 - Pulse Shaping for Zero ISI - II
Lecture 41 - Pulse Shaping for Zero ISI - III
Lecture 42 - Partial Response Signaling - I
Lecture 43 - Partial Response Signaling - II
Lecture 44 - Principle of Invariance of Probability of Error
Lecture 45 - Binary ASK and PSK
Lecture 46 - Binary Frequency Shift Keying - I
Lecture 47 - Binary Frequency Shift Keying - II
Lecture 48 - Quadrature Phase Shift Keying - I
Lecture 49 - Quadrature Phase Shift Keying - II
Lecture 50 - Quadrature Phase Shift Keying - III
Lecture 51 - Continuous Phase Frequency Shift Keying
Lecture 52 - Minimum Shift Keying - I
Lecture 53 - Minimum Shift Keying - II
Lecture 54 - M-ary Coherent ASK (M-ASK)
Lecture 55 - M-ary PSK
Lecture 56 - M-ary Quadrature Amplitude Modulation (M-QAM)
Lecture 57 - M-ary FSK
Lecture 58 - Comparison of M-ary Schemes
Lecture 59 - Non-coherent BFSK
Lecture 60 - Differential Phase Shift Keying
Lecture 61 - Channel Coding - I
Lecture 62 - Channel Coding - II
Lecture 63 - Channel Coding - III
Lecture 64 - Channel Coding
Lecture 65 - Channel Coding

NPTEL Video Course - Electrical Engineering - NOC:Fundamental of Power Electronics

Subject Co-ordinator - Prof. Vivek Agarwal

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Familiarization with Power Electronic Systems
Lecture 2 - Overview of Basic Power Electronic Circuits from Laymans Point of View
Lecture 3 - Applications, Definitions, and Nature of Power Electronic Circuits
Lecture 4 - Components of a Power Electronic System
Lecture 5 - Analysis of Switched Networks
Lecture 6 - Review of engineering maths for power electronic circuit analysis
Lecture 7 - Review of semiconductor physics
Lecture 8 - P-N Junction
Lecture 9 - Power Diodes
Lecture 10 - Thyristors
Lecture 11 - Motivation for rectifier capacitor filter
Lecture 12 - Circuit Operation
Lecture 13 - Designing the circuit
Lecture 14 - Simulation setup for NgSpice and gEDA schematic capture
Lecture 15 - Simulating the circuit
Lecture 16 - Practicals
Lecture 17 - Inrush current limiting - Intro
Lecture 18 - Inrush current limiting - Resistor solution
Lecture 19 - Inrush current limiting - Thermistor solution
Lecture 20 - Inrush current limiting - Transformer solution
Lecture 21 - Inrush current limiting - MOSFET solution
Lecture 22 - Inrush current limiting - Relay, contactor
Lecture 23 - Three phase rectifier capacitor filter
Lecture 24 - Simulation - 3 phase rectifier capacitor filter
Lecture 25 - Power factor - Motivation
Lecture 26 - Power factor - Discussion
Lecture 27 - Power factor - Sinusoidal
Lecture 28 - Power factor for rectifier cap filter
Lecture 29 - Passive power improvement circuit

Lecture 30 - Simulation - power factor improvement
Lecture 31 - Linear regulators - Intro
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 65 - Inductor area product
Lecture 66 - Inductor design
Lecture 67 - Inductor example
Lecture 68 - Transformer design

Lecture 69 - Transformer example
Lecture 70 - Forward converter design mfile
Lecture 71 - Pushpull converter
Lecture 72 - Flux walking in pushpull
Lecture 73 - PWM generation
Lecture 74 - Simulation of pushpull converter
Lecture 75 - Half bridge converter
Lecture 76 - Simulation of halfbridge converter
Lecture 77 - Full bridge converter
Lecture 78 - Simulation of fullbridge converter
Lecture 79 - Area products and mfiles
Lecture 80 - Intro for drive circuits
Lecture 81 - BJT base drive
Lecture 82 - BJT base drive example
Lecture 83 - Multi-stage base drive
Lecture 84 - Base drive with speed-up circuit
Lecture 85 - Base drive with isolation
Lecture 86 - MOSFET gate drive
Lecture 87 - MOSFET drive with isolation
Lecture 88 - Over-current protection
Lecture 89 - Snubber circuits
Lecture 90 - Intro for close loop control
Lecture 91 - Close looping dc-dc converters
Lecture 92 - Simulation of close loop control
Lecture 93 - Current control for battery charger application
Lecture 94 - Instability in current control and slope compensation
Lecture 95 - Slope compensated current control
Lecture 96 - Simulation of current control
Lecture 97 - Single phase inverter with sinusoidal pwm
Lecture 98 - Simulation of sinusoidal PWM

NPTEL Video Course - Electrical Engineering - NOC:Electrical Equipment and Machines: Finite Element Analysis

Subject Co-ordinator - Prof. Shrikrishna V. Kulkarni

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Course Outline and Introduction
Lecture 2 - Analytical and Numerical Methods
Lecture 3 - Revisiting EM Concepts
Lecture 4 - Revisiting EM Concepts
Lecture 5 - Revisiting EM Concepts
Lecture 6 - Revisiting EM Concepts
Lecture 7 - Revisiting EM Concepts
Lecture 8 - Revisiting EM Concepts
Lecture 9 - Revisiting EM Concepts
Lecture 10 - Revisiting EM Concepts
Lecture 11 - FEM
Lecture 12 - Finding Functional for PDEs
Lecture 13 - Whole Domain Approximation
Lecture 14 - 1D FEM
Lecture 15 - 1D FEM
Lecture 16 - 1D FEM
Lecture 17 - 2D FEM
Lecture 18 - 2D FEM
Lecture 19 - 2D FEM Scilab Code
Lecture 20 - 2D FEM Code
Lecture 21 - Computation of B and H Field and Method of Weighted Residuals
Lecture 22 - Galerkin Method
Lecture 23 - Calculation of Leakage Inductance of a Transformer
Lecture 24 - Calculation of Inductance of an Induction Motor and a Gapped-Core Shunt Reactor
Lecture 25 - Insulation Design Using FE Analysis
Lecture 26 - Quadratic Finite Elements
Lecture 27 - Time Harmonic FE Analysis
Lecture 28 - Calculation of Eddy Current Losses
Lecture 29 - Eddy Losses in Transformer Windings

Lecture 30 - Torque Speed Characteristics of an Induction Motor and FE Analysis of Axisymmetric Problem
Lecture 31 - Permanent Magnets
Lecture 32 - Permanent Magnets
Lecture 33 - Periodic and Antiperiodic Boundary Conditions in Rotating Machines
Lecture 34 - FE Analysis of Rotating Machines
Lecture 35 - Voltage Fed Coupled Circuit Field Analysis
Lecture 36 - Current Fed Coupled Circuit Field Analysis
Lecture 37 - Transient FE Analysis
Lecture 38 - Nonlinear FE Analysis
Lecture 39 - Computation of Forces using Maxwell Stress Tensor
Lecture 40 - Computation of force using virtual work method

NPTEL Video Course - Electrical Engineering - NOC:Digital Signal Processing and its Applications

Subject Co-ordinator - Prof. V. M. Gadre

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Introduction: Digital signal processing and its objectives
Lecture 2 - Introduction to sampling and Fourier Transform
Lecture 3 - Sampling of sine wave and associate complication
Lecture 4 - Review of Sampling Theorem
Lecture 5 - Idealized Sampling, Reconstruction
Lecture 6 - Filters And Discrete System
Lecture 7 - Answering questions from previous lectures
Lecture 8 - Desired requirements for discrete system
Lecture 9 - Introduction to phasors
Lecture 10 - Advantages of phasors in discrete systems
Lecture 11 - What do we want from a discrete system?
Lecture 12 - Linearity - Homogeneity and Additivity
Lecture 13 - Shift Invariance and Characterization of LTI systems
Lecture 14 - Characterization of LSI system using itâ s impulse response
Lecture 15 - Introduction to convolution
Lecture 16 - Convolution: Deeper ideas and understanding
Lecture 17 - Characterisation of LSI systems, Convolution-properties
Lecture 18 - Response of LSI Systems to Complex Sinusoids
Lecture 19 - Convergence of Convolution and Bibo Stability
Lecture 20 - Commutativity and Associativity
Lecture 21 - BIBO Stability of an LSI system
Lecture 22 - Causality and memory of an LSI system
Lecture 23 - Frequency response of an LSI system
Lecture 24 - Introduction and conditions of Stability
Lecture 25 - Vectors and Inner Product
Lecture 26 - Interpretation of Frequency Response as Dot Product
Lecture 27 - Interpretation of Frequency Response as Eigenvalues
Lecture 28 - Discrete time fourier transform
Lecture 29 - DTFT in LSI System and Convolution Theorem.

Lecture 30 - Definitions of sequences and Properties of DTFT
Lecture 31 - Introduction to DTFT, IDTFT
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
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 fil
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
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 Video Course - Electrical Engineering - NOC:Stochastic Control and Communication

Subject Co-ordinator - Prof. Ankur A. Kulkarni

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Decision Making under Uncertainty
Lecture 2 - Expected Utility Theory - I
Lecture 3 - Expected Utility Theory - II
Lecture 4 - Expected Utility Theory - III
Lecture 5 - Role of Information in Decision Making
Lecture 6 - State Space Modelling of Sequential Decision Making, Example of Inventory Control
Lecture 7 - Inventory Control Problem (Continued...)
Lecture 8 - Policy-A Closed Loop Solution to Stochastic Control Problem
Lecture 9 - Introduction to Markov Decision Processes (MDP)
Lecture 10 - Types of Policy in MDP
Lecture 11 - Interpreting randomised decision rules
Lecture 12 - Stationary Transition Probability: State Diagram Representation and example of Markov policies
Lecture 13 - Example of History Dependent Policies
Lecture 14 - Complexity of the problem using brute force approach
Lecture 15 - Principle of Optimality
Lecture 16 - Dynamic Programming Algorithm
Lecture 17 - DP Algo applied to Inventory Control Problem
Lecture 18 - DP Algo applied to Inventory Control Problem (Continued...)
Lecture 19 - DP Algo applied to Inventory Control Problem (Continued...)
Lecture 20 - Optimal Stopping Problem
Lecture 21 - Optimal Stopping Example: Secretary Problem
Lecture 22 - Optimal Stopping Example: Secretary Problem (Continued...)
Lecture 23 - Optimal Stopping Example: Secretary Problem (Continued...)
Lecture 24 - Linear System Quadratic Cost Problem
Lecture 25 - Linear System Quadratic Cost Problem (Continued...)
Lecture 26 - Solving it via DP algorithm (Continued...)
Lecture 27 - Equivalence between Optimal HR Policyand optimal Markov Deterministic Policy
Lecture 28 - Stochastic Control under incomplete state information
Lecture 29 - Stochastic Control under incomplete state information (Continued...)

Lecture 30 - Stochastic Control under incomplete state information: Example
Lecture 31 - Stochastic Control under incomplete state information: Example (Continued...)
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 Video Course - Electrical Engineering - NOC:Applied Linear Algebra (2024)

Subject Co-ordinator - Prof. Dwaipayan Mukherjee

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Introduction - Part A
Lecture 2 - Introduction - Part B
Lecture 3 - Introduction - Part C
Lecture 4 - Equivalent Systems - Part A
Lecture 5 - Equivalent Systems - Part B
Lecture 6 - Equivalent Systems - Part C
Lecture 7 - Solution of Ax = b - Part A
Lecture 8 - Solution of Ax = b - Part B
Lecture 9 - Solution of Ax = b - Part C
Lecture 10 - Rings, Integral Domains and Fields - Part A
Lecture 11 - Rings, Integral Domains and Fields - Part B
Lecture 12 - Rings, Integral Domains and Fields - Part C
Lecture 13 - Vector Spaces and Subspaces - Part A
Lecture 14 - Vector Spaces and Subspaces - Part B
Lecture 15 - Vector Spaces and Subspaces - Part C
Lecture 16 - Unions, Intersection, Sums of Subspaces - Part A
Lecture 17 - Unions, Intersection, Sums of Subspaces - Part B
Lecture 18 - Generating sets, Linear independence and basis - Part A
Lecture 19 - Generating sets, Linear independence and basis - Part B
Lecture 20 - Generating sets, Linear independence and basis - Part C
Lecture 21 - Ordered basis and co-ordinates - Part A
Lecture 22 - Ordered basis and co-ordinates - Part B
Lecture 23 - Ordered basis and co-ordinates - Part C
Lecture 24 - Rank-Nullity Theorem (Matrices) - Part A
Lecture 25 - Rank-Nullity Theorem (Matrices) - Part B
Lecture 26 - Rank-Nullity Theorem (Matrices) - Part C
Lecture 27 - Rank-Nullity Theorem (Linear Transformation) - Part A
Lecture 28 - Rank-Nullity Theorem (Linear Transformation) - Part B
Lecture 29 - Rank-Nullity Theorem (Linear Transformation) - Part C

Lecture 30 - Isomorphism and Inverses - Part A
Lecture 31 - Isomorphism and Inverses - Part B
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 Video Course - Electrical Engineering - NOC:Digital Communication using GNU Radio

Subject Co-ordinator - Prof. Kumar Appaiah

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Introduction to Digital Communication
Lecture 2 - Understanding GNU Radio features for Digital Communication: Basic blocks, input and output
Lecture 3 - Understanding GNU Radio features for Digital Communication: Advanced blocks, hardware interfacing
Lecture 4 - Fundamentals of Digital Communication: Signal Processing methods, vectors, and relevant GNU Radio
Lecture 5 - Fundamentals of Digital Communication: Signal Processing methods, vectors, and relevant GNU Radio
Lecture 6 - Complex Baseband Signal Representation
Lecture 7 - Real Passband Signal Representation, Up and Down Conversion of Complex Baseband Signals
Lecture 8 - Random Variables and Random Processes
Lecture 9 - Fundamentals of Digital Modulation
Lecture 10 - Linear Modulation Methods: Amplitude Shift Keying (ASK)
Lecture 11 - Linear Modulation Methods: Phase Shift Keying (PSK)
Lecture 12 - Linear Modulation Methods: Quadrature Amplitude Modulation (QAM) and Frequency Shift Keying (FSK
Lecture 13 - Pulse Shaping for ISI Free Signaling
Lecture 14 - ASK using Raised Cosine (RC) and Root-Raised Cosine (RRC) Pulse Shaping
Lecture 15 - Basics of Detection: Properties of Gaussian Random Variables
Lecture 16 - Basics of Detection: Gaussian Random Vectors and Hypothesis Testing
Lecture 17 - Optimal Receivers for M-ary Signaling
Lecture 18 - Gram-Schmidt Orthogonalisation
Lecture 19 - Optimal Reception of M-ary Signals in AWGN
Lecture 20 - Detection and Optimal Decision for On-Off Signaling in AWGN Channel
Lecture 21 - Detection and Optimal Decision for M-ary Signaling
Lecture 22 - Python for GNU Radio
Lecture 23 - Extending GNU Radio Features using Python
Lecture 24 - Constructing and Visualising Constellations using GNU Radio
Lecture 25 - Understanding matched filtering using GNU Radio
Lecture 26 - Histograms in GNU Radio
Lecture 27 - Visualising Symbol Error Rate in GNU Radio
Lecture 28 - Signal-to-Noise Ratio and Symbol Error Probability - Part 1
Lecture 29 - Signal-to-Noise Ratio and Symbol Error Probability - Part 2

Lecture 30 - Symbol error rate and Bit error rate
Lecture 31 - Computing bit error rates in GNU Radio
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 Video Course - Electrical Engineering - NOC:Network Security

Subject Co-ordinator - Prof. Gaurav S. Kasbekar

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Introduction to the Course
Lecture 2 - Motivation and Overview
Lecture 3 - Review of Basic Concepts and Terminology in Communication Networks - Part 1
Lecture 4 - Review of Basic Concepts and Terminology in Communication Networks - Part 2
Lecture 5 - Review of Basic Concepts and Terminology in Communication Networks - Part 3
Lecture 6 - Review of Basic Concepts and Terminology in Communication Networks - Part 4
Lecture 7 - Review of Basic Concepts and Terminology in Communication Networks - Part 5
Lecture 8 - Review of Basic Concepts and Terminology in Communication Networks - Part 6
Lecture 9 - Different Types of Attacks on Networks
Lecture 10 - Mathematical Background for Cryptography
Lecture 11 - Principle of Cryptography - Part 1
Lecture 12 - Principle of Cryptography - Part 2
Lecture 13 - Principle of Cryptography - Part 3
Lecture 14 - Principle of Cryptography - Part 4
Lecture 15 - Principle of Cryptography - Part 5
Lecture 16 - Message Integrity, Cryptographic Hash Functions and Digital Signatures - Part 1
Lecture 17 - Message Integrity, Cryptographic Hash Functions and Digital Signatures - Part 2
Lecture 18 - Message Integrity, Cryptographic Hash Functions and Digital Signatures - Part 3
Lecture 19 - Message Integrity, Cryptographic Hash Functions and Digital Signatures - Part 4
Lecture 20 - Authentication - Part 1
Lecture 21 - Authentication - Part 2
Lecture 22 - Authentication - Part 3
Lecture 23 - Authentication - Part 4
Lecture 24 - Authentication - Part 5
Lecture 25 - Authentication - Part 6
Lecture 26 - Public Key Infrastructure - Part 1
Lecture 27 - Public Key Infrastructure - Part 2
Lecture 28 - Secure Email - Part 1
Lecture 29 - Secure Email - Part 2

Lecture 30 - Secure Sockets Layer (SSL) and Transport Layer Security (TLS) - Part 1
Lecture 31 - Secure Sockets Layer (SSL) and Transport Layer Security (TLS) - Part 2
Lecture 32 - Structure of an intergenic fitness landscape
Lecture 33 - Structure of an intergenic fitness landscape
Lecture 34 - Large scale fitness landscape (folA in E. coli)
Lecture 35 - Fixation probability of a beneficial mutation in a chemostat
Lecture 36 - Marbles in a jar: role of chance in dictating evolution
Lecture 37 - Securing Wireless LANs - Part 3
Lecture 38 - Securing Wireless LANs - Part 4
Lecture 39 - Securing Wireless LANs - Part 5
Lecture 40 - Securing Wireless LANs - Part 6
Lecture 41 - Securing Wireless LANs - Part 7
Lecture 42 - Securing Wireless LANs - Part 8
Lecture 43 - Wireless Cellular Network Security - Part 1
Lecture 44 - Wireless Cellular Network Security - Part 2
Lecture 45 - Wireless Cellular Network Security - Part 3
Lecture 46 - Wireless Cellular Network Security - Part 4
Lecture 47 - Wireless Cellular Network Security - Part 5
Lecture 48 - Wireless Cellular Network Security - Part 6
Lecture 49 - Wireless Cellular Network Security - Part 7
Lecture 50 - Wireless Cellular Network Security - Part 8
Lecture 51 - Firewalls and Intrusion Detection Systems - Part 1
Lecture 52 - Firewalls and Intrusion Detection Systems - Part 2
Lecture 53 - Firewalls and Intrusion Detection Systems - Part 3
Lecture 54 - Firewalls and Intrusion Detection Systems - Part 4
Lecture 55 - Firewalls and Intrusion Detection Systems - Part 5
Lecture 56 - Firewalls and Intrusion Detection Systems - Part 6
Lecture 57 - Firewalls and Intrusion Detection Systems - Part 7
Lecture 58 - Firewalls and Intrusion Detection Systems - Part 8
Lecture 59 - Tor: The Onion Router - Part 1
Lecture 60 - Tor: The Onion Router - Part 2
Lecture 61 - The Bitcoin Cryptocurrency - Part 1
Lecture 62 - The Bitcoin Cryptocurrency - Part 2
Lecture 63 - The Bitcoin Cryptocurrency - Part 3
Lecture 64 - The Bitcoin Cryptocurrency - Part 4
Lecture 65 - The Bitcoin Cryptocurrency - Part 5
Lecture 66 - The Bitcoin Cryptocurrency - Part 6
Lecture 67 - Cloud Security - Part 1
Lecture 68 - Cloud Security - Part 2

Lecture 69 - Cloud Security - Part 3
Lecture 70 - Cloud Security - Part 4
Lecture 71 - Security of the Internet of Things (IoT), Hardware Security - Part 1
Lecture 72 - Security of the Internet of Things (IoT), Hardware Security - Part 2
Lecture 73 - Security of the Internet of Things (IoT), Hardware Security - Part 3
Lecture 74 - Post-Quantum Cryptography

NPTEL Video Course - Electrical Engineering - NOC:Behavioural Theory of Systems with a View Toward Data Drive

Subject Co-ordinator - Prof. Debasattam Pal

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Introduction
Lecture 2 - Dynamical systems in the behavioural setting
Lecture 3 - Ordinary differential and difference equations : Kernel representation
Lecture 4 - Equivalent kernel representations
Lecture 5 - Unimodular transformations, equivalent behaviours - sufficient condition
Lecture 6 - Polynomial matrices: Aryabhatta-Bezout identity, upper triangular form
Lecture 7 - Example - Solution of system of differential equations using back substitution
Lecture 8 - Solving scalar ordinary differential equations, equivalent behaviours
Lecture 9 - Solving multivariable system of differential equations
Lecture 10 - Equivalent behaviours: necessary condition for autonomous systems proof
Lecture 11 - Equivalent Behaviours: non-autonomous systems proof, input-output partitioning
Lecture 12 - Annihilator submodule and associated behaviour
Lecture 13 - Elimination Theory introduction, Fundamental principle of algebraic analysis
Lecture 14 - Proof of Fundamental principle of algebraic analysis
Lecture 15 - Proof revisited: Fundamental principle of Algebraic analysis
Lecture 16 - Elimination Theory proof with example
Lecture 17 - Elimination examples
Lecture 18 - Controllability definition in the behavioural framework
Lecture 19 - Equivalent conditions for controllability proof
Lecture 20 - More equivalent conditions for controllability
Lecture 21 - Moving from controllability to observability
Lecture 22 - Observability (Continued...)
Lecture 23 - Behavioural Pole Placement
Lecture 24 - Identification Basics
Lecture 25 - The Most Powerful Unfalsified Model (MPUM)
Lecture 26 - MPUM for LTI systems: Uniqueness and construction approach
Lecture 27 - Construction approach of MPUM (Continued...)
Lecture 28 - MPUM construction recalled
Lecture 29 - Some simple numerical examples

Lecture 30 - Finding annhilators and hence kernel representation matrix from data
Lecture 31 - Identification of the behaviour using a single trajectory of finite length
Lecture 32 - Single finite length trajectory based identification (Continued...)
Lecture 33 - More discussions on single finite length trajectory based identification
Lecture 34 - Proof of fundamental lemma of data-driven control
Lecture 35 - Proof of fundamental lemma (Continued...)
Lecture 36 - Some consequences of fundamental lemma discussed
Lecture 37 - Finding low rank approximations of data Hankel matrices using SVD
Lecture 38 - Towards data-driven simulation
Lecture 39 - Data-driven simulation continued and data-driven stability analysis
Lecture 40 - Data-driven Control: Stabilization by state feedback

NPTEL Video Course - Electrical Engineering - Circuit Theory

Subject Co-ordinator - Prof. S.C. Dutta Roy

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Review of Signals and Systems
Lecture 2 - Review of Signals and Systems
Lecture 3 - Network Equations; Initial and Final Conditions
Lecture 4 - Problem Session 1
Lecture 5 - Step, Impulse and Complete Responses
Lecture 6 - 2nd Order Circuits
Lecture 7 - Transformer Transform Domain Analysis
Lecture 8 - Problem Session 2
Lecture 9 - Network Theorems and Network Functions
Lecture 10 - Network Functions (Continued.)
Lecture 11 - Amplitude and Phase of Network Functions
Lecture 12 - Problem Session 3
Lecture 13 - Poles, Zeros and Network Response
Lecture 14 - Single Tuned Circuits
Lecture 15 - Single Tuned Circuits (Continued.)
Lecture 16 - Double Tuned Circuits
Lecture 17 - Double Tuned Circuits (Continued.)
Lecture 18 - Problem Session 4
Lecture 19 - Double Tuned Circuits (Continued.)
Lecture 20 - Concept of Delay and Introduction
Lecture 21 - Two-port Networks (Continued.)
Lecture 22 - Problem Session 5
Lecture 23 - Minor - 1
Lecture 24 - The Hybrid & Transmission Parameters of 2 ports
Lecture 25 - Problem Session 6
Lecture 26 - Two - port Network parameters
Lecture 27 - Two-port Interconnections
Lecture 28 - Interconnection of Two-port Networks (Continued.)
Lecture 29 - Problem Session 7

Lecture 30 - Scattering Matrix
Lecture 31 - Scattering Parameters of a Two-port
Lecture 32 - Problem Session 8
Lecture 33 - Solutions of Minor - 2 Problems
Lecture 34 - Insertion Loss
Lecture 35 - Example of Insertion Loss and Elements
Lecture 36 - Elements of Realizability Theory (Continued.)
Lecture 37 - Positive Real Functions
Lecture 38 - Testing of Positive Real Functions
Lecture 39 - Problem Session 9
Lecture 40 - More on PRF's and their Synthesis
Lecture 41 - LC Driving Point Functions
Lecture 42 - LC Driving Point Synthesis (Continued.)
Lecture 43 - RC and RL Driving Point Synthesis
Lecture 44 - Problem Session 10
Lecture 45 - RC & RL One-port Synthesis (Continued.)
Lecture 46 - Elementary RLC One-port Synthesis
Lecture 47 - Properties and Synthesis of Transfer Parameters
Lecture 48 - Resistance Terminated LC Ladder
Lecture 49 - Resistance Terminated LC Ladder (Continued.)
Lecture 50 - Problem session 11
Lecture 51 - Network Transmission Criteria

NPTEL Video Course - Electrical Engineering - Control Engineering (Prof. M. Gopal)

Subject Co-ordinator - Prof. M. Gopal

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction to control problem
Lecture 2 - Basic Feedback Structure
Lecture 3 - Introduction to Control Problem (Continued.)
Lecture 4 - Dynamic Systems and Dynamic Response
Lecture 5 - Dynamic Systems and Dynamic Response (Continued.)
Lecture 6 - Dynamic Systems and Dynamic Response (Continued.)
Lecture 7 - Dynamic Systems and Dynamic Response (Continued.)
Lecture 8 - Dynamic Systems and Dynamic Response (Continued.)
Lecture 9 - Dynamic Systems and Dynamic Response (Continued.)
Lecture 10 - Models of Industrial Control Devices and Systems
Lecture 11 - Models of Industrial Control Devices and Systems (Continued.)
Lecture 12 - Models of Industrial Control Devices and Systems(Continued.)
Lecture 13 - Models of Industrial Control Devices and Systems(Continued.)
Lecture 14 - Models of Industrial Control Devices and Systems(Continued.)
Lecture 15 - Models of Industrial Control Devices and Systems(Continued.)
Lecture 16 - Models of Industrial Control Devices and Systems (Continued.)
Lecture 17 - Models of Industrial Control Devices and Systems (Continued.)
Lecture 18 - Models of Industrial Control Devices and Systems (Continued.)
Lecture 19 - Basic Principles of Feedback Control
Lecture 20 - Basic Principles of Feedback Control (Continued.)
Lecture 21 - Basic Principles of Feedback Control (Continued.)
Lecture 22 - Basic Principles of Feedback Control (Continued.)
Lecture 23 - Concepts of stability and Routh Stability Criterion
Lecture 24 - Concepts of stability and Routh Stability Criterion (Continued.)
Lecture 25 - Concepts of stability and Routh Stability Criterion (Continued.)
Lecture 26 - The Performance of Feedback Systems
Lecture 27 - The Performance of Feedback Systems (Continued.)
Lecture 28 - The Performance of Feedback Systems (Continued.)
Lecture 29 - The Performance of Feedback Systems (Continued.)

Lecture 30 - Compensator Design Using Root Locus Plots
Lecture 31 - Compensator Design Using Root Locus Plots (Continued.)
Lecture 32 - Compensator Design Using Root Locus Plots (Continued.)
Lecture 33 - Compensator Design Using Root Locus Plots (Continued.)
Lecture 34 - Compensator Design Using Root Locus Plots (Continued.)
Lecture 35 - The Nyquist Stability Criterion and Stability Margins
Lecture 36 - The Nyquist Stability Criterion and Stability Margins (Continued.)
Lecture 37 - The Nyquist Stability Criterion and Stability Margins (Continued.)
Lecture 38 - The Nyquist Stability Criterion and Stability Margins (Continued.)
Lecture 39 - Feedback System Performance Based on the Frequency Response
Lecture 40 - Feedback System Performance Based on the Frequency Response (Continued.)
Lecture 41 - Compensator Design Using Frequency Response Plots

NPTEL Video Course - Electrical Engineering - Embedded Systems

Subject Co-ordinator - Prof. Santanu Chaudhary

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Embedded Systems
Lecture 2 - Embedded Hardware
Lecture 3 - PIC
Lecture 4 - PIC Peripherals On Chip
Lecture 5 - ARM Processor
Lecture 6 - More ARM Instructions
Lecture 7 - ARM
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
Lecture 32 - Designing Embedded Systems - V
Lecture 33 - Platform Based Design
Lecture 34 - Compilers for Embedded Systems
Lecture 35 - Developing Embedded Systems
Lecture 36 - Building Dependable Embedded Systems
Lecture 37 - Pervasive and Ubiquitous Computing

NPTEL Video Course - Electrical Engineering - Power System Generation, Transmission and Distribution (Encapsu

Subject Co-ordinator - Prof. D.P. Kothari

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Electric Energy Systems A Perspective
Lecture 2 - Structure of Power Systems
Lecture 3 - Conventional Sources of Electric Energy
Lecture 4 - Hydroelectric Power Generation
Lecture 5 - Non Conventional Energy Sources
Lecture 6 - Renewable Energy (Continued.)
Lecture 7 - Energy Storage
Lecture 8 - Deregulation
Lecture 9 - Air Pollutants
Lecture 10 - Transmission Line Parameters
Lecture 11 - Capacitance of Transmission Lines
Lecture 12 - Characteristics and Performance of Transmission Lines
Lecture 13 - Voltage Regulation (VR)
Lecture 14 - Power Flow through a Line
Lecture 15 - Methods of Voltage Control
Lecture 16 - Compensation of Transmission Lines
Lecture 17 - Compensation of Transmission Lines (Continued.)
Lecture 18 - Underground Cables
Lecture 19 - Cables (Continued.)
Lecture 20 - Insulators for Overhead Lines
Lecture 21 - HVDC
Lecture 22 - HVDC (Continued.)
Lecture 23 - Distribution Systems
Lecture 24 - Automatic Generation Control
Lecture 25 - Automatic Generation Control (Continued.)
Lecture 26 - Load Flow Studies
Lecture 27 - Load Flow Problem
Lecture 28 - Load Flow Analysis (Continued.), Gauss Siedel Method
Lecture 29 - Newton Raphson (NR), Load Flow Method

Lecture 30 - Fast Decoupled Load Flow
Lecture 31 - Control of Voltage Profile
Lecture 32 - Optimal System Operation (Economic Operation)
Lecture 33 - Optimal Unit Commitment
Lecture 34 - Optimal Generation Scheduling
Lecture 35 - Optimal Load Flow (Continued.) and Hydro Thermal Scheduling

NPTEL Video Course - Electrical Engineering - Power System Dynamics

Subject Co-ordinator - Dr. M.L. Kothari

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction to Power System Stability Problem - Part-1
Lecture 2 - Introduction to Power System Stability Problem - Part-2
Lecture 3 - Introduction to Power System Stability Problem - Part-3
Lecture 4 - Solution of Switching Equation
Lecture 5 - The Equal Area Criterion for Stability - Part-1
Lecture 6 - The Equal Area Criterion for Stability - Part-2
Lecture 7 - Transient Stability Analysis of a Multi Machine System
Lecture 8 - Modeling of Synchronous Machine - Part-1
Lecture 9 - Modeling of Synchronous Machine - Part-2
Lecture 10 - Modeling of Synchronous Machine - Part-3
Lecture 11 - Modeling of Synchronous Machine - Part-4
Lecture 12 - Synchronous Machine Representation for Stability Studies - Part-1
Lecture 13 - Synchronous Machine Representation for Stability Studies - Part-2
Lecture 14 - Excitation Systems - Part-1
Lecture 15 - Excitation Systems - Part-2
Lecture 16 - Modeling of Excitation Systems - Part-1
Lecture 17 - Modeling of Excitation Systems - Part-2
Lecture 18 - Small Signal Stability of a Single Machine Infinite Bus System - Part-1
Lecture 19 - Small Signal Stability of a Single Machine Infinite Bus System - Part-2
Lecture 20 - Small Signal Stability of a Single Machine Infinite Bus System - Part-3
Lecture 21 - Small Signal Stability of a Single Machine Infinite Bus System - Part-4
Lecture 22 - Small Signal Stability of a Single Machine Infinite Bus System - Part-5
Lecture 23 - Dynamic Modeling of Steam turbines and Governors
Lecture 24 - Dynamic modeling of Hydro Turbines and Governors
Lecture 25 - Load modeling for Stability Studies
Lecture 26 - Numerical Integration Methods for Solving a Set of Ordinary Nonlinear Differential Equation
Lecture 27 - Simulation of Power System Dynamic Response
Lecture 28 - Dynamic Equivalents for Large Scale Systems - Part-1
Lecture 29 - Dynamic Equivalents for Large Scale Systems - Part-2

Lecture 30 - Dynamic Equivalents for Large Scale Systems - Part-3
Lecture 31 - Direct Method of Transient Stability Analysis - Part-1
Lecture 32 - Direct Method of Transient Stability Analysis - Part-2
Lecture 33 - Sub Synchronous Oscillations - Part-1
Lecture 34 - Sub Synchronous Oscillations - Part-2
Lecture 35 - Voltage Stability - Part-1
Lecture 36 - Voltage Stability - Part-2
Lecture 37 - Voltage Stability - Part-3
Lecture 38 - Voltage Stability - Part-4
Lecture 39 - Methods of Improving Stability - Part-1
Lecture 40 - Methods of Improving Stability - Part-2

NPTEL Video Course - Electrical Engineering - Analog Electronic Circuits

Subject Co-ordinator - Prof. S.C. Dutta Roy

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Review of DC Models of Diodes & BJT's
Lecture 2 - Review of DC Models of BJT (Continued...) and FET
Lecture 3 - FET Characteristics and Models
Lecture 4 - Problem Session-1 on DC Analysis of BJT Circuits
Lecture 5 - BJT Biasing and Bias Stability
Lecture 6 - BJT Bias Stability (Continued...)
Lecture 7 - FET Biasing, Current Sources
Lecture 8 - Problem Session-2 on FET and BJT Characteristics and Biasing
Lecture 9 - Current Mirrors; BJT Small Signal Models
Lecture 10 - Small Signal Amplifiers
Lecture 11 - Mid Frequency Analysis of the CE and CB Amplifier
Lecture 12 - Problem Session-3 on Mid- Frequency Analysis of CE Amplifiers
Lecture 13 - Midband Analysis of CB and CC Amplifiers
Lecture 14 - Midband Analysis of FET Amplifiers
Lecture 15 - Problem Session-4 on Midband Analysis of Amplifiers
Lecture 16 - High Frequency Response of Small Signal Amplifiers
Lecture 17 - High Frequency Response of Small Signal Amplifiers (Continued...)
Lecture 18 - Low Frequency Response of Small Signal Amplifiers
Lecture 19 - Problem Session-5 on Frequency Response of Small Signal Amplifiers
Lecture 20 - Differential Amplifiers
Lecture 21 - Differential Amplifiers (Continued...)
Lecture 22 - Discussion on Minor-1 Problems and Differential Amplifiers (Continued...)
Lecture 23 - Problem Session-6 on Frequency Response of Small Signal Amplifiers (Continued...) and Differenti
Lecture 24 - Use of Current Mirrors in Differential Amplifiers
Lecture 25 - FET Differential Amplifiers and Introduction to Power Amplifiers
Lecture 26 - Class B, Class AB and Class A Power Amplifiers
Lecture 27 - Class A Power Amplifiers; Efficiency Considerations
Lecture 28 - Problem Session-7 on Deferential and Power Amplifiers
Lecture 29 - Introduction to Feedback Amplifiers

Lecture 30 - Advantages of Negative Feedback Amplifiers
Lecture 31 - Analysis of Feedback Amplifiers
Lecture 32 - Analysis of the Series - Series and Other Feedback Configurations
Lecture 33 - Problem Session-8 on Feedback Amplifiers
Lecture 34 - Sinusoidal Oscillators
Lecture 35 - More on Oscillators
Lecture 36 - Solutions to Minor-2 Exam and Concluding Discussions on Oscillators
Lecture 37 - Problem Session-9 on Oscillators
Lecture 38 - Tuned (or Narrowband) Amplifiers
Lecture 39 - Widebanding Techniques
Lecture 40 - Widebanding By Using an Inductance
Lecture 41 - Problem Session-10 on Tuned Amplifiers
Lecture 42 - Widebanding by Using Compound Devices
Lecture 43 - Cascode Configuration as Wideband Amplifier
Lecture 44 - Widebanding by Local Feedback
Lecture 45 - Problem Session-11 on Minor-3 Problems & Widebanding by Compound Devices
Lecture 46 - Widebanding by Local Feedback and Feedback Cascades
Lecture 47 - Widebanding by Overall Feedback and Dual Loop Feedback
Lecture 48 - The Differential Pair and the Gilbert Cell as Wideband Amplifiers
Lecture 49 - Correction to Gilbert Cell Analysis and Operational Amplifier Imperfections
Lecture 50 - Op-Amp offsets, Compensation and Slew Rate
Lecture 51 - Op-Amp Compensation, Slew Rate and Some Problems

NPTEL Video Course - Electrical Engineering - Digital Communication

Subject Co-ordinator - Prof. Surendra Prasad

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction to the Course
Lecture 2 - Digital Representation of Analog Signals, Delta Modulation
Lecture 3 - Digital Representation of Analog Signals, Pulse Code Modulation
Lecture 4 - Digital Representation of Analog Signals
Lecture 5 - Quantization Noise in Delta Modulation (Continued...) and Time Division Multiplexing
Lecture 6 - Introduction to Line Coding
Lecture 7 - Spectral Properties of Line Codes
Lecture 8 - Spectral Properties of Line Codes
Lecture 9 - Spectral Properties of Line Codes
Lecture 10 - Baseband Pulse Shaping
Lecture 11 - Baseband Pulse Shaping; Raised Cosine Family of Pulses
Lecture 12 - Partial Response Signalling
Lecture 13 - Precoding for Duobinary and Modified Duobinary Systems
Lecture 14 - Precoding for Modified Duobinary Systems (Continued...) and General Partial Response Signalling
Lecture 15 - Binary Baseband Digital Modulation Techniques
Lecture 16 - Mâ ary Baseband Digital Modulation Techniques
Lecture 17 - Passband Digital Modulations - I
Lecture 18 - Passband Digital Modulations - II
Lecture 19 - Passband Digital Modulations - III
Lecture 20 - Passband Digital Modulations - IV
Lecture 21 - Passband Modulations for Band Limited Channels
Lecture 22 - Baseband and Passband Digital Demodulations
Lecture 23 - Digital Modulation Part - II Matched Filters
Lecture 24 - Matched Filters and Coherent Demodulation-I
Lecture 25 - Coherent Demodulation for Binary Wave Form
Lecture 26 - Demodulators for Binary Waveforms (Continued...)
Lecture 27 - Performance Analysis of Binary Digital Modulations
Lecture 28 - Error Rates for Binary Signalling
Lecture 29 - Performance of Non Coherent FSK and Differential Phase Shift Keying

Lecture 30 - Demodulation of DPSK and M\'ary Signals
Lecture 31 - Performance of M\'ary Digital Modulations
Lecture 32 - Performance of M\'ary Digital Modulations (Continued...)
Lecture 33 - Introduction to Information Theory, Part-1
Lecture 34 - Source Coding
Lecture 35 - Error Free Communication Over a Noisy Channel
Lecture 36 - The Concept of Channel Capacity
Lecture 37 - Error Correcting Codes
Lecture 38 - Error Correcting Codes (Continued...)

NPTEL Video Course - Electrical Engineering - Introduction To Electronic Circuits

Subject Co-ordinator - Prof. S.C. Dutta Roy

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction to the Course and Basic Electrical Quantity
Lecture 2 - R.L.C. Components, Energy Considerations, Sources and Circuit Laws
Lecture 3 - KCL, KVL and Network Analysis
Lecture 4 - Networks Theorems (Thevenin's Norton's)
Lecture 5 - Source Transformation; Super Position Theorem and Non-Linear One-Ports
Lecture 6 - Signal Wave Forms
Lecture 7 - Periodic Wave Forms and Elements of Amplifiers
Lecture 8 - Operational Amplifiers and Diodes
Lecture 9 - Rectifiers and Power Supplies
Lecture 10 - Wave Shaping Circuits
Lecture 11 - More on Wave Shaping Circuits and Introduction to Natural Response of Circuits
Lecture 12 - Natural Response (Continued...)
Lecture 13 - Natural Response of 2nd Order Circuit
Lecture 14 - Natural Response of 2nd Order Circuit (Continued...)
Lecture 15 - Impedance Functions, Poles, Zeros and their Applications
Lecture 16 - Natural Response and Poles and Zeros and Introduction to Forced Response
Lecture 17 - Phasors and their Applications in AC Ckts, analysis
Lecture 18 - More About Phasors and Introduction to Complete Response
Lecture 19 - Complete Response of Electrical Circuits
Lecture 20 - AC Circuit Analysis
Lecture 21 - Filter Circuits and Resonance
Lecture 22 - Resonance (Continued...)
Lecture 23 - General Network Analysis
Lecture 24 - Two-Port Networks
Lecture 25 - Semiconductor Physics
Lecture 26 - Semiconductor Physics (Continued...)
Lecture 27 - More About Diodes Including Zener Diodes
Lecture 28 - Bipolar Junction Transistors
Lecture 29 - Transistors Characteristics and Biasing

Lecture 30 - BJT Biasing and Introduction to Power Amplifiers
Lecture 31 - BJT Power Amplifiers
Lecture 32 - Power Amplifier
Lecture 33 - Power Amplifiers (Continued...) and an Introduction to Small Signal Modelling of BJT
Lecture 34 - Small Signal Model and Small Signal Amplifiers
Lecture 35 - Small Signal Amplifiers (Continued...)
Lecture 36 - Small Signal Amplifier (Continued...)
Lecture 37 - Small Signal Amplifiers (Continued...)
Lecture 38 - Negative Feedback
Lecture 39 - Digital Circuits
Lecture 40 - Digital Circuits (Continued...)

NPTEL Video Course - Electrical Engineering - NOC:Analog Electronic Circuit

Subject Co-ordinator - Dr. Shouribrata Chatterjee

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction to Analog Circuits Introduction to the Diode
Lecture 2 - Diodes, Introduction to The Transistor
Lecture 3 - MOS Device, Characteristics
Lecture 4 - DC operating point
Lecture 5 - DC operating point, amplifier design
Lecture 6 - Common source amplifier, small signal analysis
Lecture 7 - Common gate, common drain
Lecture 8 - Common gate circuit
Lecture 9 - Source degenerated amplifier
Lecture 10 - Swing limits
Lecture 11 - Swing limits (Continued...), multi transistor amplifiers
Lecture 12 - Multi-transistor amplifiers
Lecture 13 - Introduction to current sources
Lecture 14 - Current sources/mirrors (Continued...)
Lecture 15 - Current sources, biasing
Lecture 16 - Differential circuits
Lecture 17 - Differential amplifiers-I
Lecture 18 - Differential amplifiers-II
Lecture 19 - Differential amplifiers-III
Lecture 20 - Self biased active load diff. amp
Lecture 21 - Diff. Cascode amplifier, two stage amplifiers
Lecture 22 - Two stage diff. amps, op-amps
Lecture 23 - Op-amps, OTAs
Lecture 24 - Circuits with op-amps
Lecture 25 - Capacitance in MOS devices
Lecture 26 - Common source, drain, gate-revisited
Lecture 27 - Common gate, common drain with capacitances
Lecture 28 - Cascode, cascade-revisit with capacitance
Lecture 29 - Cascade amplifier (with capacitance)

Lecture 30 - Diversion
Lecture 31 - Diversion Continued
Lecture 32 - Compensation
Lecture 33 - Op-amp Design with Compensation
Lecture 34 - Unity Gain Bandwidth
Lecture 35 - Power Amplification
Lecture 36 - Power Amplifiers-2
Lecture 37 - Power Amplifiers- Class A,B,AB,C ClassD
Lecture 38 - Class D Amplifiers, Push-pull Amplifiers
Lecture 39 - Introduction to Voltage Regulators
Lecture 40 - Voltage Regulators- line, load; Conclusion Regulation

NPTEL Video Course - Electrical Engineering - NOC:Nonlinear and Adaptive Control

Subject Co-ordinator - Prof. Shubhendu Bhasin

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction
Lecture 2 - Preliminaries
Lecture 3 - Model Reference Adaptive Control - Part 1
Lecture 4 - Model Reference Adaptive Control - Part 2
Lecture 5 - Model Reference Adaptive Control - Part 3
Lecture 6 - Adaptive Command Tracking
Lecture 7 - Robust Model Reference Adaptive Control - Part 1
Lecture 8 - Robust Model Reference Adaptive Control - Part 2
Lecture 9 - Robust Model Reference Adaptive Control - Part 3
Lecture 10 - Robust Model Reference Adaptive Control - Part 4

NPTEL Video Course - Electrical Engineering - NOC:Information Theory, Coding and Cryptography

Subject Co-ordinator - Prof. Ranjan Bose

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction to Information Theory
Lecture 2 - Entropy, Mutual Information, Conditional and Joint Entropy
Lecture 3 - Measures for Continuous, Random Variable, Relative Entropy
Lecture 4 - Variable Length Codes, Prefix Codes
Lecture 5 - Source Coding Theorem
Lecture 6 - various source coding Techniques
Lecture 7 - Optimum Quantizer, Practical Application of Source Coding
Lecture 8 - Introduction to Super Information
Lecture 9 - Channel Models and Channel Capacity
Lecture 10 - Noisy Channel Coding Theorem
Lecture 11 - Gaussian Channel and Information Capacity Theorem
Lecture 12 - Capacity of MIMO Channels
Lecture 13 - Introduction to Error Control Coding
Lecture 14 - Introduction to Galois Field
Lecture 15 - Equivalent Codes, Generator Matrix and Parity Check Matrix
Lecture 16 - Systematic Codes, Error Detections and Correction
Lecture 17 - Erasure and Errors, Standard Array and Syndrome Decoding
Lecture 18 - Probability of Error, Coding Gain and Hamming Bound
Lecture 19 - Hamming Codes, LDPC Codes and MDS Codes
Lecture 20 - Introduction to Cyclic Codes
Lecture 21 - Generator Polynomial, Syndrome Polynomial and Matrix Representation
Lecture 22 - Fire Code, Golay Code, CRC Codes and Circuit Implementation of Cyclic Codes
Lecture 23 - Introduction to BCH Codes
Lecture 24 - Multiple Error Correcting BCH Codes, Decoding of BCH Codes
Lecture 25 - Introduction to Reed Solomon (RS) Codes
Lecture 26 - Introduction to Convolutional Codes
Lecture 27 - Trellis Codes
Lecture 28 - Vitrebi Decoding and Known good Convolutional Codes
Lecture 29 - Introduction to Turbo Codes

Lecture 30 - Introduction to Trellis Coded Modulation (TCM)
Lecture 31 - Ungerboek's Design Rules and Performance Evaluation of TCM Schemes
Lecture 32 - TCM for Fading Channel and Space Time Trellis Codes (STTC)
Lecture 33 - Introduction to Space Time Block Codes (STBC)
Lecture 34 - Space Time Codes
Lecture 35 - Space Time Codes (Continued...)
Lecture 36 - Introduction to Cryptography
Lecture 37 - Some Well-Known Algorithms
Lecture 38 - Introduction to Physical Layer Security
Lecture 39 - Secrecy Outage Capacity, Secrecy Outage Probability, Cooperative Jamming

NPTEL Video Course - Electrical Engineering - Engineering Electromagnetics

Subject Co-ordinator - Prof. Sheel Aditya

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction
Lecture 2 - Transmission Lines
Lecture 3 - Transmission Lines
Lecture 4 - Transmission Lines
Lecture 5 - Transmission Lines
Lecture 6 - Transmission Lines
Lecture 7 - Transmission Lines
Lecture 8 - Transmission Lines
Lecture 9 - Transmission Lines
Lecture 10 - Transmission Lines
Lecture 11 - Transmission Lines
Lecture 12 - Wave Propagation
Lecture 13 - Wave Propagation (Continued...)
Lecture 14 - Wave Propagation
Lecture 15 - Wave Propagation
Lecture 16 - Wave Propagation
Lecture 17 - Wave Propagation
Lecture 18 - Reflection and Refraction of waves
Lecture 19 - Reflection and Refraction of waves (Continued...)
Lecture 20 - Reflection and Refraction of waves (Continued...) - 1
Lecture 21 - Reflection and Refraction of waves (Continued...); The Plane slab
Lecture 22 - Reflection and Refraction of waves (Continued...); Transmission Line Analogy for Planes Waves
Lecture 23 - Wave Guides
Lecture 24 - Wave Guides (Continued...) Parallel plane Guide,Transverse Electric Waves,Field Distribution,Sup
Lecture 25 - Wave Guides (Continued...)
Lecture 26 - Wave Guides (Continued...) Parallel plane Guide,Characteristics of TE and Tm Waves,TEM Waves,Wav
Lecture 27 - Wave Guides (Continued...) - 1
Lecture 28 - Wave Guides (Continued...) - 2
Lecture 29 - Wave Guides (Continued...) Rectangular Wave Guides

Lecture 30 - Wave Guides (Continued...)
Lecture 31 - Wave Guides (Continued...) Rectangular Wave Guides - 1
Lecture 32 - Resonators General Properties
Lecture 33 - Resonators (Continued...) Transmission Line Resonators
Lecture 34 - Resonators (Continued...) Wave Guide Resonators
Lecture 35 - Radiation
Lecture 36 - Radiation (Continued...)
Lecture 37 - Radiation (Continued...) - 1
Lecture 38 - Radiation (Continued...) - 2
Lecture 39 - Radiation (Continued...) Monopole Antennas half Wave Dipole Antenna
Lecture 40 - Radiation (Continued...)
Lecture 41 - Radiation (Continued...) 2 - Element Arrays,Yagi-Uda Array

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

Subject Co-ordinator - Prof. Abhishek Dixit

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction
Lecture 2 - Signal Spaces
Lecture 3 - Inner Product and Orthogonal Expansion
Lecture 4 - Signal Spaces
Lecture 5 - Signal Spaces
Lecture 6 - Signal Spaces
Lecture 7 - Random Variables and Random Processes
Lecture 8 - Random Variables and Random Processes
Lecture 9 - Random Variables and Random Processes
Lecture 10 - Random Variables and Random Processes
Lecture 11 - Random Variables and Random Processes
Lecture 12 - Random Variables and Random Processes
Lecture 13 - Random Variables and Random Processes
Lecture 14 - Random Variables and Random Processes
Lecture 15 - Random Variables and Random Processes
Lecture 16 - Random Variables and Random Processes
Lecture 17 - Random Variables and Random Processes
Lecture 18 - Waveform Coding
Lecture 19 - Modulation
Lecture 20 - Modulation
Lecture 21 - Modulation
Lecture 22 - Modulation
Lecture 23 - Modulation
Lecture 24 - Modulation
Lecture 25 - Modulation
Lecture 26 - Modulation
Lecture 27 - Modulation
Lecture 28 - Modulation
Lecture 29 - Modulation

Lecture 30 - Detection
Lecture 31 - Detection
Lecture 32 - Detection
Lecture 33 - Detection
Lecture 34 - Detection
Lecture 35 - Detection
Lecture 36 - Detection
Lecture 37 - Detection
Lecture 38 - Detection

NPTEL Video Course - Electrical Engineering - NOC:Electric Vehicles - Part 1

Subject Co-ordinator - Prof. Amit Jain

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Intro EV Historical Background
Lecture 2 - Intro EV Benefits of Using EVs
Lecture 3 - Intro EV Overview of types of EVs and its Challenges
Lecture 4 - Intro EV Motor Drive Technologies
Lecture 5 - Intro EV Energy Source Technologies
Lecture 6 - Intro EV Battery Charging Technologies
Lecture 7 - Intro EV Vehicle to Grid
Lecture 8 - Intro EV Subsystems and Configurations
Lecture 9 - Intro HEV Subsystems and Configurations
Lecture 10 - Intro HEV Subsystems and Modes of Operation
Lecture 11 - Vehicle Dynamics intro and tractive effort
Lecture 12 - Vehicle Dynamics Simulation and dynamic equation
Lecture 13 - Vehicle Dynamics Simulation dynamic equation constant Fte
Lecture 14 - Vehicle Dynamics dynamic equation variable Fte
Lecture 15 - Vehicle Dynamics simulation dynamic equation variable Fte
Lecture 16 - Vehicle Dynamics Modelling and simulation in Simulink
Lecture 17 - Summary Electric Vehicles - Part 1 Course
Lecture 18 - Basics of DC Motor Drive
Lecture 19 - Realization of DC Chopper
Lecture 20 - Open Loop Operation of Chopper Fed DC Motor Drive
Lecture 21 - Review of Control Theory
Lecture 22 - Modeling and Current Controller Design for Separately Excited DC Motor Drive
Lecture 23 - Speed Controller Design and Performance Evaluation of DC Motor Drive
Lecture 24 - Fundamentals of Three Phase Induction Motor
Lecture 25 - Equivalent Circuit and Torque-Speed Characteristics of Induction Motor
Lecture 26 - Starting and Speed Control of Induction Motor
Lecture 27 - Realisation of DC to AC Power Converter
Lecture 28 - Impact of Non-Sinusoidal Voltage on Induction Motor
Lecture 29 - Selective Harmonic Elimination and Optimal Pulse Width Modulation Techniques

Lecture 30 - Switching Energy Losses and Sine-Triangle PWM
Lecture 31 - Analysis of Sine-Triangle PWM
Lecture 32 - Simulation Studies on Open Loop Induction Motor Drive
Lecture 33 - Modeling of Crylindrical Rotor Machine
Lecture 34 - Modeling of Surface Mounted PMSM Drive
Lecture 35 - Sensored Vector Control of PMSM Drive
Lecture 36 - Dynamic Modeling of Squirrel Cage Induction Machine - Part 1
Lecture 37 - Dynamic Modeling of Squirrel Cage Induction Machine - Part 2
Lecture 38 - Controller Design for RFO Vector Controlled IM Drive
Lecture 39 - Estimation of Rotor Flux Vector and Mechanical Speed
Lecture 40 - Case Study - Indian Railway Propulsion System
Lecture 41 - Simulation Exercise - PMSM and IM Drives
Lecture 42 - Basics of Electromagnetic Circuit
Lecture 43 - SRM and BLDC Motor Drives - Part 1
Lecture 44 - SRM and BLDC Motor Drives - Part 2

NPTEL Video Course - Electrical Engineering - NOC:Power Electronics

Subject Co-ordinator - Prof. G.Bhuvaneshwari

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction to Power Electronics
Lecture 2 - Power Devices
Lecture 3 - Power Devices
Lecture 4 - Power Devices
Lecture 5 - Single-phase Uncontrolled Rectifiers
Lecture 6 - Single-phase Controlled Rectifiers - I
Lecture 7 - Single-phase Controlled Rectifiers - II
Lecture 8 - Three Phase Rectifiers - I
Lecture 9 - Numericals on devices and Single-phase Rectifiers
Lecture 10 - Three Phase Rectifiers - II
Lecture 11 - Dual Converter and Communication Overlap
Lecture 12 - Communication Overlap - II and AC-AC Converter-Introduction
Lecture 13 - Single-Phase and Three-Phase AC Voltage Controllers
Lecture 14 - Three-Phase AC Voltage Controllers and Cycloconverters
Lecture 15 - Non-Isolated DC-DC Converters - I
Lecture 16 - Non-Isolated DC-DC Converters - II
Lecture 17 - Isolated DC-DC Converters - I
Lecture 18 - Isolated DC-DC Converters - II and Cuk Converters
Lecture 19 - Voltage Source Inverters
Lecture 20 - VSI PWM Techniques - I
Lecture 21 - VSI PWM Techniques - II
Lecture 22 - SPWM and SVM Technique
Lecture 23 - Current Source Inverter
Lecture 24 - Power Electronics Applications

NPTEL Video Course - Electrical Engineering - NOC:Electrical Machines

Subject Co-ordinator - Prof. G.Bhuvaneshwari

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction to Electrical Machines - I
Lecture 2 - Single-phase and Three-phase AC Circuits, Magnetic circuits
Lecture 3 - Magnetic Circuit - II
Lecture 4 - Magnetic Circuit - III
Lecture 5 - Transformers - Introduction
Lecture 6 - Transformers - Amp-Turn Balance, Ideal and practical transformers
Lecture 7 - Transformer Equivalent circuit and Reducing leakage
Lecture 8 - Transformer equivalent circuit parameter determination
Lecture 9 - Transformers - Voltage regulation and efficiency
Lecture 10 - Auto-transformers
Lecture 11 - PU notation and Intoduction to Instrument transformers
Lecture 12 - Instrument Transformers and All Day Efficiency
Lecture 13 - Three Phase Transformers - I
Lecture 14 - Three Phase Transformers - II
Lecture 15 - Electromechanical Energy Conversion - I
Lecture 16 - Electromechanical Energy Conversion - II
Lecture 17 - Electromechanical Energy Conversion - III
Lecture 18 - DC Machines-Introduction, Constructional Features
Lecture 19 - DC Machines - EMF and Torque Equations and Generator Operation
Lecture 20 - DC Machines - OCC and Load Charactristics Classification
Lecture 21 - DC Machines - Armature Reaction
Lecture 22 - DC Machines - Voltage Build-up and Load Characteristics
Lecture 23 - DC Generator Characteristics and Introduction to DC Motors
Lecture 24 - DC Motors
Lecture 25 - DC Motor
Lecture 26 - DC Motor
Lecture 27 - DC Machine
Lecture 28 - DC Machine
Lecture 29 - 3 Phase Induction Machine

Lecture 30 - 3 Phase Induction Machine
Lecture 31 - 3 Phase Induction Machine
Lecture 32 - Testing of Induction Motor
Lecture 33 - 3 Phase Induction Machine
Lecture 34 - Synchronous Machines
Lecture 35 - Synchronous Machines
Lecture 36 - Numerical Session
Lecture 37 - Synchronization of Alternators
Lecture 38 - Synchronous Machines
Lecture 39 - Synchronous Machines
Lecture 40 - Synchronous Machines
Lecture 41 - Single Phase Induction Motors

NPTEL Video Course - Electrical Engineering - Special Electromechanical Systems

Subject Co-ordinator - Prof. S.S. Murthy

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Special Electromechanical Systems (Introduction)
Lecture 2 - Classification of Machines
Lecture 3 - Single and Two-Phase Motors
Lecture 4 - Single-Phase Induction Motors-Analysis
Lecture 5 - Starting of Single-Phase Induction Motors
Lecture 6 - Single-Phase Induction Motors Analysis
Lecture 7 - Induction Motors Analysis by Symmetrical Components
Lecture 8 - Modelling of 1-Phase Induction Motor (One and Two Windings)
Lecture 9 - Asymmetrical Induction Motor Generalized Rotating Field Theory
Lecture 10 - Generalized Rotating Field Theory (Continued...)
Lecture 11 - Generalized Rotating Field Theory (Continued...)
Lecture 12 - Generalized Rotating Field Theory (Continued...)
Lecture 13 - Analysis of Asymmetrical Machine by Generalized Rotating Field Theory
Lecture 14 - Analysis of Asymmetrical Machine
Lecture 15 - Analysis of Asymmetrical Induction Machine
Lecture 16 - Generalised Rotating-Field Theory of Wound Rotor Ind. Machine Having Asymmetry in Stator and Rot
Lecture 17 - Generalised Rotating-Field Theory of Wound Rotor Ind. Machine Having Asymmetry in Stator and Rot
Lecture 18 - Testing of Small Electrical Machines
Lecture 19 - Testing of 1-Phase Induction Motors
Lecture 20 - Variable Reluctance (VR) Motors
Lecture 21 - Switched Reluctance Motor (Continued...)
Lecture 22 - Switched Reluctance Motor (Continued...)
Lecture 23 - Switched Reluctance Motor (Continued...)
Lecture 24 - Stepper Motors
Lecture 25 - Stepper Motors (Continued...)
Lecture 26 - Induction Generators
Lecture 27 - Induction Generators (Continued...)
Lecture 28 - Doubly Fed Induction Generators
Lecture 29 - Self Excited Induction Generators

Lecture 30 - Self Excited Induction Generators (Continued...)
Lecture 31 - Permanent Magnet Machines
Lecture 32 - Squareware Permanent Magnet Brushless Motor Drive
Lecture 33 - Sine Wave Permanent Magnet Brushless Motor Drives
Lecture 34 - Permanent Magnet Synchronous Motors

NPTEL Video Course - Electrical Engineering - NOC:High Power Multilevel Converters - Analysis, Design and Ope

Subject Co-ordinator - Prof. Anand Rup

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Basic Understanding of Converter (Introduction to Power Converters)
Lecture 2 - Basic Understanding of Converter (Half Bridge and Full Bridge Circuit Operation)
Lecture 3 - Basic Understanding of Converter (Sinusoidal Pulse width Modulation and Three Phase Circuit)
Lecture 4 - Basic Understanding of Converter (Harmonics in Sinusoidal PWM)
Lecture 5 - Third harmonic addition in Sine PWM
Lecture 6 - Introduction to Space Vectors
Lecture 7 - Space Vector PWM - Timing Calculation
Lecture 8 - Space Vector PWM - Switching Sequence
Lecture 9 - Space Vector PWM - Using Carriers
Lecture 10 - Basic Introduction to Power Devices
Lecture 11 - Introduction to Multilevel Converters
Lecture 12 - Cascaded H-bridge Multilevel Converters
Lecture 13 - Output Voltage Waveform Synthesis in CHB Converter and Basic of Asymmetrical CHB Converters
Lecture 14 - Cascaded H-Bridge Converters
Lecture 15 - Cascaded H-Bridge Converters
Lecture 16 - Fault Tolerant Operation of Cascaded H-Bridge Converter - Part I
Lecture 17 - Fault Tolerant Operation of Cascaded H-Bridge Converter - Part II
Lecture 18 - Modular Multilevel Converter - Topology and Operation
Lecture 19 - Modular Multilevel Converter - Arm and Cell Voltage Ratings
Lecture 20 - Modular Multilevel Converter - Arm Currents
Lecture 21 - Modular Multilevel Converter - Arm Energy Balancing
Lecture 22 - Modular Multilevel Converter - Different Circuit Topologies
Lecture 23 - Modular Multilevel Converter - PWM Technique and Capacitor Voltage Balancing
Lecture 24 - Modular Multilevel Converter - Fault Tolerant Operation and Commercial Production
Lecture 25 - Design of Components in MMC
Lecture 26 - Neutral Point Clamped Converter - Circuit Topology - Part I
Lecture 27 - Neutral Point Clamped Converter - Circuit Topology - Part II
Lecture 28 - Neutral Point Clamped Converter - Space Vector Diagram
Lecture 29 - Neutral Point Clamped Converter - Space Vector PWM

Lecture 30 - NPC - Sinusoidal PWM and Space Vector PWM using Single Carrier Strategy
Lecture 31 - Neutral Point Clamped Converter - Mid-point Voltage Fluctuations
Lecture 32 - Neutral Point Clamped Converter - Capacitor Voltage Balancing
Lecture 33 - Neutral Point Clamped Converter - Another Strategy of Capacitor Voltage Balancing
Lecture 34 - Other Topologies of NPC Converters - Higher Level NPC, TNPC and Active NPC
Lecture 35 - Multipulse Transformer - Part I
Lecture 36 - Multipulse Transformer - Part II
Lecture 37 - A Case Study on MMC and CHB
Lecture 38 - Basics of Gate Driver Circuits
Lecture 39 - Gate Driver Circuits - Turn-on and Turn-off Process
Lecture 40 - Gate Driver Circuits - Features of Gate Drivers and Basics of Bootstrap Functionality
Lecture 41 - Condition Monitoring of Converters
Lecture 42 - Other Converter Topologies
Lecture 43 - Summary of the Course

NPTEL Video Course - Electrical Engineering - NOC:Introduction to Embedded System Design

Subject Co-ordinator - Prof. Badri N Subudhi, Prof.Dhananjay V. Gadre

Co-ordinating Institute - IIT - Jammu

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

Lecture 1 - Introduction
Lecture 2 - Introduction continued with Project demos
Lecture 3 - Modular Approach to ESD
Lecture 4 - Modular Approach to ESD (Continued...)
Lecture 5 - Salient Features of Modern Microcontrollers
Lecture 6 - Salient Features of Modern Microcontrollers (Continued...)
Lecture 7 - Elements of Microcontroller Ecosystem
Lecture 8 - Elements of Microcontroller Ecosystem (Continued...)
Lecture 9 - Power Supply for Embedded Systems
Lecture 10 - Power Supply for Embedded Systems (Continued...)
Lecture 11 - Introduction to MSP430
Lecture 12 - MSP430 Architecture
Lecture 13 - MSP430 Architecture- (Continued...) And Introduction to Lunchbox
Lecture 14 - Programming Methods for MSP430
Lecture 15 - Physical Interfacing - 1
Lecture 16 - Physical Interfacing - 2
Lecture 17 - Physical Interfacing - 3
Lecture 18 - Physical Interfacing - 4
Lecture 19 - Physical Interfacing - 5
Lecture 20 - Physical Interfacing - 6
Lecture 21 - GIT, CCS Installation and Embedded C
Lecture 22 - MSP430 Digital I/O
Lecture 23 - MSP430 Digital I/O
Lecture 24 - MSP430 Clock System and Reset
Lecture 25 - Interrupts in MSP430
Lecture 26 - Interrupts in MSP430 (Continued...)
Lecture 27 - Interfacing Seven Segment Displays with MSP430; Low Power Modes in MSP430
Lecture 28 - Interfacing Liquid Crystal Displays (LCD)
Lecture 29 - MSP430 Timer Module

Lecture 30 - Pulse Width Modulation, PWM using Timer Capture
Lecture 31 - Analog to Digital Converter in the MSP430
Lecture 32 - ADC and DAC using R2R Ladder and Random number generation using LFSR
Lecture 33 - Serial Communication Protocols, USCI Module in MSP430
Lecture 34 - MSP430 Timer in Capture Mode
Lecture 35 - Coding Ninja
Lecture 36 - Building an Electronics Project
Lecture 37 - Circuit Prototyping Techniques
Lecture 38 - Single Purpose Computers
Lecture 39 - Single Purpose Computers (Continued...)
Lecture 40 - Recap of Course Coverage and Project Demonstration from Concept to Final

NPTEL Video Course - Electrical Engineering - NOC:Power Quality

Subject Co-ordinator - Prof. Bhim Singh

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Power Quality - An Introduction
Lecture 2 - Power Quality Standards and Monitoring
Lecture 3 - Power Quality Standards and Monitoring (Continued...)
Lecture 4 - Passive Shunt and Series Compensations
Lecture 5 - Passive Shunt and Series Compensations (Continued...)
Lecture 6 - Passive Shunt and Series Compensations (Continued...)
Lecture 7 - Active Shunt Compensation
Lecture 8 - Active Shunt Compensation (Continued...)
Lecture 9 - Active Shunt Compensation (Continued...)
Lecture 10 - Active Series Compensation
Lecture 11 - Active Series Compensation (Continued...)
Lecture 12 - Unified Power Quality Compensators
Lecture 13 - Unified Power Quality Compensators (Continued...)
Lecture 14 - Unified Power Quality Compensators (Continued...)
Lecture 15 - Loads Which Cause Power Quality Problems
Lecture 16 - Loads Which Cause Power Quality Problems (Continued...)
Lecture 17 - Passive Power Filters
Lecture 18 - Passive Power Filters (Continued...)
Lecture 19 - Passive Power Filters (Continued...)
Lecture 20 - Shunt Active Power Filters
Lecture 21 - Shunt Active Power Filters (Continued...)
Lecture 22 - Shunt Active Power Filters (Continued...)
Lecture 23 - Active Series Power Filters
Lecture 24 - Active Series Power Filters (Continued...)
Lecture 25 - Active Series Power Filters (Continued...)
Lecture 26 - Hybrid Power Filters
Lecture 27 - Hybrid Power Filters (Continued...)
Lecture 28 - Hybrid Power Filters (Continued...)
Lecture 29 - AC-DC Converters That Cause Power Quality

Lecture 30 - Improved Power Quality Converters - AC-DC Boost Converters
Lecture 31 - Improved Power Quality Converters - AC-DC Boost Converters (Continued...)
Lecture 32 - Improved Power Quality Converters - AC-DC Buck Converters
Lecture 33 - Improved Power Quality Converters - AC-DC Buck-Boost Converters
Lecture 34 - Improved Power Quality Converters - AC-DC Buck-Boost Converters (Continued...)
Lecture 35 - Improved Power Quality Converters - AC-DC Buck-Boost Converters (Continued...)
Lecture 36 - Three Phase AC-DC Improved Power Quality Converters
Lecture 37 - Multipulse Converters
Lecture 38 - Multipulse Converters (Continued...)
Lecture 39 - Multipulse Converters (Continued...)
Lecture 40 - Power Quality Improvement in Solar Energy Conversion System
Lecture 41 - Power Quality Improvement in Solar Energy Conversion System (Continued...)
Lecture 42 - Power Quality Improvement in Wind Energy Conversion System
Lecture 43 - Power Quality Improvement in Diesel Generator Set Based Power Supply System
Lecture 44 - Power Quality Improvement in Diesel Generator Set Based Power Supply System (Continued...)
Lecture 45 - Power Quality Improvement in Distributed Generation Sources Based Microgrids

NPTEL Video Course - Electrical Engineering - NOC:Introduction to Electrical Engineering

Subject Co-ordinator - Prof. Bhim Singh

Co-ordinating Institute - IIT - Delhi

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

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
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Lecture 26
Lecture 27
Lecture 28
Lecture 29

Lecture 30
Lecture 31
Lecture 32
Lecture 33
Lecture 34
Lecture 35
Lecture 36
Lecture 37
Lecture 38
Lecture 39
Lecture 40
Lecture 41
Lecture 42

NPTEL Video Course - Electrical Engineering - NOC:Transducers for Instrumentation

Subject Co-ordinator - Ankur Gupta

Co-ordinating Institute - IIT - Delhi

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

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
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Lecture 29

Lecture 30
Lecture 31
Lecture 32
Lecture 33
Lecture 34
Lecture 35
Lecture 36

NPTEL Video Course - Electrical Engineering - NOC:Computer-Aided Design of Electrical Machines

Subject Co-ordinator - Prof. Bhim Singh

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Course Outline and Introduction
Lecture 2 - Fundamental - I
Lecture 3 - Equivalent Circuit Approach to Design
Lecture 4 - Transformer Design - I
Lecture 5 - Transformer Design - II
Lecture 6 - Transformer Design - III
Lecture 7 - Transformer Design - IV
Lecture 8 - Windings in Electrical Machines
Lecture 9 - Design of DC Machine - I
Lecture 10 - Design of DC Machine - II
Lecture 11 - Design of DC Machine - III
Lecture 12 - Design of Three-Phase Induction Motors - I
Lecture 13 - Design of Three-Phase Induction Motors - II
Lecture 14 - Design of Three-Phase Induction Motors - III
Lecture 15 - Design of Three-Phase Induction Motors - IV
Lecture 16 - Design of Single-Phase Induction Machine - I
Lecture 17 - Design of Single-Phase Induction Machine - II
Lecture 18 - Design of Single-Phase Induction Machine - III
Lecture 19 - Design of Three-Phase Synchronous Machines - I
Lecture 20 - Design of Three-Phase Synchronous Machines - II
Lecture 21 - Design of Three-Phase Synchronous Machines - III
Lecture 22 - Design of Three-Phase Synchronous Machines - IV
Lecture 23 - Design of Synchronous Reluctance Machines - I
Lecture 24 - Design of Synchronous Reluctance Machines - II
Lecture 25 - Design of Synchronous Reluctance Machines - III
Lecture 26 - Design of Brushless PM Machines - I
Lecture 27 - Design of Brushless PM Machines - II
Lecture 28 - Design of Brushless PM Machines - III
Lecture 29 - Design of Brushless PM Machines - IV

Lecture 30 - Design of Brushless PM Machines - V
Lecture 31 - Design of Switched Reluctance Machines - I
Lecture 32 - Design of Switched Reluctance Machines - II
Lecture 33 - Design of Switched Reluctance Machines - III
Lecture 34 - Design of Stepper Machines - I
Lecture 35 - Design of Stepper Machines - II
Lecture 36 - Design of Axial Flux Machines - I
Lecture 37 - Design of Axial Flux Machines - II
Lecture 38 - Computer Aided Design and Analysis Method - I
Lecture 39 - Computer Aided Design and Analysis Method - II
Lecture 40 - Case Studies and Tutorials - I and II
Lecture 41 - Tutorial-III : Determination of Transformer Operating Point
Lecture 42 - Tutorial-IV

NPTEL Video Course - Electrical Engineering - NOC:Electronic Systems Design: Hands-on Circuits and PCB Design

Subject Co-ordinator - Prof. Ankur Gupta

Co-ordinating Institute - IIT - Delhi

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

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
Lecture 32 - KiCad Custom Symbol and Footprints Creation
Lecture 33 - KiCad Example : PCB design using OpAmp IC
Lecture 34 - KiCad Example : PCB design using 555 Timer IC
Lecture 35 - RF PCB Design Guidelines
Lecture 36 - RF PCB Example

NPTEL Video Course - Electrical Engineering - NOC:Advance Power Electronics

Subject Co-ordinator - Prof. Bhim Singh

Co-ordinating Institute - IIT - Delhi

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

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
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
Lecture 32 - Permanent Magnet Synchronous Motor Drive
Lecture 33 - Permanent Magnet Brushless DC Motor Drive
Lecture 34 - Switched Reluctance Motor Drive
Lecture 35 - Synchronous Reluctance (SyR) Motor Drive
Lecture 36 - Synchronous Motor (SM) Drive
Lecture 37 - Vector Control of Synchronous Motor (SM) Drives

NPTEL Video Course - Electrical Engineering - Advanced Control Systems

Subject Co-ordinator - Prof. S. Majhi

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Introduction
Lecture 2 - Control structures and performance measures
Lecture 3 - Time and frequency domain performance measures
Lecture 4 - Design of controller
Lecture 5 - Design of controller for SISO system
Lecture 6 - Controller design for TITO processes
Lecture 7 - Limitations of PID controllers
Lecture 8 - PI-PD controller for SISO system
Lecture 9 - PID-P controller for Two Input Two Output system
Lecture 10 - Effects of measurement noise and load
Lecture 11 - Identification of dynamic models of plants
Lecture 12 - Relay control system for identification
Lecture 13 - Off-line identification of process dynamics
Lecture 14 - On-line identification of plant dynamics
Lecture 15 - State space based identification
Lecture 16 - State space analysis of systems
Lecture 17 - State space based identification of systems - 1
Lecture 18 - State space based identification of systems - 2
Lecture 19 - Identification of simple systems
Lecture 20 - Identification of FOPDT model
Lecture 21 - Identification of second order plus dead time model
Lecture 22 - Identification of SOPDT model
Lecture 23 - Steady state gain from asymmetrical relay test
Lecture 24 - Identification of SOPDT model with pole multiplicity
Lecture 25 - Existence of limit cycle for unstable system
Lecture 26 - Identification procedures
Lecture 27 - Identification of underdamped systems
Lecture 28 - Off-line identification of TITO systems
Lecture 29 - On-line identification of TITO systems

Lecture 30 - Review of time domain based identification
Lecture 31 - DF based analytical expressions for on-line identification
Lecture 32 - Model parameter accuracy and sensitivity
Lecture 33 - Improved identification using Fourier series and wavelet transform
Lecture 34 - Reviews of DF based identification
Lecture 35 - Advanced Smith predictor controller
Lecture 36 - Design of controllers for the advanced Smith predictor
Lecture 37 - Model-free controller design
Lecture 38 - Model Based PID controller Design - I
Lecture 39 - Model Based PI-PD controller Design - II
Lecture 40 - Tuning of reconfigurable PID controllers

NPTEL Video Course - Electrical Engineering - NOC:Optimization Techniques for Digital VLSI Design

Subject Co-ordinator - Dr. Santosh Biswas, Prof. Chandan Karfa

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Introduction to Digital VLSI Design Flow
Lecture 2 - High-level Synthesis (HLS) flow with an example
Lecture 3 - Automation of High-level Synthesis Steps
Lecture 4 - Impact of Coding Style on HLS Results
Lecture 5 - Impact of Compiler Optimizations on HLS Results
Lecture 6 - RTL Optimizations for Timing
Lecture 7 - Retiming
Lecture 8 - RTL Optimizations for Area
Lecture 9 - RTL Optimizations for Power
Lecture 10 - High Level Synthesis
Lecture 11 - Overview of FPGA Technology Mapping
Lecture 12 - Introduction to Physical Synthesis
Lecture 13 - Introduction to Digital VLSI Testing - I
Lecture 14 - Introduction to Digital VLSI Testing - II
Lecture 15 - Optimization Techniques for ATPG - Part I
Lecture 16 - Optimization Techniques for ATPG - Part II
Lecture 17 - Optimization Techniques for Design for Testability
Lecture 18 - High-level fault modeling and RTL level Testing
Lecture 19 - LTL/CTL based Verification
Lecture 20 - Verification of Large Scale Systems
Lecture 21 - BDD based verification
Lecture 22 - Verification
Lecture 23 - Verification
Lecture 24 - Verification

NPTEL Video Course - Electrical Engineering - NOC:Advanced Topics in Probability and Random Processes

Subject Co-ordinator - Prof. Prabin K Bora

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Probability Basics
Lecture 2 - Random Variable - I
Lecture 3 - Random Variable - II
Lecture 4 - Random Vectors and Random Processes
Lecture 5 - Infinite Sequence of Events - I
Lecture 6 - Infinite Sequence of Events - II
Lecture 7 - Convergence of Sequence of Random Variables
Lecture 8 - Weak Convergence - I
Lecture 9 - Weak Convergence - II
Lecture 10 - Laws of Large Numbers
Lecture 11 - Central Limit Theorem
Lecture 12 - Large Deviation Theory
Lecture 13 - Crammer's Theorem for Large Deviation
Lecture 14 - Introduction to Markov Processes
Lecture 15 - Discrete Time Markov Chain - 1
Lecture 16 - Discrete Time Markov Chain - 2
Lecture 17 - Discrete Time Markov Chain - 3
Lecture 18 - Discrete Time Markov Chain - 4
Lecture 19 - Discrete Time Markov Chain - 5
Lecture 20 - Continuous Time Markov Chain - 1
Lecture 21 - Continuous Time Markov Chain - 2
Lecture 22 - Continuous Time Markov Chain - 3
Lecture 23 - Martingale Process - 1
Lecture 24 - Martingale Process - 2

NPTEL Video Course - Electrical Engineering - NOC:Microwave Engineering

Subject Co-ordinator - Dr. Ratnajit Bhattacharjee

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Introduction to Microwave Engineering
Lecture 2 - Introduction to Transmission Line Theory
Lecture 3 - Lossy Transmission Line
Lecture 4 - Smith Chart
Lecture 5 - Introduction to Waveguides and Rectangular Waveguide
Lecture 6 - Circular Waveguide
Lecture 7 - Attenuation Waveguide
Lecture 8 - N-port microwave networks and equivalent voltages and currents
Lecture 9 - Scattering Matrix (S-Parameters) Part-1
Lecture 10 - Scattering Matrix (S-parameters) Part-2 and Transmission Matrix (ABCD-Parameters)
Lecture 11 - Impedance Matching Using L-Section and Series Stub Networks
Lecture 12 - Impedance Matching Using Shunt Stub, Double Stub and Quarter wave Transformer
Lecture 13 - Multisection Matching Networks and Tapered Lines
Lecture 14 - Series and Parallel RLC Resonators
Lecture 15 - Transmission Line Resonators
Lecture 16 - Waveguide Resonators
Lecture 17 - Introduction to power dividers
Lecture 18 - Directional couplers
Lecture 19 - Microwave Filters - Part 1
Lecture 20 - Microwave Filters - Part 2
Lecture 21 - Characteristics of Microwave BJT and FET
Lecture 22 - PIN Diodes and Control Circuits
Lecture 23 - Schottky Diodes and Detectors and Tunnel Diodes
Lecture 24 - Gunn Diodes, IMPATT Diodes and Varactor Diodes
Lecture 25 - Two-Port Power Gain and Stability
Lecture 26 - Design of single stage transistor amplifier (for maximum gain, specified gain, low noise)
Lecture 27 - RF oscillator
Lecture 28 - Limitations of Conventional Tubes at Microwave Ranges
Lecture 29 - Introduction to Klystron

Lecture 30 - Reflex Klystron, Magnetron and TWT
Lecture 31 - Ferrite Devices
Lecture 32 - Planar transmission lines for MIC
Lecture 33 - Lumped elements for MIC
Lecture 34 - Lumped inductor, HMIC and MMIC
Lecture 35 - Overview of Radar
Lecture 36 - Cellular Communication
Lecture 37 - Satellite Communication and Applications of Microwave

NPTEL Video Course - Electrical Engineering - NOC:Microprocessors and Interfacing

Subject Co-ordinator - Prof. Shaik Rafi Ahamed

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Microprocessor Operations
Lecture 2 - 8086 Flags
Lecture 3 - Functional Diagram of 8086
Lecture 4 - 8086 Common and Minimum Mode Signals
Lecture 5 - 8086 Maximum Mode Signals
Lecture 6 - 8086 Data Transfer Instructions
Lecture 7 - 8086 Arithmetic Instructions - I
Lecture 8 - 8086 Arithmetic Instructions - II
Lecture 9 - 8086 Logical Instructions
Lecture 10 - 8086 Branch and String Instructions
Lecture 11 - 8086 Interrupt and Machine Control Instructions
Lecture 12 - Sum of Products, Multi-byte addition
Lecture 13 - Largest number, 2's complement Programs
Lecture 14 - Programs on Subroutines
Lecture 15 - ROM, RAM
Lecture 16 - Example I
Lecture 17 - Example II
Lecture 18 - Architecture, Interfacing to Simple I/O
Lecture 19 - Keyboard Interface
Lecture 20 - 7-segment Display Interface
Lecture 21 - Multiplexed 7-sgment Display Interface
Lecture 22 - Stepper motor, Liquid level control
Lecture 23 - Traffic light control, A/D converter
Lecture 24 - D/A converter
Lecture 25 - Electronic weighing machine
Lecture 26 - Programable Interval Timer (8254)
Lecture 27 - Modes of 8254
Lecture 28 - Architecture of 8259
Lecture 29 - Initialization command words of 8259

Lecture 30 - Operational command words of 8259
Lecture 31 - 8237 Architecture, interfacing and Programming
Lecture 32 - Basic Concepts of serial I/O
Lecture 33 - Basic Concepts of serial I/O (Continued...)
Lecture 34 - Architecture of 8251

NPTEL Video Course - Electrical Engineering - NOC:Statistical Signal Processing

Subject Co-ordinator - Prof. Prabin Kumar Bora

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Overview of Statistical Signal Processing
Lecture 2 - Probability and Random Variables
Lecture 3 - Linear Algebra of Random Variables
Lecture 4 - Random Processes
Lecture 5 - Linear Shift Invariant Systems with Random Inputs
Lecture 6 - White Noise and Spectral Factorization Theorem
Lecture 7 - Linear Models of Random Signals
Lecture 8 - Estimation Theory - 1
Lecture 9 - Estimation Theory - 2
Lecture 10 - Cramer Rao Lower Bound 2
Lecture 11 - MVUE through Sufficient Statistic - 1
Lecture 12 - MVUE through Sufficient Statistic - 2
Lecture 13 - Method of Moments and Maximum Likelihood Estimators
Lecture 14 - Properties of Maximum Likelihood Estimator (MLE)
Lecture 15 - Bayesian Estimators - 1
Lecture 16 - Bayesian Estimators - 2
Lecture 17 - Optimal linear filters
Lecture 18 - FIR Wiener filter
Lecture 19 - Non-Causual IIR Wiener Filter
Lecture 20 - Causal IIR Wiener Filter
Lecture 21 - Linear Prediction of Signals - 1
Lecture 22 - Linear Prediction of Signals - 2
Lecture 23 - Linear Prediction of Signals - 3
Lecture 24 - Review Assignment - 1
Lecture 25 - Adaptive Filters - 1
Lecture 26 - Adaptive Filters - 2
Lecture 27 - Adaptive Filters - 3
Lecture 28 - Review Assignment - 2
Lecture 29 - Adaptive Filters - 4

Lecture 30 - Adaptive Filters - 4 (Continued...)
Lecture 31 - Review Assignment - 3
Lecture 32 - Recursive Least Squares (RLS) Adaptive Filter - 1
Lecture 33 - Recursive Least Squares (RLS) Adaptive Filter - 2
Lecture 34 - Review Assignment - 4
Lecture 35 - Kalman Filter - 1
Lecture 36 - Vector Kalman Filter
Lecture 37 - Linear Models of Random Signals
Lecture 38 - Review - 1
Lecture 39 - Review - 2

NPTEL Video Course - Electrical Engineering - NOC:Computer Vision and Image Processing - Fundamentals and App

Subject Co-ordinator - Prof. M. K. Bhuyan

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Introduction to Digital Image Processing
Lecture 2 - Introduction to Computer Vision
Lecture 3 - Introduction to Computer Vision and Basic Concepts of Image Formation
Lecture 4 - Shape From Shading
Lecture 5 - Image Formation: Geometric Camera Models - I
Lecture 6 - Image Formation: Geometric Camera Models - II
Lecture 7 - Image Formation: Geometric Camera Models - III
Lecture 8 - Image Formation in a Stereo Vision Setup
Lecture 9 - Image Reconstruction from a Series of Projections
Lecture 10 - Image Reconstruction from a Series of Projections
Lecture 11 - Image Transforms - I
Lecture 12 - Image Transforms - II
Lecture 13 - Image Transforms - III
Lecture 14 - Image Transforms - IV
Lecture 15 - Image Enhancement
Lecture 16 - Image Filtering - I
Lecture 17 - Image Filtering - II
Lecture 18 - Colour Image Processing - I
Lecture 19 - Colour Image Processing - II
Lecture 20 - Image Segmentation
Lecture 21 - Image Features and Edge Detection
Lecture 22 - Edge Detection
Lecture 23 - Hough Transform
Lecture 24 - Image Texture Analysis - I
Lecture 25 - Image Texture Analysis - II
Lecture 26 - Object Boundary and Shape Representations - I
Lecture 27 - Object Boundary and Shape Representations - II
Lecture 28 - Interest Point Detectors
Lecture 29 - Image Features - HOG and SIFT

Lecture 30 - Introduction to Machine Learning - I
Lecture 31 - Introduction to Machine Learning - II
Lecture 32 - Introduction to Machine Learning - III
Lecture 33 - Introduction to Machine Learning - IV
Lecture 34 - Introduction to Machine Learning - V
Lecture 35 - Artificial Neural Network for Pattern Classification - I
Lecture 36 - Artificial Neural Network for Pattern Classification - II
Lecture 37 - Introduction to Deep Learning
Lecture 38 - Gesture Recognition
Lecture 39 - Background Modelling and Motion Estimation
Lecture 40 - Object Tracking
Lecture 41 - Programming Examples

NPTEL Video Course - Electrical Engineering - NOC:System Design through VERILOG

Subject Co-ordinator - Prof. Shaik Rafi Ahamed

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Verilog Operators and Modules
Lecture 2 - Verilog Ports, Data types and Assignments
Lecture 3 - Basics of gate level modeling
Lecture 4 - Half adder, full adder and ripple carry adder
Lecture 5 - Parallel adder/subtractor
Lecture 6 - Multiplier and comparator
Lecture 7 - Decoder, encoder and multiplexer
Lecture 8 - Demultiplexer, read only memory
Lecture 9 - Review of flip-flops
Lecture 10 - Verilog modeling of flip-flops
Lecture 11 - Modeling of CMOS gates and Boolean functions
Lecture 12 - Modeling using transmission gates, CMOS dalay times
Lecture 13 - Signal strengths
Lecture 14 - Basics of dataflow modeling
Lecture 15 - Examples of dataflow modeling
Lecture 16 - Basics of behavioral modeling
Lecture 17 - Examples of behavioral modeling
Lecture 18 - Verilog modeling of counters
Lecture 19 - Verilog modeling of sequence detector
Lecture 20 - Verilog modeling FSMs and shift registers
Lecture 21 - Combinational circuit examples
Lecture 22 - Sequential circuit examples
Lecture 23 - Arithmetic and Logic Unit (ALU)
Lecture 24 - Static RAM and Braun Multiplier
Lecture 25 - FIR filter implementation
Lecture 26 - Baugh-Wooley signed multiplier architecture
Lecture 27 - IIR filter implementation

NPTEL Video Course - Electrical Engineering - NOC:Usability Engineering

Subject Co-ordinator - Prof. Debayan Dhar

Co-ordinating Institute - IIT - Guwahati

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

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 Video Course - Electrical Engineering - NOC:Probability and Random Processes

Subject Co-ordinator - Prof. Ribhu, Prof. Rohit Sinha

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Introduction
Lecture 2 - Algebra of Events
Lecture 3 - Axioms of Probability
Lecture 4 - Example 1
Lecture 5 - Example 2
Lecture 6 - Example 3
Lecture 7 - Example 4
Lecture 8 - Example 5
Lecture 9 - Conditional Probability
Lecture 10 - Bayes Theorem 1
Lecture 11 - Bayes Theorem 2
Lecture 12 - A Brief Review
Lecture 13 - Example 1
Lecture 14 - Example 2
Lecture 15 - Example 3
Lecture 16 - Example 4
Lecture 17 - Example 5
Lecture 18 - Independent Events
Lecture 19 - A Brief Review
Lecture 20 - Example 1
Lecture 21 - Example 2
Lecture 22 - Example 3
Lecture 23 - Example 4
Lecture 24 - Discrete Random Variables
Lecture 25 - Expectation
Lecture 26 - Moments
Lecture 27 - Variance
Lecture 28 - Binomial Random Variables
Lecture 29 - Poisson Random Variables

Lecture 30 - More on Poission Random Variables
Lecture 31 - Properties of the CDF
Lecture 32 - A Brief Review - I
Lecture 33 - A Brief Review - II
Lecture 34 - Example 1
Lecture 35 - Example 2
Lecture 36 - Example 3
Lecture 37 - Example 4
Lecture 38 - Example 5
Lecture 39 - Example 6
Lecture 40 - Example 7
Lecture 41 - Example 8
Lecture 42 - Example 9
Lecture 43 - Continuous Random Variables
Lecture 44 - Expectation of Continuous random variables
Lecture 45 - The uniform and the Gaussian Random variables
Lecture 46 - The mean and variance of a Gaussian Random Variable
Lecture 47 - The exponential random variable and other continuous distributions
Lecture 48 - A Brief Review
Lecture 49 - Example 1
Lecture 50 - Example 2
Lecture 51 - Example 3
Lecture 52 - Example 4
Lecture 53 - Example 5
Lecture 54 - Functions of a random varible
Lecture 55 - Functions of a random varible
Lecture 56 - The moment generating function
Lecture 57 - Conditional Distributions
Lecture 58 - Bivariate Distributions
Lecture 59 - Independence of Random Varibles
Lecture 60 - Jointly Gaussian Random Varibales and Circular symmetry
Lecture 61 - Jointly Discrete Random Variables
Lecture 62 - One Function of two random variables
Lecture 63 - Order Statistics
Lecture 64 - Two functions of two random variables
Lecture 65 - Joint Moments
Lecture 66 - Joint Charactristic Functions
Lecture 67 - Conditional Distributions for multiple random variables
Lecture 68 - Conditional Expectations

Lecture 69 - Examples
Lecture 70 - Random Vectors
Lecture 71 - Independence of Random Varibles
Lecture 72 - Complex Random Varibales
Lecture 73 - Covariance Matrices
Lecture 74 - Conditional Densities
Lecture 75 - Gaussianity
Lecture 76 - Chi Squared Densities
Lecture 77 - Examples
Lecture 78 - Estimation Theory
Lecture 79 - Measurements
Lecture 80 - Sequences of Random Variables
Lecture 81 - Laws of large numbers
Lecture 82 - Random processes
Lecture 83 - Stationarity, Cyclostationarity, Ergodicity
Lecture 84 - Random Processes as Signals (PSD and LTI Response)
Lecture 85 - White and Gaussian Processes Noise

NPTEL Video Course - Electrical Engineering - NOC:Simulation of Communication Systems using Matlab

Subject Co-ordinator - Dr. Ribhu

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Introduction
Lecture 2 - Basics of MATLAB
Lecture 3 - Data Types
Lecture 4 - Floating Point Numbers
Lecture 5 - Scripts and Flow of Control
Lecture 6 - The For Loop
Lecture 7 - Arrays
Lecture 8 - Indexing
Lecture 9 - Some Reuslts from Linear Algebra
Lecture 10 - Matrix Multiplication
Lecture 11 - Eigenvalues and Eigenvectors
Lecture 12 - Complex Numbers
Lecture 13 - Hermitian Matrices
Lecture 14 - Matrix Inversion
Lecture 15 - Signals
Lecture 16 - Convolution
Lecture 17 - Probability
Lecture 18 - Bayes Theorem
Lecture 19 - Random Varibles
Lecture 20 - Clinical Trials - I
Lecture 21 - Clinical Trials - II
Lecture 22 - Random Numbers
Lecture 23 - Random Disttributions
Lecture 24 - Histograms - I
Lecture 25 - Histograms - II
Lecture 26 - Functions of Random Variables
Lecture 27 - Generating Random Disttributions
Lecture 28 - Laws of Large numbers
Lecture 29 - Random Processes

Lecture 30 - Properties of Random Processes
Lecture 31 - Power Spectra
Lecture 32 - Signals and Noise
Lecture 33 - Stochastic Models
Lecture 34 - The AR-1 Process
Lecture 35 - Stochastic Models II
Lecture 36 - Yule Walker Equations
Lecture 37 - Markov Chains - I
Lecture 38 - Markov Chains - II
Lecture 39 - Markov Chains - III
Lecture 40 - Analog to Digital Coversion
Lecture 41 - K Means
Lecture 42 - Correlation
Lecture 43 - Predictive Coding
Lecture 44 - Image Compression
Lecture 45 - Transform Domain Compression
Lecture 46 - Multi Resolution Coding
Lecture 47 - Introduction to Communications
Lecture 48 - Low Pass and BandPass Signals
Lecture 49 - Signal Spaces
Lecture 50 - PAM
Lecture 51 - Detection
Lecture 52 - Effects of AWGN
Lecture 53 - ML Detection - I
Lecture 54 - ML Detection - II
Lecture 55 - The Union Bound
Lecture 56 - Symbol Error Rates
Lecture 57 - Choosing Constellations
Lecture 58 - Orthogonal Signalling
Lecture 59 - Non-Coherent Dection - 1
Lecture 60 - Non-Coherent Dection - 2
Lecture 61 - DPSK - I
Lecture 62 - DPSK - II
Lecture 63 - Introduction to Wireless Communications
Lecture 64 - Conclusion

NPTEL Video Course - Electrical Engineering - NOC:Machine Learning and Deep Learning - Fundamentals and Appli

Subject Co-ordinator - Prof. M.K. Bhuyan

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Introduction to Machine Learning
Lecture 2 - Performance Measures of Classification
Lecture 3 - Bias-Variance Tradeoff
Lecture 4 - Regression
Lecture 5 - Bayesian Decision Theory - 1
Lecture 6 - Bayesian Decision Theory - 2
Lecture 7 - Bayes Decision Theory - Binary Features
Lecture 8 - Bayesian Decision Theory - 3
Lecture 9 - Bayesian Decision Theory - 4
Lecture 10 - Bayesian Belief Networks
Lecture 11 - Parameter Estimation and Maximum Likelihood Estimation
Lecture 12 - Parameter Estimation and Bayesian Estimation
Lecture 13 - Concept of non-parametric techniques
Lecture 14 - Density Estimation by Parzen Window
Lecture 15 - Parzen Window and K nearest neighbor algorithm
Lecture 16 - Linear Discriminant Functions and Perceptron Criteria - Part I
Lecture 17 - Linear Discriminant Functions and Perceptron Criteria - Part II
Lecture 18 - Linear Discriminant Functions and Perceptron Criteria - Part III
Lecture 19 - Support Vector Machine - Part I
Lecture 20 - Support Vector Machine - Part II
Lecture 21 - Logistic Regression
Lecture 22 - Decision Tree
Lecture 23 - Hidden Markov Model (HMM)
Lecture 24 - Ensemble Classifiers - Part I
Lecture 25 - Ensemble Classifiers - Part II
Lecture 26 - Dimensionality Problem and Principal Component Analysis
Lecture 27 - Principal Component Analysis
Lecture 28 - Linear Discriminant Analysis (LDA) - Part I
Lecture 29 - Linear Discriminant Analysis (LDA) - Part II

Lecture 30 - Gaussian Mixture Model and EM Algorithm
Lecture 31 - K-means clustering.
Lecture 32 - Fuzzy K-means clustering
Lecture 33 - Hierarchical Agglomerative Clustering and Mean-shift Clustering
Lecture 34 - Artificial Neural Networks for Pattern Classification - Part 1
Lecture 35 - Artificial Neural Networks for Pattern Classification - Part 2
Lecture 36 - Artificial Neural Networks for Pattern Classification - Part 3
Lecture 37 - Introduction to Deep Learning and Convolutional Neural Network (CNN)
Lecture 38 - Vanishing and Exploding Gradients in Deep Neural Networks
Lecture 39 - CNN Architectures - LeNet-5 and AlexNet
Lecture 40 - CNN Architectures - VGG 16, GoogLeNet and ResNet
Lecture 41 - Generative Adversarial Networks (GAN) - Fundamentals and Applications
Lecture 42 - U-Net: Convolutional Networks for Image Segmentation
Lecture 43 - Introduction to Autoencoder and Recurrent Neural Networks (RNN)
Lecture 44 - Programming Concepts - 1
Lecture 45 - Programming Concepts - 2
Lecture 46 - Problem Solving Session - 1
Lecture 47 - Problem Solving Session - 2
Lecture 48 - Problem Solving Session - 3

NPTEL Video Course - Electrical Engineering - NOC:Integrated Circuits and Applications

Subject Co-ordinator - Prof. Shaik Rafi Ahamed

Co-ordinating Institute - IIT - Guwahati

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

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
Lecture 32 - PLL IC 565 operation
Lecture 33 - PLL Applications
Lecture 34 - Fixed Voltage Regulator
Lecture 35 - Adjastable Voltage Regulator
Lecture 36 - Switching Regulators
Lecture 37 - Weighted Resistor D/A Converter
Lecture 38 - R-2R Ladder D/A Converter
Lecture 39 - Inverted R-2R Ladder D/A Converter
Lecture 40 - Analog to Digital Converters
Lecture 41 - CMOS Inverter
Lecture 42 - CMOS NAND Gate
Lecture 43 - Transient Response of CMOS NAND and NOR Gates
Lecture 44 - Boolean function Realization using CMOS and Sizing

NPTEL Video Course - Electrical Engineering - NOC:Photonic Crystals: Fundamentals and Applications

Subject Co-ordinator - Prof. Debabrata Sikdar

Co-ordinating Institute - IIT - Guwahati

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

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
Lecture 32 - Temporal Coupled Mode Theory: Fundamentals and Applications
Lecture 33 - Waveguide Splitters, Non-linear Filters, and Bistability
Lecture 34 - Unusual Refraction and Diffraction Effects
Lecture 35 - Photonic Crystal Devices for Slow Wave Phenomena
Lecture 36 - Next Generation Devices based on Photonic Crystals
Lecture 37 - Simulation Demonstration of Topological Photonic Crystals Based Waveguides - Part 1
Lecture 38 - Simulation Demonstration of Topological Photonic Crystals Based Waveguides - Part 2

NPTEL Video Course - Electrical Engineering - Advanced Electric Drives

Subject Co-ordinator - Dr. S.P. Das

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1
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Lecture 37
Lecture 38
Lecture 39
Lecture 40

NPTEL Video Course - Electrical Engineering - High Voltage DC Transmission

Subject Co-ordinator - Dr. S.N. Singh

Co-ordinating Institute - IIT - Kanpur

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

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
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Lecture 34 - High Voltage DC Transmission
Lecture 35 - High Voltage DC Transmission
Lecture 36 - High Voltage DC Transmission
Lecture 37 - High Voltage DC Transmission

NPTEL Video Course - Electrical Engineering - Intelligent Systems and Control

Subject Co-ordinator - Prof. Laxmidhar Behera

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Introduction to Intelligent Systems and Control
Lecture 2 - Linear Neural networks
Lecture 3 - Multi layered Neural Networks
Lecture 4 - Back Propagation Algorithm revisited
Lecture 5 - Non Linear System Analysis - Part I
Lecture 6 - Non Linear System Analysis - Part II
Lecture 7 - Radial Basis Function Networks
Lecture 8 - Adaptive Learning rate
Lecture 9 - Weight update rules
Lecture 10 - Recurrent networks Back propagation through time
Lecture 11 - Recurrent networks Real time recurrent learning
Lecture 12 - Self organizing Map - Multidimensional networks
Lecture 13 - Fuzzy sets - A Primer
Lecture 14 - Fuzzy Relations
Lecture 15 - Fuzzy Rule base and Approximate Reasoning
Lecture 16 - Introduction to Fuzzy Logic Control
Lecture 17 - Neural Control A review
Lecture 18 - Network inversion and Control
Lecture 19 - Neural Model of a Robot manipulator
Lecture 20 - Indirect Adaptive Control of a Robot manipulator
Lecture 21 - Adaptive neural control for Affine Systems SISO
Lecture 22 - Adaptive neural control for Affine systems MIMO
Lecture 23 - Visual Motor Coordination with KSOM
Lecture 24 - Visual Motor coordination - quantum clustering
Lecture 25 - Direct Adaptive control of Manipulators - Intro
Lecture 26 - NN based back stepping control
Lecture 27 - Fuzzy Control - a Review
Lecture 28 - Mamdani type flc and parameter optimization
Lecture 29 - Fuzzy Control of a pH reactor

Lecture 30 - Fuzzy Lyapunov controller - Computing with words
Lecture 31 - Controller Design for a T-S Fuzzy model
Lecture 32 - Linear controllers using T-S fuzzy model

NPTEL Video Course - Electrical Engineering - Power Systems Operation and Control

Subject Co-ordinator - Dr. S.N. Singh

Co-ordinating Institute - IIT - Kanpur

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

Module 1 - Lecture 1
Module 1 - Lecture 2
Module 1 - Lecture 3
Module 2 - Lecture 1
Module 2 - Lecture 2
Module 2 - Lecture 3
Module 2 - Lecture 4
Module 2 - Lecture 5
Module 2 - Lecture 6
Module 2 - Lecture 7
Module 2 - Lecture 8
Module 2 - Lecture 9
Module 2 - Lecture 10
Module 2 - Lecture 11
Module 2 - Lecture 12
Module 2 - Lecture 13
Module 2 - Lecture 14
Module 3 - Lecture 1
Module 3 - Lecture 2
Module 3 - Lecture 3
Module 3 - Lecture 4
Module 3 - Lecture 5
Module 3 - Lecture 6
Module 3 - Lecture 7
Module 3 - Lecture 8
Module 3 - Lecture 9
Module 3 - Lecture 10
Module 4 - Lecture 1
Module 4 - Lecture 2

Module 4 - Lecture 3
Module 4 - Lecture 4
Module 5 - Lecture 1
Module 5 - Lecture 2
Module 6 - Lecture 1
Module 6 - Lecture 2

NPTEL Video Course - Electrical Engineering - NOC:Electromagnetic theory

Subject Co-ordinator - Dr. Pradeep Kumar K

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Introduction to EMT
Lecture 2 - Coulombs law
Lecture 3 - Vector analysis-I and Introduction to coordinate system
Lecture 4 - Rectangular coordinate system
Lecture 5 - Vector analysis-II
Lecture 6 - Introduction to Electric field
Lecture 7 - Electric field-I
Lecture 8 - Cylindrical coordinate system
Lecture 9 - Transformation and Electric field-II
Lecture 10 - Electric Potential-I
Lecture 11 - Spherical co-ordinate system and Electric potential-II
Lecture 12 - Vector Analysis-III and Electric potential-III
Lecture 13 - GaussÂ s law and its application-I
Lecture 14 - GaussÂ s law and its application-II
Lecture 15 - Divergence and PoissonÂ s and LaplaceÂ s equation
Lecture 16 - GaussÂ s law and its application -III
Lecture 17 - Vector analysis Â III (curl and its significance)
Lecture 18 - Conductor and dielectric-I
Lecture 19 - Polarization - I
Lecture 20 - Polarization - II
Lecture 21 - Polarization - II (Continued...)
Lecture 22 - Boundary condition
Lecture 23 - Continuity equation and Conductors - III
Lecture 24 - Conductors Â IV
Lecture 25 - Conductors Â IV (Continued...) and Capacitor - I
Lecture 26 - Capacitor - II
Lecture 27 - Capacitor - II (Continued...) and Equipotential Surfaces
Lecture 28 - Solution of LaplaceÂ s equation-I
Lecture 29 - Solution of LaplaceÂ s equation-I I and method of images-I

Lecture 30 - Method of images-II
Lecture 31 - Solution of LaplaceÂ s equation-III
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
Lecture 65 - Transients on Transmission line-I
Lecture 66 - Transients on Transmission line-II
Lecture 67 - Pulse on Transmission line
Lecture 68 - Capacitive termination in Transmission line

Lecture 69 - Waveguide
Lecture 70 - Waveguide Analysis
Lecture 71 - TM modes in Waveguide
Lecture 72 - Rectangular waveguide
Lecture 73 - Rectangular waveguide
Lecture 74 - Waveguide
Lecture 75 - Waveguide losses
Lecture 76 - Dielectric Waveguide
Lecture 77 - Dielectric Waveguide (Continued...)
Lecture 78 - Radiation and Antenna
Lecture 79 - Hertzian Dipole Antenna
Lecture 80 - Hertzian Dipole Antenna (Continued...)
Lecture 81 - Quasi-statistics-I
Lecture 82 - Quasi-statistics-II
Lecture 83 - Long wire Antenna
Lecture 84 - Group velocity and Phase velocity
Lecture 85 - Numerical solution of Laplace's equation

NPTEL Video Course - Electrical Engineering - NOC:Principles of Communication - Part 1

Subject Co-ordinator - Prof. Aditya K. Jagannatham

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Basics - Definition of Energy and Power of Signals
Lecture 2 - Frequency Domain Representation and Introduction to Discrete Fourier Series
Lecture 3 - Discrete Fourier Series Example and Parseval's Theorem for Periodic Signals
Lecture 4 - Fourier Transform (FT), Inverse Fourier Transform (IFT) of Continuous Signals, Example of FT of P
Lecture 5 - Modulation Property of Fourier Transform, Dirac Delta or Unit Impulse Function - Definition and P
Lecture 6 - Duality Property of Fourier Transform and Introduction to Linear Time Invatiant (LTI) Systems
Lecture 7 - Transmission of Signal through Linear Time Invariant (LTI) Systems and Cross- Correlation of Sign
Lecture 8 - Auto-Correlation of Signal and Energy Spectral Density (ESD)
Lecture 9 - Example for Auto-Correlation of Signal and Energy Spectral Density (ESD)
Lecture 10 - Introduction to Amplitude Modulation (AM), Modulation Index, Envelope Distortion and Over Modula
Lecture 11 - Spectrum of Amplitude Modulated(AM) Signals and Introduction to Envelope Detection
Lecture 12 - Envelope Detection for Amplitude Modulated (AM) Signals and Time Constant for Capacitor in Envel
Lecture 13 - Power of Amplitude Modulated (AM) Signals and Power Efficiency of AM Signals
Lecture 14 - Double Sideband (DSB) Suppressed Carrier (SC) Modulation, Spectrum of DSB-SC Signals and Coheren
Lecture 15 - Double Sideband(DSB) Suppressed Carrier (SC) Demodulation, Non-coherent demodulation, Impact of
Lecture 16 - Carrier Phase Offset Example for Double Sideband (DSB) Suppressed Carrier (SC) Demodulation- Wir
Lecture 17 - Phase Synchronization using Costas Receiver for Double Sideband (DSB) Suppressed Carrier (SC) De
Lecture 18 - Introduction to Quadrature Carrier Multiplexing (QCM) and Demodulation of QCM Signals.
Lecture 19 - Introduction to Single Sideband (SSB) Modulation
Lecture 20 - Generation of Single Sideband (SSB) Modulation Signals through Frequency Discrimination
Lecture 21 - Frequency Domain Description of Hilbert Transform Â Fourier Spectrum of the Hilbert Transformer
Lecture 22 - Time Domain Description of Hilbert Transform Â Impulse Response of the Hilbert Transformer
Lecture 23 - Phase Shifting Method for Generation of Single Sideband (SSB) Modulated Signals based on Hilbert
Lecture 24 - Complex Pre-Envelope and Complex Envelope of Passband Signals
Lecture 25 - Complex Pre- Envelope and Complex Envelope of QCM (Quadrature Carrier Modulated) Signals
Lecture 26 - Introduction to Vestigial Side Band(VSB) Modulation and Non- Ideal Filtering, Spectral Efficienc
Lecture 27 - Properties of Vestigial Side Band Filter for Reconstruction of Message Signal without Distortion
Lecture 28 - Introduction to Angle Modulation, Description of Phase Modulation (PM) and Frequency Modulation
Lecture 29 - Frequency Modulation (FM) with Sinusoidal Modulation Signal and Pictorial Examples, Insights of

Lecture 30 - Indirect Method for Generation of FM Signals - Generation of Narrowband FM Signal
Lecture 31 - Indirect Method for Generation of FM Signals - Generation of Wideband FM Signal through Frequenc
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 fro
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
Lecture 42 - Introduction to Lloyd- Max Quantization Algorithm, Optimal Quantizer Design
Lecture 43 - Lloyd- Max Quantization Algorithm, Iterative Computation of Optimal Quantization Levels and Inte
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 Gra
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 Recei
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

NPTEL Video Course - Electrical Engineering - NOC:An Introduction to Coding Theory

Subject Co-ordinator - Dr. Adrish Banerjee

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Introduction to Error Control Coding - I
Lecture 2 - Introduction to Error Control Coding - II
Lecture 3 - Introduction to Error Control Coding - III
Lecture 4 - Introduction to Linear Block Codes, Generator Matrix and Parity Check Matrix
Lecture 5 - Syndrome, Error Correction and Error Detection
Lecture 6 - Problem Solving Session - I
Lecture 7 - Decoding of Linear Block Codes
Lecture 8 - Distance Properties of Linear Block Codes - I
Lecture 9 - Distance Properties of Linear Block Codes - II
Lecture 10 - Problem Solving Session - II
Lecture 11 - Some Simple Linear Block Codes - I
Lecture 12 - Some Simple Linear Block Codes - II
Lecture 13 - Bounds on the Size of a Code
Lecture 14 - Problem Solving Session - III
Lecture 15 - Introduction to Convolutional Codes - I
Lecture 16 - Introduction to Convolutional Codes - II
Lecture 17 - Convolutional Codes
Lecture 18 - Convolutional Codes
Lecture 19 - Decoding of Convolutional Codes - I
Lecture 20 - Decoding of Convolutional Codes - II
Lecture 21 - Problem solving session - IV
Lecture 22 - Problem solving session - V
Lecture 23 - Performance Bounds for Convolutional Codes
Lecture 24 - Low Density Parity Check Codes
Lecture 25 - Decoding of Low Density Parity Check Codes - I
Lecture 26 - Decoding of Low Density Parity Check Codes - II
Lecture 27 - Turbo Codes
Lecture 28 - Turbo Decoding
Lecture 29 - Problem Solving Sessions - VI

Lecture 30 - Distance Properties of Turbo Codes
Lecture 31 - Convergence of Turbo Codes
Lecture 32 - Automatic Repeat reQuest (ARQ) Schemes
Lecture 33 - Applications of Linear Codes

NPTEL Video Course - Electrical Engineering - NOC:Principles of Communication Systems - Part II

Subject Co-ordinator - Prof. Aditya K. Jagannatham

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Introduction to Digital Communication Systems
Lecture 2 - Spectrum of Transmitted Digital Communication Signal and Wide Sense Stationarity
Lecture 3 - Spectrum of Transmitted Digital Communication Signal, Autocorrelation Function and Power Spectral
Lecture 4 - Spectrum of Transmitted Digital Communication Signal, Relation to Energy Spectral Density and Int
Lecture 5 - Additive White Gaussian Noise (AWGN) Properties, Gaussian Noise and White Noise
Lecture 6 - Structure of Digital Communication Receiver, Receiver Filter and Signal-to-Noise Power Ratio (SNR
Lecture 7 - Digital Communication Receiver, Noise Properties and Output Noise Power
Lecture 8 - Digital Communication Receiver, Optimal SNR and Matched Filter
Lecture 9 - Probability of Error in Digital Communication and Probability Density Functions of Output
Lecture 10 - Probability of Error in Digital Communication, Optimal Decison Rule and Gaussian Q function
Lecture 11 - Introduction to Binary Phase Shift Keying (BPSK) Modulation, Optimal Decision Rule and Probabili
Lecture 12 - Introduction to Amplitude Shift Keying (ASK) Modulation
Lecture 13 - Optimal Decision Rule for Amplitude Shift Keying (ASK), Bit Error Rate (BER) and Comparison with
Lecture 14 - Introduction to Signal Space Concept and Orthonormal Basis Signals
Lecture 15 - Introduction to Frequency Shift Keying (FSK)
Lecture 16 - Optimal Decision Rule for FSK, Bit Error Rate (BER) and Comparison with BPSK, ASK
Lecture 17 - Introduction to Quadrature Phase Shift Keying (QPSK)
Lecture 18 - Waveforms of Quadrature Phase Shift Keying (QPSK)
Lecture 19 - Matched Filtering, Bit Error Rate and Symbol Error Rate for Quadrature Phase Shift Keying (QPSK)
Lecture 20 - Introduction to M-ary PAM (Pulse Amplitude Modulation), Average Symbol Power and Decision rules
Lecture 21 - M-ary PAM (Pulse Amplitude Modulation) -Part-II, Optimal Decision Rule and Probability of Error
Lecture 22 - M-ary QAM (Quadrature Amplitude Modulation) Part-I, Introduction, Transmitted Waveform and Avera
Lecture 23 - M-ary QAM (Quadrature Amplitude Modulation) - Part-II, Optimal Decision Rule, Probability of Err
Lecture 24 - M-ary PSK (Phase Shift Keying) Part-I, Introduction , Transmitted Waveform and Constellation Dia
Lecture 25 - M-ary PSK (Phase Shift Keying) - Part-II, Optimal Decision Rule, Nearest Neighbor Criterion and
Lecture 26 - Introduction to Information Theory, Relevance of Information Theory and Characterization of Info
Lecture 27 - Definition of Entropy, Average of Information / Uncertainity of source and Properties of Entropy
Lecture 28 - Entropy Example- Binary Source Maximum and Minimum Entropy of Binary Source
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
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 Symmetri
Lecture 35 - Channel Capacity, Implications of Channel Capacity, Claude E. Shannon- Father of Information The
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 Decodabilit
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
Lecture 52 - State Diagram Representation of Convolutional Code, State transitions and Example of Code Genera
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 Est
Lecture 55 - Principle of Decoding of Convolutional code
Lecture 56 - Viterbi Decoder for Maximum Likelihood Decoding of Convolutional Code Using Trellis Representati

NPTEL Video Course - Electrical Engineering - NOC:Applied Engineering Electromagnetics

Subject Co-ordinator - Dr. Pradeep Kumar K

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Introduction to Applied Elecromagnetics
Lecture 2 - Introduction to Transmission lines
Lecture 3 - Sinusoidal waves on Transmission lines
Lecture 4 - Terminating T-lines
Lecture 5 - Circuit parameters of a T-line
Lecture 6 - Lossy Transmission lines and primary constants
Lecture 7 - When to apply T-line Theory?
Lecture 8 - Standing Waves on T-lines
Lecture 9 - Lumped equivalent circuits of T-lines
Lecture 10 - Impedance transformation and power flow on T-lines
Lecture 11 - Graphical aid
Lecture 12 - Smith chart applications
Lecture 13 - Further applications of Smith chart - Part 1
Lecture 14 - Further applications of Smith chart - Part 2
Lecture 15 - Impedance matching techniques - Part 1
Lecture 16 - Impedance matching techniques - Part 2
Lecture 17 - Impedance matching techniques - Part 3
Lecture 18 - T-lines in time domain
Lecture 19 - Further examples of use of lattice diagrams
Lecture 20 - High-speed digital signal propagation on T-lines
Lecture 21 - Transient analysis with reactive termination and Time-domain reflectometry
Lecture 22 - Fault detection using TDR
Lecture 23 - Why Electromagnetics?
Lecture 24 - Rectangular coordinate systems
Lecture 25 - Cylindrical coordinate systems
Lecture 26 - Review of vector fields and Gradient
Lecture 27 - Divergence, Curl, and Laplacian operations
Lecture 28 - Towards Maxwells equations - Part 1
Lecture 29 - Towards Maxwells equations - Part 2

Lecture 30 - Faradays law
Lecture 31 - Completing Maxwells equations and Boundary conditions
Lecture 32 - Boundary conditions for Electromagnetic fields
Lecture 33 - Electrostatics-I
Lecture 34 - Electrostatics-II
Lecture 35 - Electrostatics-III
Lecture 36 - Electrostatics-IV
Lecture 37 - Magnetostatic fields-I
Lecture 38 - Magnetostatic fields-II
Lecture 39 - Inductance calculations
Lecture 40 - From Maxwells equations to uniform plane waves
Lecture 41 - Plane wave propagation in lossless dielectric media
Lecture 42 - Polarization of plane waves
Lecture 43 - Can an Ideal capacitor exist?
Lecture 44 - Skin effect in conductors
Lecture 45 - Skin effect in round wires
Lecture 46 - Finite difference method
Lecture 47 - Reflection of uniform plane waves
Lecture 48 - Application
Lecture 49 - Oblique incidence of plane waves
Lecture 50 - Total internal reflection
Lecture 51 - Application
Lecture 52 - Application
Lecture 53 - Introduction to waveguides
Lecture 54 - Rectangular waveguides
Lecture 55 - Attenuation and Dispersion in rectangular waveguides
Lecture 56 - Planar optical waveguides
Lecture 57 - Application
Lecture 58 - Application
Lecture 59 - Mach-Zehnder Modulator
Lecture 60 - Wave Propagation in Anisotropic Medium
Lecture 61 - Wave Propagation in Ferrites
Lecture 62 - Magnetic Vector Potential - Part 1
Lecture 63 - Magnetic Vector Potential - Part 2
Lecture 64 - Fields of a Dipole Antenna
Lecture 65 - Antenna Parameters and Long wire Antenna
Lecture 66 - Friis Transmission Formula

NPTEL Video Course - Electrical Engineering - NOC:Principles of Signals and Systems

Subject Co-ordinator - Prof. Aditya K. Jagannatham

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Principles of Signals and Systems- Introduction to Signals and Systems, Signal Classification - C
Lecture 2 - Analog and Digital Signals
Lecture 3 - Energy and Power Signals
Lecture 4 - Real Exponential Signals
Lecture 5 - Memory/Memory-less and Causal/Non-Causal Systems
Lecture 6 - Properties of Linear Systems
Lecture 7 - Example Problems - 1
Lecture 8 - Example Problems - 2
Lecture 9 - Example Problems - 3
Lecture 10 - Properties and Analysis of LTI Systems - I
Lecture 11 - Properties and Analysis of LTI Systems - II
Lecture 12 - Properties and Analysis of LTI Systems - III
Lecture 13 - Properties of Discrete Time LTI Systems
Lecture 14 - Example Problems LTI Systems - I
Lecture 15 - Example Problems LTI Systems - II
Lecture 16 - Example Problems DT-LTI Systems
Lecture 17 - Laplace Transform
Lecture 18 - Laplace Transform Properties - I
Lecture 19 - Laplace Transform Properties - II
Lecture 20 - Laplace Transform of LTI Systems
Lecture 21 - Laplace Transform Example Problems - I
Lecture 22 - Laplace Transform Example Problems - II
Lecture 23 - Laplace Transform of RL, RC Circuit
Lecture 24 - Z-Transform
Lecture 25 - Z-Transform Properties - I
Lecture 26 - Z-Transform Properties - II
Lecture 27 - Z-Transform of LTI Systems
Lecture 28 - Z-Transform Examples - I
Lecture 29 - Z-Transform Examples - II

Lecture 30 - Z-Transform Examples - III
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
Lecture 51 - Fourier Transform Problems
Lecture 52 - Sampling
Lecture 53 - Sampling
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
Lecture 57 - Discrete Time Fourier Transform
Lecture 58 - Discrete Time Fourier Transform
Lecture 59 - DTFT
Lecture 60 - Discrete Fourier Transform - Definition, Inverse DFT, Relation between DFT and DFS, Relation bet
Lecture 61 - Discrete Fourier Transform
Lecture 62 - Example Problems
Lecture 63 - Example Problems
Lecture 64 - DTFT Example Problems - III
Lecture 65 - DTFT Example Problems - IV
Lecture 66 - DTFT Example Problems - V
Lecture 67 - DFT Example Problems - I
Lecture 68 - Example Problems

Lecture 69 - Group/Phase Delay - Part I
Lecture 70 - Group/Phase Delay - Part II
Lecture 71 - IIR Filter Structures
Lecture 72 - IIR Filter Structures
Lecture 73 - IIR Filter Structures
Lecture 74 - IIR Filter Structures
Lecture 75 - IIR Filter

NPTEL Video Course - Electrical Engineering - NOC:Applied Optimization for Wireless, Machine Learning, Big Da

Subject Co-ordinator - Prof. Aditya K. Jagannatham

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Vectors and Matrices - Linear Independence and Rank
Lecture 2 - Eigenvectors and Eigenvalues of Matrices and their Properties
Lecture 3 - Positive Semidefinite (PSD) and Postive Definite (PD) Matrices and their Properties
Lecture 4 - Inner Product Space and it's Properties
Lecture 5 - Inner Product Space and it's Properties
Lecture 6 - Properties of Norm, Gaussian Elimination and Echleon form of matrix
Lecture 7 - Gram Schmidt Orthogonalization Procedure
Lecture 8 - Null Space and Trace of Matrices
Lecture 9 - Eigenvalue Decomposition of Hermitian Matrices and Properties
Lecture 10 - Matrix Inversion Lemma (Woodbury identity)
Lecture 11 - Introduction to Convex Sets and Properties
Lecture 12 - Affine Set Examples and Application
Lecture 13 - Norm Ball and its Practical Applications
Lecture 14 - Ellipsoid and its Practical Applications
Lecture 15 - Norm Cone,Polyhedron and its Applications
Lecture 16 - Applications
Lecture 17 - Positive Semi Definite Cone And Positive Semi Definite (PSD) Matrices
Lecture 18 - Introduction to Affine functions and examples
Lecture 19 - norm balls and Matrix properties
Lecture 20 - Inverse of a Positive Definite Matrix
Lecture 21 - Example Problems
Lecture 22 - Problems on Convex Sets (Continued...)
Lecture 23 - Introduction to Convex and Concave Functions
Lecture 24 - Properties of Convex Functions with examples
Lecture 25 - Test for Convexity
Lecture 26 - Application
Lecture 27 - Jensen's Inequality and Practical Application
Lecture 28 - Jensen's Inequality application
Lecture 29 - Properties of Convex Functions

Lecture 30 - Conjugate Function and Examples to prove Convexity of various Functions
Lecture 31 - Examples on Operations Preserving Convexity
Lecture 32 - Examples on Test for Convexity, Quasi-Convexity
Lecture 33 - Examples on Convex Functions
Lecture 34 - Practical Application
Lecture 35 - Practical Application
Lecture 36 - Practical Application
Lecture 37 - Practical Application
Lecture 38 - Practical Application
Lecture 39 - Practical Application
Lecture 40 - Practical Application
Lecture 41 - Linear modeling and Approximation Problems
Lecture 42 - Geometric Intuition for Least Squares
Lecture 43 - Practical Application
Lecture 44 - Practical Application
Lecture 45 - Least Norm Signal Estimation
Lecture 46 - Regularization
Lecture 47 - Convex Optimization Problem representation
Lecture 48 - Linear Program Practical Application
Lecture 49 - Stochastic Linear Program,Gaussian Uncertainty
Lecture 50 - Practical Application
Lecture 51 - Practical Application
Lecture 52 - Practical Application
Lecture 53 - Practical Application
Lecture 54 - Practical Application
Lecture 55 - Practical Application
Lecture 56 - Practical Application
Lecture 57 - Practical Application- Orthogonal Matching Pursuit (OMP) algorithm for Compressive Sensing
Lecture 58 - Example Problem
Lecture 59 - Practical Application
Lecture 60 - Practical Application of Machine Learning and Artificial Intelligence
Lecture 61 - Practical Application
Lecture 62 - Practical Application
Lecture 63 - Concept of Duality
Lecture 64 - Relation between optimal value of Primal and Dual Problems, concepts of Duality gap and Strong D
Lecture 65 - Example problem on Strong Duality
Lecture 66 - Karush-Kuhn-Tucker (KKT) conditions
Lecture 67 - Application of KKT condition
Lecture 68 - Optimal MIMO Power allocation (Waterfilling)-II

Lecture 69 - Example problem on Optimal MIMO Power allocation (Waterfilling)
Lecture 70 - Linear objective with box constraints, Linear Programming
Lecture 71 - Example Problems II
Lecture 72 - Examples on Quadratic Optimization
Lecture 73 - Examples on Duality
Lecture 74 - Examples on Duality
Lecture 75 - Semi Definite Program (SDP) and its application
Lecture 76 - Application
Lecture 77 - Introduction to big Data
Lecture 78 - Matrix Completion Problem in Big Data
Lecture 79 - Matrix Completion Problem in Big Data

NPTEL Video Course - Electrical Engineering - NOC:Fiber-Optic Communication Systems and Techniques

Subject Co-ordinator - Dr. Pradeep Kumar K

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Overview of fiber-optic communication systems
Lecture 2 - Review of Maxwellâ s equations
Lecture 3 - Uniform plane waves (UWPs) in free-space
Lecture 4 - Properties of UWPs (propagation constant, polarization, and Poynting vector)
Lecture 5 - Boundary conditions and reflection from a PEC
Lecture 6 - Obliquely incident waves-I (TE and TM waves, Snellâ s laws)
Lecture 7 - Obliquely incident waves-II (Reflection and transmission coefficients, Brewster angle)
Lecture 8 - Total internal reflection
Lecture 9 - Ray theory of dielectric slab waveguides
Lecture 10 - Transverse resonance condition for slab waveguides
Lecture 11 - Introduction to optical fibers
Lecture 12 - Ray theory of light propagation in optical fibers
Lecture 13 - Concept of waveguide modes
Lecture 14 - Systematic procedure to obtain modes of a waveguide
Lecture 15 - Systematic analysis of parallel plate metallic waveguide
Lecture 16 - Systematic analysis of dielectric slab waveguides
Lecture 17 - Further discussion on slab waveguides
Lecture 18 - Modal analysis of step index optical fiber
Lecture 19 - Properties of modes of step-index optical fiber - I
Lecture 20 - Properties of modes of step-index optical fiber - II
Lecture 21 - Linearly polarized modes
Lecture 22 - Attenuation and power loss in fibers
Lecture 23 - Introduction to dispersion in fibers
Lecture 24 - Mathematical modelling of dispersion
Lecture 25 - Pulse propagation equation and its solution
Lecture 26 - Pre-chirped pulses and Inter and Intra-modal dispersion in optical fibers
Lecture 27 - Beam Propagation Method
Lecture 28 - Polarization Effects on Pulse Propagation
Lecture 29 - Modes in Optical Fibres and Pulse Propagation in Optical Fibres

Lecture 30 - Graded Index Fibers
Lecture 31 - Light Sources, Detectors and Amplifiers
Lecture 32 - Basics of Lasers-I (Structure of Lasers, Process of Photon Emission)
Lecture 33 - Basics of Lasers-II (Einstein's Theory of Radiation)
Lecture 34 - Basics of Lasers-III (Population Inversion and Rate Equation for Lasers)
Lecture 35 - Basic Properties of Semiconductor Laser-I (Energy Gap, Intrinsic and Extrinsic Semiconductors)
Lecture 36 - Basic Properties of Semiconductor Laser-II (Fermi Level)
Lecture 37 - Optical Properties of Semiconductors-I (Direct Bandgap and Indirect Bandgap, Density of States)
Lecture 38 - Optical Properties of Semiconductors-II (Gain, Absorption, Recombination rate) Homojunction Lase
Lecture 39 - Double Heterostructure Lasers, Introduction to Quantum Well Lasers
Lecture 40 - Semiconductor Optical Amplifier
Lecture 41 - Erbium-doped fiber amplifier
Lecture 42 - Photodetectors
Lecture 43 - Noise in Photodetectors
Lecture 44 - Introduction to WDM components
Lecture 45 - Couplers, Circulators, FRM and Filters
Lecture 46 - Filter, MUX/DEMUX, Diffraction grating (FBG and Long period grating)
Lecture 47 - Optical Modulators-I (Current modulation)
Lecture 48 - Optical Modulators-II (Electro-optic modulators)
Lecture 49 - Review of Communication Concepts-I (Deterministic and Random Signals, Baseband and Passband Sigr
Lecture 50 - Review of Communication Concepts-II (Signal and vectors, Signal energy, Orthonormal basis functi
Lecture 51 - Intensity modulation/ Direct Detection
Lecture 52 - BER discussion for OOK systems
Lecture 53 - Higher order modulation and Coherent Receiver
Lecture 54 - Coherent receiver for BPSK systems and BER calculation
Lecture 55 - Recovering Polarization
Lecture 56 - DSP algorithms for Chromatic dispersion mitigation
Lecture 57 - DSP algorithms for Carrier phase estimation - I
Lecture 58 - DSP algorithms for Carrier phase estimation - II
Lecture 59 - Nonlinear effects in fiber
Lecture 60 - Four wave mixing, Loss measurement, Dispersion measurement
Lecture 61 - Lab Demonstration (Laser diode characteristics, Loss measurement, Optical Intensity Modulation)

NPTEL Video Course - Electrical Engineering - NOC:Electromagnetic Waves in Guided and Wireless Media

Subject Co-ordinator - Dr. Pradeep Kumar K

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Introduction and Types of Transmission Lines
Lecture 2 - Distributed Circuit Model of Uniform Transmission Line
Lecture 3 - Voltage and Current Equation of the Transmission line
Lecture 4 - Sinusoidal Excitation of Transmission Line (Propagation constant, Characteristic Impedance)
Lecture 5 - Properties of Transmission Line (Reflection Coefficient, Input Impedance, Standing Wave Ratio)
Lecture 6 - Power Calculations and Introduction to Smith Chart
Lecture 7 - Smith Chart
Lecture 8 - Additional Applications of Smith Chart
Lecture 9 - Time domain Analysis of Transmission Line - I
Lecture 10 - Time domain Analysis of Transmission Line - II
Lecture 11 - Usage of Lattice Diagrams
Lecture 12 - TDR analysis of Transmission Lines
Lecture 13 - Introduction to Propagation of Electromagnetic Waves
Lecture 14 - Uniform Plane Waves - I
Lecture 15 - Uniform Plane Waves - II
Lecture 16 - Poynting Vector, Average Power, Polarization
Lecture 17 - Uniform Plane Waves in Lossy Medium
Lecture 18 - Normal Incidence of Plane Waves
Lecture 19 - Oblique Incidence of Plane Waves - I
Lecture 20 - Oblique Incidence of Plane Waves - II
Lecture 21 - Total Internal Reflection
Lecture 22 - Slab Waveguides
Lecture 23 - Optical Fibers
Lecture 24 - Parallel Plate Waveguides
Lecture 25 - Rectangular Waveguides
Lecture 26 - Modes of Rectangular Waveguides
Lecture 27 - Waveguides summary and Introduction to Radiation
Lecture 28 - Solution to Electric Scalar Potential and Magnetic Vector Potential Equations
Lecture 29 - Further discussion on Magnetic Vector Potential and Elementary Hertzian Dipole

Lecture 30 - Near field and Far-field Antenna and Properties of Antennas
Lecture 31 - Linear antenna - I
Lecture 32 - Linear antenna - II and Properties of Transmitting and Receiving Antenna
Lecture 33 - Friis Transmission Formula
Lecture 34 - Antenna Array
Lecture 35 - Wireless Channel
Lecture 36 - Further discussion on Wireless Channel Modelling
Lecture 37 - Diffraction - I
Lecture 38 - Diffraction - II
Lecture 39 - Distribution of Laser Beam
Lecture 40 - Interference (Double slit experiment, Fabry Perot Interferometer)
Lecture 41 - Summary

NPTEL Video Course - Electrical Engineering - NOC:Basic Electric Circuits

Subject Co-ordinator - Prof. Ankush Sharma

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Basic Concepts
Lecture 2 - Sinusoids and Phasors
Lecture 3 - Circuit Elements - Part 1
Lecture 4 - Circuit Elements - Part 2
Lecture 5 - AC Power Analysis
Lecture 6 - RMS Voltage and Current
Lecture 7 - Topology
Lecture 8 - Star-Delta Transformation and Mesh Analysis
Lecture 9 - Mesh Analysis.
Lecture 10 - Nodal Analysis
Lecture 11 - Linearity Property and Superposition Theorem
Lecture 12 - Source Transformation
Lecture 13 - Duality
Lecture 14 - Thevenin's Theorem - 1
Lecture 15 - Thevenin's Theorem - 2
Lecture 16 - Norton's Theorem - 1
Lecture 17 - Norton's Theorem - 2
Lecture 18 - Maximum Power Transfer Theorem - 1
Lecture 19 - Maximum Power Transfer Theorem - 2
Lecture 20 - Reciprocity and Compensation Theorem
Lecture 21 - First Order RC Circuits
Lecture 22 - First Order RL Circuits
Lecture 23 - Singularity Functions
Lecture 24 - Step Response of RC and RL Circuits
Lecture 25 - Second Order Response
Lecture 26 - Step Response of Second Order Circuits-First Order and Second Order Circuits (Continued...)
Lecture 27 - Step Response of Parallel RLC Circuit-First Order and Second Order Circuits (Continued...)
Lecture 28 - Definition of the Laplace Transform
Lecture 29 - Properties of the Laplace Transform

Lecture 30 - Inverse Laplace Transform
Lecture 31 - Laplace Transform of Circuit Elements
Lecture 32 - Transfer Function
Lecture 33 - Convolution Integral
Lecture 34 - Graphical Approach of Convolution Integral
Lecture 35 - Network Stability and Network Synthesis
Lecture 36 - Impedance Parameters
Lecture 37 - Admittance Parameters
Lecture 38 - Hybrid Parameters
Lecture 39 - Transmission Parameters
Lecture 40 - Interconnection of Networks
Lecture 41 - Nodal and Mesh Analysis
Lecture 42 - Superposition Theorem and Source Transformation
Lecture 43 - Thevenin's, Norton's and, Maximum Power Transfer Theorem
Lecture 44 - Magnetically Coupled Circuits
Lecture 45 - Energy in Coupled Circuits and Ideal Transformer
Lecture 46 - Ideal Transformer and Introduction to Three-Phase Circuits
Lecture 47 - Balanced Three-Phase Connections
Lecture 48 - Balanced Wye-Delta and Delta-Delta Connections
Lecture 49 - Balanced Delta-Wye Connection and Power in Balanced Three-Phase System
Lecture 50 - Unbalanced Three-Phase System and Three-Phase Power Measurement
Lecture 51 - Introduction to Graphical Models
Lecture 52 - State Equations
Lecture 53 - State Diagram
Lecture 54 - State Transition Matrix
Lecture 55 - State Variable Method to Circuit Analysis
Lecture 56 - Characteristic Equation, Eigenvalues, and Eigenvectors-State Variable Analysis (Continued...)
Lecture 57 - Modeling of Mechanical Systems
Lecture 58 - Modeling of The Rotational Motion of Mechanical Systems
Lecture 59 - Modeling of Electrical Systems
Lecture 60 - Solving Analogous Systems

NPTEL Video Course - Electrical Engineering - NOC:Fundamentals of Electric Drives

Subject Co-ordinator - Prof. Shyama Prasad Das

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Introduction to Electric Drives
Lecture 2 - Dynamics of Electric Drives, Four Quadrant Operation, Equivalent Drive Parameters
Lecture 3 - Equivalent Drive Parameters, Friction Components, Nature of Load Torque
Lecture 4 - Steady State Stability, Load Equalization
Lecture 5 - Load Equalization, Characteristics of DC Motor
Lecture 6 - Speed Torque Characteristics of Separately Excited DC Motor and Series DC Motor
Lecture 7 - Field Control of Series Motor, Motoring and Braking of Separately Excited and Series DC motors
Lecture 8 - Speed Control of Separately Excited DC Motor Using Controlled Rectifiers
Lecture 9 - Analysis of Single Phase Full Controlled Converter-fed Separately Excited DC Motor
Lecture 10 - Speed Torque Characteristics of Full Controlled Converter-fed Separately Excited DC Motor, Analy
Lecture 11 - Analysis of Single Phase Half Controlled Converter-fed Separately Excited DC Motor.
Lecture 12 - Three Phase Full Controlled Converter-fed Separately Excited DC Motor, Multi-quadrant Operation
Lecture 13 - Dual Converter-fed DC Motor, Multi-quadrant Operation Using Field Current Reversal
Lecture 14 - DC Chopper-fed Separately Excited DC Motor for Motoring and Braking
Lecture 15 - Two-quadrant DC Chopper, Four-quadrant DC Chopper
Lecture 16 - Dynamic Braking of DC Motor by Chopper Controlled Resistor, Closed-loop Operation of DC Drives,
Lecture 17 - Speed Torque Characteristics of Induction Motor, Operation of Induction Motor from Non-sinusoida
Lecture 18 - Operation of Induction Motor from Non-sinusoidal Supply
Lecture 19 - Stator Current of Induction Motor with Non-sinusoidal Supply, Operation of Induction Motor with
Lecture 20 - Single Phasing of Induction Motor, Braking of Induction Motor
Lecture 21 - Dynamic braking of induction motor, AC dynamic braking, DC dynamic braking
Lecture 22 - Analysis of DC dynamic braking of induction motor
Lecture 23 - Self-excited dynamic braking of induction motor, Speed control of induction motor using stator v
Lecture 24 - Variable voltage variable frequency control of induction motor, Open loop V/F control
Lecture 25 - Slip speed control of induction motor, Constant Volt/Hz control with slip speed regulation
Lecture 26 - Closed-loop Volt/Hz control of induction motor with slip speed regulation, Multi-quadrant operat
Lecture 27 - Current Source Inverter (CSI) fed induction motor drive
Lecture 28 - Closed-loop operation of current source inverter (CSI) fed induction motor drive, Control of sli
Lecture 29 - Closed-loop operation of slip ring induction motor with static rotor resistance control, Slip po

Lecture 30 - Static Kramer drive and its closed-loop control, Introduction to synchronous motor
Lecture 31 - Various types of synchronous motors, Equivalent circuit and phasor diagram of cylindrical synchr
Lecture 32 - Phasor diagram of salient pole synchronous motor, Expression of power and torque for a salient p
Lecture 33 - Open-loop V/f control, Torque-speed characteristics, Self controlled synchronous motor drive emp
Lecture 34 - Detailed analysis of commutation of load commutated thyrisor inverter, Derivation of overlap ang
Lecture 35 - Low cost brushless DC motor (BLDCM), Trapezoidal permanent magnet AC motor
Lecture 36 - Trapezoidal permanent magnet AC motor, Derivation of power and torque, Closed-loop control of tr
Lecture 37 - Construction and operating principle of switched reluctance motor
Lecture 38 - Current/ voltage control for switched reluctance motor, operating modes of switched reluctance m
Lecture 39 - Current collector for mainline trains, Nature of traction load, Duty cycle of traction drives
Lecture 40 - Duty cycle of traction drives, Distance between two stops, Calculation of total tractive effort

NPTEL Video Course - Electrical Engineering - NOC:Fuzzy Sets, Logic and Systems and Applications

Subject Co-ordinator - Prof. Nishchal K Verma

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Introduction
Lecture 2 - Introduction
Lecture 3 - Fuzzy Sets and Fuzzy Logic Toolbox in MATLAB - I
Lecture 4 - Fuzzy Sets and Fuzzy Logic Toolbox in MATLAB - II
Lecture 5 - Membership Functions - I
Lecture 6 - Membership Functions - II
Lecture 7 - Nomenclatures used in Fuzzy Set Theory - I
Lecture 8 - Nomenclatures used in Fuzzy Set Theory - II
Lecture 9 - Nomenclatures used in Fuzzy Set Theory - III
Lecture 10 - Set Theoretic Operations on Fuzzy Sets - I
Lecture 11 - Set Theoretic Operations on Fuzzy Sets - II
Lecture 12 - Properties of Fuzzy Sets - I
Lecture 13 - Properties of Fuzzy Sets - II
Lecture 14 - Properties of Fuzzy Sets - III
Lecture 15 - Properties of Fuzzy Sets - IV
Lecture 16 - Properties of Fuzzy Sets - V
Lecture 17 - Distance between Fuzzy Sets - I
Lecture 18 - Distance between Fuzzy Sets - II
Lecture 19 - Distance between Fuzzy Sets - III
Lecture 20 - Arithmetic Operations on Fuzzy Numbers - I
Lecture 21 - Arithmetic Operations on Fuzzy Numbers - II
Lecture 22 - Arithmetic Operations on Fuzzy Numbers - III
Lecture 23 - Complement of Fuzzy Sets
Lecture 24 - T-norm Operators
Lecture 25 - S-norm Operators
Lecture 26 - Parameterized T-Norm Operators
Lecture 27 - Parameterized S-Norm Operators
Lecture 28 - Fuzzy Relation - I
Lecture 29 - Fuzzy Relation - II

Lecture 30 - Operations on Crisp and Fuzzy Relations
Lecture 31 - Projection of Fuzzy Relation Set
Lecture 32 - Cylindrical Extension of Fuzzy Set
Lecture 33 - Properties of Fuzzy Relation - I
Lecture 34 - Properties of Fuzzy Relation - II
Lecture 35 - Extension Principle
Lecture 36 - Composition of Fuzzy Relations
Lecture 37 - Properties of Composition of Fuzzy Relations
Lecture 38 - Fuzzy Tolerance and Equivalence Relations - I
Lecture 39 - Fuzzy Tolerance and Equivalence Relations - II
Lecture 40 - Fuzzy Tolerance and Equivalence Relations - III
Lecture 41 - Linguistic Hedges
Lecture 42 - Linguistic Hedges and Negation/ Complement and Connectives
Lecture 43 - Concentration and Dilation and Composite Linguistic Term and Some Examples
Lecture 44 - Dilation and Composite Linguistic Term and Some Examples
Lecture 45 - Some Examples on Composite Linguistic Terms
Lecture 46 - Contrast Intensification of Fuzzy Sets
Lecture 47 - Orthogonality of Fuzzy Sets
Lecture 48 - Fuzzy Rules and Fuzzy Reasoning - I
Lecture 49 - Fuzzy Rules and Fuzzy Reasoning - II
Lecture 50 - Fuzzy Inference System
Lecture 51 - Mamdani Fuzzy Model - I
Lecture 52 - Mamdani Fuzzy Model - II
Lecture 53 - Mamdani Fuzzy Model - III
Lecture 54 - Example on Mamdani Fuzzy Model for Single Antecedent with Three Rules
Lecture 55 - Example on Mamdani Fuzzy Model for Two Antecedents with Four Rules
Lecture 56 - Larsen Fuzzy Model - I
Lecture 57 - Larsen Fuzzy Model - II
Lecture 58 - Larsen Fuzzy Model - III
Lecture 59 - Tsukamoto Fuzzy Model
Lecture 60 - TSK Fuzzy Model

NPTEL Video Course - Electrical Engineering - NOC:Peer to Peer Networks

Subject Co-ordinator - Prof. Yatindra N Singh

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Introduction to Peer to Peer Networks
Lecture 2 - Peer to Peer Network in Telephony
Lecture 3 - Building DHT Networks
Lecture 4 - Logarithmic Partitioning of Node ID Space and Index Entry Authenticity
Lecture 5 - Implementation of Voice over Internet Telephony in P2P Way
Lecture 6 - Leaf Nodes, Core Nodes and Type of Messages in DHT Networks
Lecture 7 - Static and Dynamic Partitioning of Node ID Space
Lecture 8 - PASTRY Protocol
Lecture 9 - Understanding the PASTRY Protocol through Example
Lecture 10 - Kademlia
Lecture 11 - Tapestry
Lecture 12 - Understanding the Tapestry Protocol through Example
Lecture 13 - Multi-dimensional Distributed Hash Table
Lecture 14 - Multi-Layer DHT
Lecture 15 - Keeping <Key, Value> Pairs at Correct Root Nodes
Lecture 16 - Abrupt and Graceful Exit of Root Node
Lecture 17 - Resilience of <Key, Value> Pairs
Lecture 18 - A P2P Distributed File System
Lecture 19 - Storage Space Problem and Incentives to Share Storage
Lecture 20 - P2P Nodes Communications Challenges in Heterogeneous Network Environments
Lecture 21 - P2P Overlaid Multicast
Lecture 22 - P2P Overlaid Multicast
Lecture 23 - A Design of P2P Email System
Lecture 24 - P2P Mailing List Services
Lecture 25 - P2P Mailing List Services
Lecture 26 - P2P Web
Lecture 27 - P2P Web Search Engine
Lecture 28 - P2P Internet
Lecture 29 - P2P in Blockchain

Lecture 30 - P2P Anonymous Communication
Lecture 31 - The Anonymous Communication on the Internet through TOR Network
Lecture 32 - An Introduction To TOR Browser
Lecture 33 - Hidden Services on TOR Network
Lecture 34 - MOOC Wrap-Up

NPTEL Video Course - Electrical Engineering - NOC:Applied Linear Algebra for Signal Processing, Data Analytic

Subject Co-ordinator - Prof. Aditya K. Jagannatham

Co-ordinating Institute - IIT - Kanpur

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

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 No
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
Lecture 32 - SVD application for Machine Learning: Principal component analysis (PCA)
Lecture 33 - Multiple signal classification (MUSIC) algorithm: system model
Lecture 34 - MUSIC algorithm for Direction of Arrival (DoA) estimation
Lecture 35 - Linear minimum mean square error (LMMSE) principle
Lecture 36 - LMMSE estimate and error covariance matrix
Lecture 37 - LMMSE estimation in linear systems
Lecture 38 - LMMSE application: Wireless channel estimation and example
Lecture 39 - Time-series prediction via auto-regressive (AR) model
Lecture 40 - Recommender system: design and rating prediction
Lecture 41 - Recommender system: Illustration via movie rating prediction example
Lecture 42 - Fast Fourier transform (FFT) and Inverse fast Fourier transform (IFFT)
Lecture 43 - IFFT/ FFT application in Orthogonal Frequency Division Multiplexing (OFDM) wireless technology
Lecture 44 - OFDM system: Circulant matrices and properties
Lecture 45 - OFDM system model: Transmitter and receiver processing
Lecture 46 - Single-carrier frequency division for multiple access (SC-FDMA) technology
Lecture 47 - Linear dynamical systems: definition and solution via matrix exponential
Lecture 48 - Linear dynamical systems: matrix exponential via SVD
Lecture 49 - Machine Learning application: Support Vector Machines (SVM)
Lecture 50 - Support Vector Machines (SVM): Problem formulation via maximum hyperplane separation
Lecture 51 - Sparse regression: problem formulation and relation to Compressive Sensing (CS)
Lecture 52 - Sparse regression: solution via the Orthogonal Matching Pursuit (OMP) algorithm
Lecture 53 - OMP Example for Sparse Regression
Lecture 54 - Machine Learning Application: Clustering
Lecture 55 - K-Means Clustering algorithm
Lecture 56 - Introduction to Stochastic Processes and Markov Chains
Lecture 57 - Discrete Time Markov Chains and Transition Probability Matrix
Lecture 58 - Discrete Time Markov Chain Examples
Lecture 59 - m-STEP Transition Probabilities for Discrete Time Markov Chains
Lecture 60 - Limiting Behavior of Discrete Time Markov Chains
Lecture 61 - Least Squares Revisited: Rank Deficient Matrix
Lecture 62 - Least Squares using SVD
Lecture 63 - Weighted Least Squares
Lecture 64 - Weighted Least Squares Example
Lecture 65 - Woodbury Matrix Identity - Matrix Inversion Lemma
Lecture 66 - Woodbury Matrix Identity - Proof
Lecture 67 - Conditional Gaussian Density - Mean
Lecture 68 - Conditional Gaussian Density - Covariance

Lecture 69 - Scalar Linear Model for Gaussian Estimation
Lecture 70 - MMSE Estimate and Covariance for the Scalar Linear Model

NPTEL Video Course - Electrical Engineering - NOC:Economic Operations and Control of Power Systems

Subject Co-ordinator - Prof. Gururaj Mirle Vishwanath, Prof. Narayana Prasad Padhy

Co-ordinating Institute - IIT - Kanpur

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

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NPTEL Video Course - Electrical Engineering - NOC:Digital Switching

Subject Co-ordinator - Prof. Yatindra N Singh

Co-ordinating Institute - IIT - Kanpur

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

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NPTEL Video Course - Electrical Engineering - NOC:Analog VLSI Design

Subject Co-ordinator - Prof. Imon Mondal

Co-ordinating Institute - IIT - Kanpur

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

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NPTEL Video Course - Electrical Engineering - Electrical Machines I

Subject Co-ordinator - Dr. D. Kastha

Co-ordinating Institute - IIT - Kharagpur

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

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
Lecture 32 - Speed Control of DC Shunt Motors
Lecture 33 - Braking of DC Shunt Motors
Lecture 34 - Electronic Control of DC Shunt Motors
Lecture 35 - Testing of DC Shunt Motors
Lecture 36 - Characteristics of DC Series Motors
Lecture 37 - Starting and Braking of DC Series Motors
Lecture 38 - Speed Control and of DC Series Motors
Lecture 39 - Testing of DC Series Motors
Lecture 40 - Characteristics of Compound DC Series Motors

NPTEL Video Course - Electrical Engineering - Optimal Control

Subject Co-ordinator - Prof. G.D. Ray

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to Optimization Problem
Lecture 2 - Introduction to Optimization Problem
Lecture 3 - Optimality Conditions for Function of Several Variables
Lecture 4 - Optimality Conditions for Function of Several Variables (Continued.)
Lecture 5 - Unconstrained Optimization Problem (Numerical Techniques)
Lecture 6 - Solution of Unconstrained Optimization Problem Using Conjugate Quadient Method and Networks Metho
Lecture 7 - Solution of Unconstrained Optimization Problem Using Conjugate Quadient Method and Networks Metho
Lecture 8 - Solution of Constraint Optimization Problem-Karush-Kuhn Tucker (KKT) Conditions
Lecture 9 - Solution of Constraint Optimization Problem-Karush-Kuhn Tucker (KKT) Conditions (Continued.)
Lecture 10 - Problem and Solution Session
Lecture 11 - Post Optimality Analysis, Convex Function and its Properties
Lecture 12 - Post Optimality Analysis, Convex Function and its Properties (Continued.)
Lecture 13 - Quadratic Optimization Problem Using Linear Programming
Lecture 14 - Matrix form of the Simplex Method
Lecture 15 - Matrix form of the Simplex Method (Continued.)
Lecture 16 - Solution of Linear Programming Using Simplex Method
Lecture 17 - Solution of Linear Programming Using Simplex Method
Lecture 18 - Solution of LP Problems with Two Phase Method
Lecture 19 - Solution of LP Problems with Two Phase Method (Continued.)
Lecture 20 - Standard Primal and Dual Problems
Lecture 21 - Relationship Between Primal and Dual Variables
Lecture 22 - Solution of Quadratic Programming Problem Using Simplex Method
Lecture 23 - Interior Point Method for Solving Optimization Problems
Lecture 24 - Interior Point Method for Solving Optimization Problems (Continued.)
Lecture 25 - Solution of Nonlinear Programming Problem Using Exterior Penalty Function Method
Lecture 26 - Solution of Nonlinear Programming Problem Using Exterior Penalty Function Method (Continued.)
Lecture 27 - Solution of Nonlinear Programming Problem Using Interior Penalty Function Method
Lecture 28 - Solution of Nonlinear Programming Problem Using Interior Penalty Function Method (Continued.)
Lecture 29 - Multiobjective Optimization Problem

Lecture 30 - Dynamic Optimization Problem
Lecture 31 - Dynamic Optimization Problem
Lecture 32 - Dynamic Optimization Problem
Lecture 33 - Numerical Example and Solution of Optimal Control Problem using Calculus of Variation principle
Lecture 34 - Numerical Example and Solution of Optimal Control Problem using Calculus of Variation principle
Lecture 35 - Hamiltonian Formulation for solution of optimal Control problem and numerical example
Lecture 36 - Hamiltonian Formulation for solution of optimal Control problem and numerical example (Continued
Lecture 37 - Performance Indices and Linear Quadratic Regulator Problem
Lecture 38 - Performance Indices and Linear Quadratic Regulator Problem (Continued.)
Lecture 39 - Solution and Stability Analysis of Finite - time LQR Problem
Lecture 40 - Solution and Infinite - time LQR Problem and Stability Analysis
Lecture 41 - Numerical Example and Methods for Solution of A.R.E.
Lecture 42 - Numerical Example and Methods for Solution of A.R.E. (Continued.)
Lecture 43 - Frequency Domain Interpretation of LQR Controlled System
Lecture 44 - Gain and Phase Margin of LQR Controlled System
Lecture 45 - The Linear Quadratic Gaussian Problem
Lecture 46 - Loop-Transfer Recovery
Lecture 47 - Dynamic Programming for Discrete Time Systems
Lecture 48 - Minimum â   Time Control of a Linear Time Invariant System
Lecture 49 - Solution of Minimum â   Time Control Problem with an Example
Lecture 50 - Constraint in Control Inputs and State Variables
Lecture 51 - Constraint in Control Inputs and State Variables (Continued...)
Lecture 52 - Norms for Vectors, Matrices, Signals and Linear Systems
Lecture 53 - Signal and System Norms
Lecture 54 - Internal Stability, Sensitivity and Complementary Sensitivity Functions
Lecture 55 - Internal Stability, Sensitivity and Complementary Sensitivity Functions (Continued...)
Lecture 56 - Plant Uncertainty and Standard form for Robust Stability Analysis
Lecture 57 - Plant Uncertainty and Standard form for Robust Stability Analysis (Continued...)
Lecture 58 - Frequency Response of Linear System and Singular Value Decomposition of System
Lecture 59 - Control Problem Statement in H- alpha Framework
Lecture 60 - Control Problem Statement in H - alpha Framework (Continued...)

NPTEL Video Course - Electrical Engineering - Chaos, Fractals and Dynamic Systems

Subject Co-ordinator - Prof. S. Banerjee

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Representations of Dynamical Systems
Lecture 2 - Vector Fields of Nonlinear Systems
Lecture 3 - Limit Cycles
Lecture 4 - The Lorenz Equation - I
Lecture 5 - The Lorenz Equation - II
Lecture 6 - The Rossler Equation and Forced Pendulum
Lecture 7 - The Chua's Circuit
Lecture 8 - Discrete Time Dynamical Systems
Lecture 9 - The Logistic Map and Period doubling
Lecture 10 - Flip and Tangent Bifurcations
Lecture 11 - Intermittency Transcritical and pitchfork
Lecture 12 - Two Dimensional Maps
Lecture 13 - Bifurcations in Two Dimensional Maps
Lecture 14 - Introduction to Fractals
Lecture 15 - Mandelbrot Sets and Julia Sets
Lecture 16 - The Space Where Fractals Live
Lecture 17 - Interactive Function Systems
Lecture 18 - IFS Algorithms
Lecture 19 - Fractal Image Compression
Lecture 20 - Stable and Unstable Manifolds
Lecture 21 - Boundary Crisis and Interior Crisis
Lecture 22 - Statistics of Chaotic Attractors
Lecture 23 - Matrix Times Circle
Lecture 24 - Lyapunov Exponent
Lecture 25 - Frequency Spectra of Orbits
Lecture 26 - Dynamics on a Torus
Lecture 27 - Dynamics on a Torus
Lecture 28 - Analysis of Chaotic Time Series
Lecture 29 - Analysis of Chaotic Time Series

Lecture 30 - Lyapunou Function and Centre Manifold Theory
Lecture 31 - Non-Smooth Bifurcations
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 Video Course - Electrical Engineering - Digital Signal Processing

Subject Co-ordinator - Prof. T.K. Basu

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Discrete Time Signal and System
Lecture 2 - Discrete Time Signal and System (Continued...)
Lecture 3 - Discrete Time Signal and System (Continued...)
Lecture 4 - Frequency Domain Representation of Discrete Signals
Lecture 5 - Z-Transform
Lecture 6 - Z-Transform (Continued...)
Lecture 7 - Solution of Difference Equation
Lecture 8 - Tutorial on Discrete Time Signals & Their Transforms
Lecture 9 - Relation Between Discrete Time and Continuous Signals
Lecture 10 - Discrete Fourier Transform (DFT)
Lecture 11 - Discrete Fourier Transform (DFT) (Continued...)
Lecture 12 - Discrete Fourier Transform (DFT) (Continued...)
Lecture 13 - State Space Representation
Lecture 14 - Filters Introduction
Lecture 15 - FIR Filters
Lecture 16 - FIR Filters (Continued...) Introduction to IIR Filters
Lecture 17 - IIR Filters (Continued...)
Lecture 18 - IIR Filters (Continued...)
Lecture 19 - IIR Filters (Continued...)
Lecture 20 - Tutorial & Introduction to Computer Aided Design of Filters
Lecture 21 - Computer Aided Design of Filters
Lecture 22 - FFT and Computer Aided Design of Filters
Lecture 23 - Introduction to Lattice Filter
Lecture 24 - Lattice Filter (Continued...)
Lecture 25 - Effects of Quantization
Lecture 26 - Effects of Quantization (Continued...)
Lecture 27 - Effects of Quantization (Continued...)
Lecture 28 - Effects of Quantization (Continued...)
Lecture 29 - Random Signals

Lecture 30 - Relationship Between Real and Imaginary Parts of DTFT
Lecture 31 - Relationship Between Real and Imaginary Parts of DTFT
Lecture 32 - Relationship Between Real and Imaginary Parts of DTFT
Lecture 33 - Multi rate Signal Processing
Lecture 34 - Multi rate Signal Processing (Continued...)
Lecture 35 - Polyphase Decomposition

NPTEL Video Course - Electrical Engineering - Dynamics of Physical Systems

Subject Co-ordinator - Prof. S. Banerjee

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to System Elements
Lecture 2 - Newton's Method and Constraints
Lecture 3 - Derivation of the Lagrangian Equation
Lecture 4 - Using the lagrangian Equation to Obtain Differential Equations (Part-I)
Lecture 5 - Using the lagrangian Equation to Obtain Differential Equations (Part-II)
Lecture 6 - Using the lagrangian Equation to Obtain Differential Equations (Part-III)
Lecture 7 - Using the lagrangian Equation to Obtain Differential Equations (Part-IV)
Lecture 8 - Obtaining First Order Equations
Lecture 9 - Application of the Hamiltonian Method
Lecture 10 - Obtaining Differential Equations Using Kirchoff's Laws
Lecture 11 - The Graph Theory Approach for Electrical Circuits (Part-I)
Lecture 12 - The Graph Theory Approach for Electrical Circuits (Part-II)
Lecture 13 - The Bond Graph Approach - I
Lecture 14 - The Bond Graph Approach - II
Lecture 15 - The Bond Graph Approach - III
Lecture 16 - The Bond Graph Approach - IV
Lecture 17 - The Bond Graph Approach - V
Lecture 18 - The Bond Graph Approach - VI
Lecture 19 - The Bond Graph Approach - VII
Lecture 20 - Numerical Solution of Differential Equations
Lecture 21 - Dynamics in the State Space
Lecture 22 - Vector Field Around Equilibrium Points - I
Lecture 23 - Vector Field Around Equilibrium Points - II
Lecture 24 - Vector Field Around Equilibrium Points - III
Lecture 25 - Vector Field Around Equilibrium Points - IV
Lecture 26 - High Dimensional Linear Systems
Lecture 27 - Linear Systems with External Input - I
Lecture 28 - Linear Systems with External Input - II
Lecture 29 - Linear Systems with External Input - III

Lecture 30 - Dynamics of Nonlinear Systems - I
Lecture 31 - Dynamics of Nonlinear Systems - II
Lecture 32 - Dynamics of Nonlinear Systems - III
Lecture 33 - Discrete-Time Dynamical Systems - I
Lecture 34 - Discrete-Time Dynamical Systems - II

NPTEL Video Course - Electrical Engineering - Energy Resources and Technology

Subject Co-ordinator - Prof. S. Banerjee

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Thermodynamics
Lecture 2 - Quality of Energy
Lecture 3 - Complete Cycle Analysis of Fossil Fuels
Lecture 4 - Energy in Transportation
Lecture 5 - Other Fossil Fuels
Lecture 6 - Energy Economics
Lecture 7 - Energy Economics
Lecture 8 - Thermal Power Plants
Lecture 9 - Thermal Power Plants
Lecture 10 - Hydroelectric Power
Lecture 11 - Hydroelectric Power
Lecture 12 - Nuclear Power Generation
Lecture 13 - Nuclear Fusion Reactors
Lecture 14 - Environmental Effects of Conventional Power
Lecture 15 - Solar Thermal Energy Conversion
Lecture 16 - Solar Concentrating Collectors
Lecture 17 - Photovoltaic Power Generation
Lecture 18 - Photovoltaic Power Generation (Continued.)
Lecture 19 - Photovoltaic Power Generation (Continued.)
Lecture 20 - Photovoltaic Power Generation (Continued.)
Lecture 21 - Wind Energy - I
Lecture 22 - Wind Energy - II
Lecture 23 - Wind Energy - III
Lecture 24 - Wind Energy - IV
Lecture 25 - Wind Energy - V
Lecture 26 - Wind Energy - VI
Lecture 27 - Wind Electrical Conversion - I
Lecture 28 - Wind Electrical Conversion - II
Lecture 29 - Wind Electrical Conversion - III

Lecture 30 - Tidal Energy
Lecture 31 - Tidal Energy
Lecture 32 - Tidal Energy
Lecture 33 - Ocean Thermal Energy Conversion
Lecture 34 - Solar Pond and Wave Power
Lecture 35 - Geothermal Energy
Lecture 36 - Solar Distillation and Biomass Energy
Lecture 37 - Energy Storage
Lecture 38 - Magneto hydrodynamic Power Generation
Lecture 39 - Magneto hydrodynamic Power Generation
Lecture 40 - Hydrogen Economy

NPTEL Video Course - Electrical Engineering - Estimation of Signals and Systems

Subject Co-ordinator - Prof. S. Mukhopadhyay

Co-ordinating Institute - IIT - Kharagpur

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

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 Video Course - Electrical Engineering - Illumination Engineering

Subject Co-ordinator - Prof. N.K. Kishore

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to Illumination Engineering
Lecture 2 - Instructional Objectives
Lecture 3 - Eye and Vision - I
Lecture 4 - Eye and Vision - II
Lecture 5 - Laws of Illumination
Lecture 6 - Photometry
Lecture 7 - Incandescent Lamps
Lecture 8 - Discharge Lamps - I
Lecture 9 - Discharge Lamps - II
Lecture 10 - Discharge Lamps - III
Lecture 11 - Illumination Systems - I
Lecture 12 - Illumination Systems - II
Lecture 13 - Glare
Lecture 14 - Color
Lecture 15 - Interior Lighting
Lecture 16 - Sports Lighting
Lecture 17 - Road Lighting
Lecture 18 - Lighting Calculations
Lecture 19 - Lighting Applications
Lecture 20 - Conclusions on Illumination Engineering

NPTEL Video Course - Electrical Engineering - Industrial Automation and Control

Subject Co-ordinator - Prof. S. Sen, Prof. S. Mukhopadhyay

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction
Lecture 2 - Architecture of Industrial Automation Systems
Lecture 3 - Measurement Systems Characteristics
Lecture 4 - Temperature Measurement
Lecture 5 - Pressure, Force and Torque Sensors
Lecture 6 - Motion Sensing
Lecture 7 - Flow Measurement
Lecture 8 - Signal Conditioning
Lecture 9 - Signal Conditioning (Continued.)
Lecture 10 - Data Acquisition Systems
Lecture 11 - Introduction to Automatic Control
Lecture 12 - P-I-D Control
Lecture 13 - PID Control Tuning
Lecture 14 - Feedforward Control Ratio Control
Lecture 15 - Time Delay Systems and Inverse Response Systems
Lecture 16 - Special Control Structures
Lecture 17 - Concluding Lesson on Process Control
Lecture 18 - Introduction to Sequence Control, PLC, RLL
Lecture 19 - Sequence Control. Scan Cycle,Simple RLL Programs
Lecture 20 - Sequence Control. More RLL Elements, RLL Syntax
Lecture 21 - A Structured Design Approach to Sequence
Lecture 22 - PLC Hardware Environment
Lecture 23 - Introduction To CNC Machines
Lecture 24 - Contour generation and Motion Control
Lecture 25 - Flow Control Valves
Lecture 26 - Hydraulic Control Systems - I
Lecture 27 - Hydraulic Control Systems - II
Lecture 28 - Industrial Hydraulic Circuit
Lecture 29 - Pneumatic Control Systems - I

Lecture 30 - Pneumatic Systems - II
Lecture 31 - Energy Savings with Variable Speed Drives
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 Video Course - Electrical Engineering - Industrial Instrumentation

Subject Co-ordinator - Prof. Alok Barua

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to Industrial Instrumentation
Lecture 2 - Dynamic Characteristics
Lecture 3 - Dynamic Characteristics (Continued.)
Lecture 4 - Strain gauge
Lecture 5 - Load cell
Lecture 6 - Torque Measurement
Lecture 7 - Thermistor
Lecture 8 - Thermocouples
Lecture 9 - Resistance Temperature Detector
Lecture 10 - LVDT
Lecture 11 - Capacitance Transducers
Lecture 12 - Flowmeter - I
Lecture 13 - Flowmeter - II
Lecture 14 - Flowmeter - III
Lecture 15 - Flowmeter - IV
Lecture 16 - Flowmeter - V
Lecture 17 - Problems on Temperature Sensors
Lecture 18 - Pressure Sensors
Lecture 19 - Low Pressure Measurement
Lecture 20 - pH and Viscosity Measurement
Lecture 21 - Problem and Solutions On Industrial Instrumentation
Lecture 22 - Signal Conditioning Circuits - I
Lecture 23 - Signal Conditioning Circuits - II
Lecture 24 - Piezoelectric Sensors
Lecture 25 - Ultrasonic Sensors
Lecture 26 - Nucleonic Instrumentation
Lecture 27 - Measurement Of Magnetic Field
Lecture 28 - Optoelectronic Sensor - I
Lecture 29 - Optoelectronic Sensor - II

Lecture 30 - Synchro
Lecture 31 - Dissolved Oxygen Sensors - I
Lecture 32 - Dissolved Oxygen Sensors - II
Lecture 33 - Flapper - Nozzle
Lecture 34 - Smart Sensors
Lecture 35 - Chromatography - I
Lecture 36 - Chromatography - II
Lecture 37 - Pollution Measurement
Lecture 38 - Control Valve - I
Lecture 39 - Control Valve - II
Lecture 40 - Signal Conditioning Integrated Circuits

NPTEL Video Course - Electrical Engineering - Networks Signals and Systems

Subject Co-ordinator - Prof. T.K. Basu

Co-ordinating Institute - IIT - Kharagpur

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

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
Lecture 32 - Synthesis of 2-port Network
Lecture 33 - Synthesis of 2-port Network (Continued.)
Lecture 34 - Synthesis of 2-port Network (Continued.)
Lecture 35 - Fourier Series
Lecture 36 - Fourier Series (Continued.)

NPTEL Video Course - Electrical Engineering - Power System Analysis

Subject Co-ordinator - Prof. A.K. Sinha

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to Power system analysis
Lecture 2 - Introduction to Single Line Diagram
Lecture 3 - Transmission Line Parameters
Lecture 4 - Inductance Calculation (Three Phase)
Lecture 5 - Transmission Line Capacitance
Lecture 6 - Transmission Line Capacitance (Continued..)
Lecture 7 - Transmission Line Modeling
Lecture 8 - Transmission Line Modeling Long Line
Lecture 9 - Transmission Line Steady State Operation
Lecture 10 - Transmission Line Steady State Control Voltage
Lecture 11 - Transmission System A Review
Lecture 12 - Transformer Model
Lecture 13 - Synchronous Machine Model
Lecture 14 - Synchronous Machine Model
Lecture 15 - Load Model
Lecture 16 - Power Flow - I
Lecture 17 - Power Flow - II
Lecture 18 - Power Flow - III
Lecture 19 - Power Flow - IV
Lecture 20 - Power Flow - V
Lecture 21 - Power Flow - VI
Lecture 22 - Power Flow - VII
Lecture 23 - Review of Power System Component Models
Lecture 24 - Review of Power Flow Study
Lecture 25 - Short Circuit Analysis
Lecture 26 - Symmetrical Component Analysis
Lecture 27 - Sequence Networks
Lecture 28 - Unbalanced Fault Analysis
Lecture 29 - Unbalanced Fault Analysis

Lecture 30 - Fault Analysis for Large power Systems
Lecture 31 - Bus Impedance Matrix
Lecture 32 - Asymmetrical Fault Analysis Using Z - Bus
Lecture 33 - Power System Stability - I
Lecture 34 - Power System Stability - II
Lecture 35 - Power System Stability - III
Lecture 36 - Power System Stability - IV
Lecture 37 - Power System Stability - V
Lecture 38 - Power System Stability - VI
Lecture 39 - Power System Stability - VII
Lecture 40 - Power System Stability - VIII

NPTEL Video Course - Electrical Engineering - NOC:Industrial Automation and Control

Subject Co-ordinator - Prof. S. Mukhopadhyay

Co-ordinating Institute - IIT - Kharagpur

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

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...)
Lecture 32 - Flow Control Valves
Lecture 33 - Flow Control Valves (Continued...)
Lecture 34 - Hydraulic Control Systems - I
Lecture 35 - Hydraulic Control Systems - I (Continued...)
Lecture 36 - Hydraulic Control Systems - II
Lecture 37 - Hydraulic Control Systems - II (Continued...)
Lecture 38 - Industrial Hydraulic Circuit
Lecture 39 - Industrial Hydraulic Circuit (Continued...)
Lecture 40 - Pneumatic Control Systems - I
Lecture 41 - Pneumatic Control Systems - I (Continued...)
Lecture 42 - Pneumatic Systems - II
Lecture 43 - Pneumatic Systems - II (Continued...)
Lecture 44 - Energy Savings with Variable Speed Drives
Lecture 45 - Energy Savings with Variable Speed Drives (Continued...)
Lecture 46 - Introduction To CNC Machines
Lecture 47 - Introduction To CNC Machines
Lecture 48 - The Fieldbus Network - I
Lecture 49 - The Fieldbus Network - I (Continued...)
Lecture 50 - Higher Level Automation Systems
Lecture 51 - Higher Level Automation Systems (Continued...)
Lecture 52 - Course Review and Conclusion (Self Study)

NPTEL Video Course - Electrical Engineering - NOC:Medical Image Analysis

Subject Co-ordinator - Prof. Debdoot Sheet

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to Medical Image Analysis
Lecture 2 - X Ray and CT Imaging
Lecture 3 - Magnetic Resonance Imaging
Lecture 4 - Ultrasound Imaging
Lecture 5 - Optical Microscopy and Molecular Imaging
Lecture 6 - Texture in Medical Images
Lecture 7 - Region Growing and Clustering
Lecture 8 - Random Walks for Segmentation
Lecture 9 - Active Contours for Segmentation
Lecture 10 - Systematic Evaluation and Validation
Lecture 11 - Decision Trees for Segmentation and Classification
Lecture 12 - Random Forests for Segmentation and Classification
Lecture 13 - Neural Networks for Segmentation and Classification
Lecture 14 - Deep Learning for Medical Image Analysis
Lecture 15 - Deep Learning for Medical Image Analysis (Continued...)
Lecture 16 - Retinal Vessel Segmentation
Lecture 17 - Vessel Segmentation in Computed Tomography Scan of Lungs
Lecture 18
Lecture 19 - Tissue Characterization in Ultrasound
Lecture 20

NPTEL Video Course - Electrical Engineering - NOC:Biomedical Signal Processing

Subject Co-ordinator - Prof. Sudipta Mukhopadhyay

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Motivation
Lecture 2 - Preliminaries
Lecture 3 - Biomedical Signal Origin and Dynamics
Lecture 4 - Biomedical Signal Origin and Dynamics (Continued...)
Lecture 5 - Biomedical Signal Origin and Dynamics (Continued...)
Lecture 6 - Biomedical Signal Origin and Dynamics (Continued...)
Lecture 7 - Artifact Removal
Lecture 8 - Artifact Removal (Continued...)
Lecture 9 - Artifact Removal (Continued...)
Lecture 10 - Artifact Removal (Continued...)
Lecture 11 - Artifact Removal (Continued...)
Lecture 12 - Artifact Removal (Continued...)
Lecture 13 - Artifact Removal (Continued...)
Lecture 14 - Artifact Removal (Continued...)
Lecture 15 - Artifact Removal (Continued...)
Lecture 16 - Artifact Removal (Continued...)
Lecture 17 - Artifact Removal (Continued...)
Lecture 18 - Event Detection
Lecture 19 - Event Detection (Continued...)
Lecture 20 - Event Detection (Continued...)
Lecture 21 - Event Detection (Continued...)
Lecture 22 - Event Detection (Continued...)
Lecture 23 - Event Detection (Continued...)
Lecture 24 - Event Detection (Continued...)
Lecture 25 - Homomorphic Processing
Lecture 26 - Homomorphic Processing (Continued...)
Lecture 27 - Waveform Analysis
Lecture 28 - Waveform Analysis (Continued...)
Lecture 29 - Waveform Analysis

Lecture 30 - Waveform Analysis (Continued...)
Lecture 31 - Waveform Analysis (Continued...)
Lecture 32 - Waveform Analysis (Continued...)
Lecture 33 - Waveform Analysis (Continued...)
Lecture 34 - Frequency Domain Characterisation
Lecture 35 - Frequency Domain Characterisation (Continued...)
Lecture 36 - Frequency Domain Characterisation (Continued...)
Lecture 37 - Frequency Domain Characterisation (Continued...)
Lecture 38 - Frequency Domain Characterisation (Continued...)
Lecture 39 - Frequency Domain Characterisation (Continued...)
Lecture 40 - Modelling of Biomedical Systems
Lecture 41 - Modelling of Biomedical Systems (Continued...)
Lecture 42 - Modelling of Biomedical Systems (Continued...)
Lecture 43 - Modelling of Biomedical Systems (Continued...)
Lecture 44 - Modelling of Biomedical Systems (Continued...)
Lecture 45 - Modelling of Biomedical Systems (Continued...)
Lecture 46 - Modelling of Biomedical Systems (Continued...)
Lecture 47 - Tutorial - I
Lecture 48 - Tutorial - I (Continued...)
Lecture 49 - Tutorial - I (Continued...)
Lecture 50 - Tutorial - II
Lecture 51 - Tutorial - II (Continued...)
Lecture 52 - Tutorial - II (Continued...)
Lecture 53 - Tutorial - III
Lecture 54 - Tutorial - III (Continued...)
Lecture 55 - Tutorial - III (Continued...)
Lecture 56 - Tutorial - III (Continued...)
Lecture 57 - Tutorial - IV
Lecture 58 - Tutorial - IV (Continued...)
Lecture 59 - Tutorial - IV (Continued...)
Lecture 60 - Tutorial - IV (Continued...)
Lecture 61 - Tutorial - IV (Continued...)
Lecture 62 - Tutorial - IV (Continued...)
Lecture 63 - Tutorial - V
Lecture 64 - Tutorial - V (Continued...)
Lecture 65 - Tutorial - V (Continued...)
Lecture 66 - Tutorial - V (Continued...)
Lecture 67 - Tutorial - V (Continued...)
Lecture 68 - Live Session

NPTEL Video Course - Electrical Engineering - NOC:Microprocessors and Microcontrollers

Subject Co-ordinator - Prof. Santanu Chattopadhyay

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction
Lecture 2 - Introduction (Continued...)
Lecture 3 - Introduction (Continued...)
Lecture 4 - Basic Computer Organization
Lecture 5 - Basic computer organization
Lecture 6 - Basic Computer Organization
Lecture 7 - 8085 Microprocessors
Lecture 8 - 8085 Microprocessors (Continued...)
Lecture 9 - 8085 Microprocessors (Continued...)
Lecture 10 - 8085 Microprocessors (Continued...)
Lecture 11 - 8085 Microprocessors (Continued...)
Lecture 12 - 8085 Microprocessors (Continued...)
Lecture 13 - 8085 Microprocessors (Continued...)
Lecture 14 - 8085 Microprocessors (Continued...)
Lecture 15 - 8085 Microprocessors (Continued...)
Lecture 16 - 8085 Microprocessors (Continued...)
Lecture 17 - 8085 Microprocessors (Continued...)
Lecture 18 - 8085 Microprocessors (Continued...)
Lecture 19 - 8085 Microprocessors (Continued...)
Lecture 20 - 8085 Microprocessors (Continued...)
Lecture 21 - 8085 Microprocessors (Continued...)
Lecture 22 - 8085 Microprocessors (Continued...)
Lecture 23 - 8051 Microcontroller
Lecture 24 - 8051 Microcontroller (Continued...)
Lecture 25 - 8051Microcontroller (Continued...)
Lecture 26 - 8051 Microcontroller (Continued...)
Lecture 27 - 8051 Microcontroller (Continued...)
Lecture 28 - 8051 Microcontroller (Continued...)
Lecture 29 - 8051 Microcontroller (Continued...)

Lecture 30 - 8051 Microcontroller (Continued...)
Lecture 31 - 8051 Microcontroller (Continued...)
Lecture 32 - 8051 Microcontroller (Continued...)
Lecture 33 - 8051 Microcontroller (Continued...)
Lecture 34 - 8051 Microcontroller (Continued...)
Lecture 35 - 8051 Microcontroller (Continued...)
Lecture 36 - 8051 Programming Examples
Lecture 37 - 8051 Programming Examples (Continued...)
Lecture 38 - 8051 Programming Examples (Continued...)
Lecture 39 - 8051 Programming Examples (Continued...)
Lecture 40 - 8051 Programming Examples (Continued...)
Lecture 41 - ARM
Lecture 42 - ARM (Continued...)
Lecture 43 - ARM (Continued...)
Lecture 44 - ARM (Continued...)
Lecture 45 - ARM (Continued...)
Lecture 46 - ARM (Continued...)
Lecture 47 - ARM (Continued...)
Lecture 48 - ARM (Continued...)
Lecture 49 - PIC
Lecture 50 - PIC, AVR
Lecture 51 - AVR (Continued...)
Lecture 52 - AVR (Continued...)
Lecture 53 - Interfacing
Lecture 54 - Interfacing (Continued...)
Lecture 55 - Interfacing (Continued...)
Lecture 56 - Interfacing (Continued...)
Lecture 57 - Interfacing (Continued...)
Lecture 58 - Interfacing (Continued...)
Lecture 59 - 8086
Lecture 60 - 8086 (Continued...)
Lecture 61 - 8086 (Continued...)
Lecture 62 - 8086 (Continued...)
Lecture 63 - 8086 (Continued...)
Lecture 64 - 8087

NPTEL Video Course - Electrical Engineering - NOC:Deep Learning For Visual Computing

Subject Co-ordinator - Prof. Debdoot Sheet

Co-ordinating Institute - IIT - Kharagpur

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

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
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
Lecture 32 - Convolutional Autoencoder for Representation Learning
Lecture 33 - AlexNet
Lecture 34 - VGGNet
Lecture 35 - Revisiting AlexNet and VGGNet for Computational Complexity
Lecture 36 - GoogLeNet - Going very deep with convolutions
Lecture 37 - GoogLeNet
Lecture 38 - ResNet - Residual Connections within Very Deep Networks and DenseNet - Densely connected network
Lecture 39 - ResNet
Lecture 40 - DenseNet
Lecture 41 - Space and Computational Complexity in DNN
Lecture 42 - Assessing the space and computational complexity of very deep CNNs
Lecture 43 - Domain Adaptation and Transfer Learning in Deep Neural Networks
Lecture 44 - Transfer Learning a GoogLeNet
Lecture 45 - Transfer Learning a ResNet
Lecture 46 - Activation pooling for object localization
Lecture 47 - Region Proposal Networks (rCNN and Faster rCNN)
Lecture 48 - GAP + rCNN
Lecture 49 - Semantic Segmentation with CNN
Lecture 50 - UNet and SegNet for Semantic Segmentation
Lecture 51 - Autoencoders and Latent Spaces
Lecture 52 - Principle of Generative Modeling
Lecture 53 - Adversarial Autoencoders
Lecture 54 - Adversarial Autoencoder for Synthetic Sample Generation
Lecture 55 - Adversarial Autoencoder for Classification
Lecture 56 - Understanding Video Analysis
Lecture 57 - Recurrent Neural Networks and Long Short-Term Memory
Lecture 58 - Spatio-Temporal Deep Learning for Video Analysis
Lecture 59 - Activity recognition using 3D-CNN
Lecture 60 - Activity recognition using CNN-LSTM

NPTEL Video Course - Electrical Engineering - NOC:Power System Engineering

Subject Co-ordinator - Prof. Debapriya Das

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1
Lecture 2
Lecture 3
Lecture 4
Lecture 5
Lecture 6
Lecture 7
Lecture 8
Lecture 9
Lecture 10
Lecture 11 - Cables (Continued...)
Lecture 12 - Transient over voltages and Insulation coordination
Lecture 13 - Transient over voltages and Insulation coordination (Continued...)
Lecture 14 - Transient over voltages and Insulation coordination (Continued...)
Lecture 15 - Transient over voltages and Insulation coordination (Continued...)
Lecture 16 - Transient over voltages and Insulation coordination (Continued...)
Lecture 17 - Transient over voltages and Insulation coordination (Continued...)
Lecture 18 - Transient over voltages and Insulation coordination (Continued...)
Lecture 19 - Transient over voltages and Insulation coordination (Continued...)
Lecture 20 - Corona
Lecture 21 - Corona (Continued...)
Lecture 22 - Corona (Continued...)
Lecture 23 - Corona (Continued...), Sag and Tension Analysis
Lecture 24 - Sag and Tension Analysis (Continued...)
Lecture 25 - Sag and Tension Analysis (Continued...)
Lecture 26 - Sag and Tension Analysis (Continued...)
Lecture 27 - Sag and Tension Analysis (Continued...)
Lecture 28 - Sag and Tension Analysis (Continued...)
Lecture 29 - Load flow of radial distribution networks

Lecture 30 - Load flow of radial distribution networks (Continued...)
Lecture 31 - Load flow of radial distribution networks (Continued...)
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 netw
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 Video Course - Electrical Engineering - NOC:Fundamentals of Electrical Engineering

Subject Co-ordinator - Prof. Debapriya Das

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Basic Concepts, Examples
Lecture 2 - Basic Concepts, Examples (Continued...)
Lecture 3 - Basic Concepts, Examples (Continued...)
Lecture 4 - Basic Concepts, Examples (Continued...)
Lecture 5 - Basic Laws
Lecture 6 - Basic Laws (Continued...)
Lecture 7 - Basic Laws (Continued...)
Lecture 8 - Basic Laws (Continued...)
Lecture 9 - Basic Laws (Continued...)
Lecture 10 - Basic Laws (Continued...)
Lecture 11 - Methods of Circuit Analysis
Lecture 12 - Methods of Circuit Analysis (Continued...)
Lecture 13 - Methods of Circuit Analysis (Continued...)
Lecture 14 - Methods of Circuit Analysis (Continued...)
Lecture 15 - Methods of Circuit Analysis (Continued...)
Lecture 16 - Methods of Circuit Analysis (Continued...)
Lecture 17 - Mesh analysis with current sources, Examples
Lecture 18 - Methods of Circuit Analysis (Continued...) and Circuit Theorems
Lecture 19 - Circuit Theorems (Continued...)
Lecture 20 - Circuit Theorems (Continued...)
Lecture 21 - Circuit Theorems (Continued...)
Lecture 22 - Circuit Theorems (Continued...)
Lecture 23 - Circuit Theorems (Continued...)
Lecture 24 - Circuit Theorems (Continued...)
Lecture 25 - Circuit Theorems (Continued...) and Capacitors and Inductors
Lecture 26 - Capacitors and Inductors (Continued...)
Lecture 27 - Capacitors and Inductors (Continued...)
Lecture 28 - Capacitors and Inductors (Continued...)
Lecture 29 - First Order Circuits

Lecture 30 - First Order Circuits (Continued...)
Lecture 31 - First Order Circuits (Continued...)
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 Video Course - Electrical Engineering - NOC:Digital Circuits

Subject Co-ordinator - Prof. Santanu Chattopadhyay

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction
Lecture 2 - Introduction (Continued...)
Lecture 3 - Number System
Lecture 4 - Number System (Continued...)
Lecture 5 - Number System (Continued...)
Lecture 6 - Number System (Continued...)
Lecture 7 - Number System (Continued...)
Lecture 8 - Boolean Algebra
Lecture 9 - Boolean Algebra (Continued...)
Lecture 10 - Boolean Algebra (Continued...)
Lecture 11 - Boolean Algebra (Continued...)
Lecture 12 - Boolean Algebra (Continued...)
Lecture 13 - Boolean Algebra (Continued...)
Lecture 14 - Logic Gates
Lecture 15 - Logic Gates (Continued...)
Lecture 16 - Logic Gates (Continued...)
Lecture 17 - Logic Gates (Continued...)
Lecture 18 - Logic Gates (Continued...)
Lecture 19 - Logic Gates (Continued...)
Lecture 20 - Arithmetic Circuits
Lecture 21 - Arithmetic Circuits (Continued...)
Lecture 22 - Arithmetic Circuits (Continued...)
Lecture 23 - Decoders, Multiplexers, PLA
Lecture 24 - Decoders, Multiplexers, PLA (Continued...)
Lecture 25 - Decoders, Multiplexers, PLA (Continued...)
Lecture 26 - Decoders, Multiplexers, PLA (Continued...)
Lecture 27 - Decoders, Multiplexers, PLA (Continued...)
Lecture 28 - Sequential Circuits
Lecture 29 - Sequential Circuits (Continued...)

Lecture 30 - Sequential Circuits (Continued...)
Lecture 31 - Sequential Circuits (Continued...)
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 Video Course - Electrical Engineering - NOC:Analysis and Design Principles of Microwave Antennas

Subject Co-ordinator - Dr. Amitabha Bhattacharya

Co-ordinating Institute - IIT - Kharagpur

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

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
Lecture 32 - Farfield Evaluation of Spherical Wave Radiation by Generalised Antenna
Lecture 33 - Slot Antenna
Lecture 34 - Open Ended Waveguide Antenna and Microstrip Antenna
Lecture 35 - Numerical Evaluation of Wire Antenna Currents
Lecture 36 - Solution of Intregral Equation by Moment Method
Lecture 37 - Array Pattern Synthesis
Lecture 38 - Array Pattern Synthesis (Continued...)
Lecture 39 - Ultra Wideband Antennas
Lecture 40 - Antenna Measurements

NPTEL Video Course - Electrical Engineering - NOC:Architectural Design of Digital Integrated Circuits

Subject Co-ordinator - Prof. Indranil Hatai

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to VLSI Design Flow
Lecture 2 - Introduction to VLSI Design Flow
Lecture 3 - Introduction to VLSI Design Flow
Lecture 4 - Algorithm to Efficient Architecture Mapping
Lecture 5 - Algorithm to Efficient Architecture Mapping (Continued...)
Lecture 6 - Algorithm to Efficient Architecture Mapping (Continued...)
Lecture 7 - Tutorial on Algorithm to Efficient Architecture Mapping
Lecture 8 - Algorithm to Efficient Architecture Mapping (Continued...)
Lecture 9 - Algorithm to Efficient Architecture Mapping (Continued...)
Lecture 10 - Algorithm to Efficient Architecture Mapping (Continued...)
Lecture 11 - Algorithm to Efficient Architecture Mapping (Continued...)
Lecture 12 - Algorithm to Efficient Architecture Mapping (Continued...)
Lecture 13 - Algorithm to Efficient Architecture Mapping (Continued...)
Lecture 14 - Algorithm to Efficient Architecture Mapping (Continued...)
Lecture 15 - Efficient Adder Architecture
Lecture 16 - Efficient Adder Architecture (Continued...)
Lecture 17 - Efficient Adder Architecture (Continued...)
Lecture 18 - Efficient Adder Architecture
Lecture 19 - Efficient Adder Architecture
Lecture 20 - Efficient Adder Architecture
Lecture 21 - Efficient Adder Architecture
Lecture 22 - Efficient Adder Architecture
Lecture 23 - Efficient Adder Architecture
Lecture 24 - Efficient Adder Architecture
Lecture 25 - Pipelining and Parallel Processing
Lecture 26 - Pipelining and Parallel Processing
Lecture 27 - Multiplier Architecture
Lecture 28 - Multiplier Architecture
Lecture 29 - Multiplier Architecture

Lecture 30 - Multiplier Architecture
Lecture 31 - Multiplier Architecture
Lecture 32 - Multiplier Architecture
Lecture 33 - Multiplier Architecture
Lecture 34 - Multiplier Architecture
Lecture 35 - Squaring Circuit Design
Lecture 36 - Reconfigurable Constant Multiplier Design
Lecture 37 - Reconfigurable Constant Multiplier Design
Lecture 38 - Reconfigurable Constant Multiplier Design
Lecture 39 - Fixed Point Number Representation
Lecture 40 - Fixed Point Number Representation
Lecture 41 - CORDIC Architecture
Lecture 42 - CORDIC Architecture
Lecture 43 - CORDIC Architecture
Lecture 44 - CORDIC Architecture
Lecture 45 - Timing Analysis
Lecture 46 - Timing Analysis
Lecture 47 - Timing Analysis
Lecture 48 - Logic Hazard
Lecture 49 - FFT Architecture
Lecture 50 - FFT Architecture (Continued...)
Lecture 51 - Timing analysis Basics
Lecture 52 - Timing analysis Basics (Continued...)
Lecture 53 - Timing analysis Basics (Continued...)
Lecture 54 - Timing Issuesin Digital IC Design
Lecture 55 - Timing Issuesin Digital IC Design (Continued...)
Lecture 56 - Timing Issuesin Digital IC Design (Continued...)
Lecture 57 - Timing Issuesin Digital IC Design (Continued...)
Lecture 58 - Architectural Design of Digital Integrated Circuits
Lecture 59 - Design Tips for Basic Circuits Design (Continued...)
Lecture 60 - Design Tips for Basic Circuits Design (Continued...)
Lecture 61 - Design Tips for Basic Circuits Design (Continued...)
Lecture 62 - Low Power Digital Design
Lecture 63 - Low Power Digital Design (Continued...)
Lecture 64 - Low Power Digital Design
Lecture 65 - Low Power Digital Design (Continued...)
Lecture 66 - Hardware for Machine Learning
Lecture 67 - Hardware for Machine Learning

NPTEL Video Course - Electrical Engineering - NOC:Electrical Machines-II

Subject Co-ordinator - Prof.Tapas Kumar Bhattacharya

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Inductance, Self and Mutual
Lecture 2 - Relationship of Inductances in Transformer
Lecture 3 - Equivalent Circuit from Circuit KVL Equations
Lecture 4 - Co-efficient of Coupling , Energy Stored in Coupled Coils
Lecture 5 - A Single Conductor Generator and Motor
Lecture 6 - Analysis of Single Conductor Generator and Motor
Lecture 7 - Analysis of Single Conductor Generator and Motor (Continued...)
Lecture 8 - Flux Density Distribution in Space and Nature emf
Lecture 9 - Flux Density Distribution in Space and Nature emf (Continued...)
Lecture 10 - From Linear to Rotating Machine
Lecture 11 - From Linear to Rotating Machine (Continued...)
Lecture 12 - Basic Underlying Principle of Operation of Rotating Machine
Lecture 13 - Basic Underlying Principle of Operation of Rotating Machine (Continued...)
Lecture 14 - Flux Density Distribution along the Air Gap
Lecture 15 - Flux Density Distribution along the Air Gap (Continued...)
Lecture 16 - Induced Voltage in a Coil in a Rotating Machine
Lecture 17 - Induced Voltage in a Coil in a Rotating Machine (Continued...)
Lecture 18 - Induced Voltage in a Coil in a Rotating Machine (Continued...)
Lecture 19 - Induced Voltage due to Fundamental and Harmonic Components of Flux Density Distribution
Lecture 20 - Distributed Coils Connected in Series Resultant Voltage
Lecture 21 - Distribution Factor
Lecture 22 - Pitch Factor and Winding Factor
Lecture 23 - How to decide about Short Pitch Angle Ã•Âµ
Lecture 24 - Double Layer 3-phase Winding - An Introduction
Lecture 25 - Winding Table for 3-phase Distributed Winding
Lecture 26 - Winding Table for 3-phase Distributed Winding with Examples
Lecture 27 - Winding Table for 3-phase Distributed Winding with Examples (Continued...)
Lecture 28 - 120 degree Phase Spread Winding with Examples
Lecture 29 - Winding Table of 120 degree Phase Spread Coils and Group Connection

Lecture 30 - Introduction to Rotating Magnetic Field
Lecture 31 - Rotating Magnetic Field (Continued...), Mechanical and Electrical Speed
Lecture 32 - Speed and Direction of Rotating Field
Lecture 33 - Synchronous Speed and How to Calculate Induced Voltage in a Coil
Lecture 34 - Introduction to Induction Motor
Lecture 35 - Introduction to Induction Motor (Continued...)
Lecture 36 - General Expression of Torque in Terms of Stator and Rotor Fields
Lecture 37 - Torque Angle and Torque Expression
Lecture 38 - How to Fix Up Positions of Net Field, Rotor Field and Stator Field
Lecture 39 - Slip
Lecture 40 - Equivalent Circuit of 3-Phase Induction Motor
Lecture 41 - Equivalent Circuit of 3-Phase Induction Motor (Continued...)
Lecture 42 - Equivalent Circuit of 3-Phase Induction Motor (Continued...)
Lecture 43 - Expression for Electromagnetic Torque in terms of Equivalent Circuit Parameters
Lecture 44 - Maximum Electromagnetic Torque and Slip at Which it Occurs
Lecture 45 - Typical Torque Slip Characteristic and Operating Point
Lecture 46 - Change in Torque-slip Characteristic as Supply Voltage and Rotor Resistance are Varied
Lecture 47 - Types of Induction Motor - Slip Ring Type
Lecture 48 - Introduction to Cage Induction Motor
Lecture 49 - Cage Motor Can Operate for Different Stator Poles
Lecture 50 - Core Loss in Induction Motor and Simplified Equivalent Circuit
Lecture 51 - Torque Expression from Simplified Equivalent Circuit and Introduction to Circle Diagram
Lecture 52 - Circle Diagram (Continued...)
Lecture 53 - Exact Power Flow Diagram and Circle Diagram
Lecture 54 - Circle Diagram (Continued...)
Lecture 55 - Circle Diagram
Lecture 56 - Circle Diagram from Test Data
Lecture 57 - Starting of 3 Phase Induction Motor - Introduction
Lecture 58 - DOL and Reactor Starting
Lecture 59 - DOL and Auto Transformer Starting
Lecture 60 - Introduction to Speed Control
Lecture 61 - Idea of VVVF Speed Control of Induction Motor
Lecture 62 - Speed Contro Using Two Motors
Lecture 63 - Electrical Braking of 3 Phase Induction Motor
Lecture 64 - Braking (Continued...)
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 Video Course - Electrical Engineering - NOC:Digital Electronic Circuits

Subject Co-ordinator - Prof. Goutam Saha

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction
Lecture 2 - Transistor as a switch
Lecture 3 - Performance Issues and Introduction to TTL
Lecture 4 - Transistor Transistor Logic (TTL)
Lecture 5 - CMOS Logic
Lecture 6 - Basic Gates and their representations
Lecture 7 - Fundamentals of Boolean Algebra
Lecture 8 - Boolean Function to Truth Table and Implementaion Issues
Lecture 9 - Truth Table to Boolean Function and Implementaion Issues
Lecture 10 - Karnugh Map and Digital Circuit Realization
Lecture 11 - Karnaugh Map to Entered Variable Map
Lecture 12 - Quine - McClusky (QM) Algorithm
Lecture 13 - Cost Criteria and Minimization of Multiple Output Functions
Lecture 14 - Static 1 Hazard
Lecture 15 - Static 0 Hazard and Dynamic Hazard
Lecture 16 - Multiplexer
Lecture 17 - Multiplexer
Lecture 18 - Demultiplexer / Decoder
Lecture 19 - Decoder with BCD Input and Encoder
Lecture 20 - Parity Generator and Checker
Lecture 21 - Number System
Lecture 22 - Negative Number and 2s Complement Arithmetic
Lecture 23 - Arithmetic Building Blocks - I
Lecture 24 - Arithmetic Building Blocks - II
Lecture 25 - Overflow Detection and BCD Arithmetic
Lecture 26 - Magnitude Comparator
Lecture 27 - Arithmetic Logic Unit (ALU)
Lecture 28 - Unweighted Code
Lecture 29 - Error Detection and Correction Code

Lecture 30 - Multiplication and Division
Lecture 31 - SR Latch and Introduction to Clocked Flip-Flop
Lecture 32 - Edge-Triggered Flip-Flop
Lecture 33 - Representations of Flip-Flops
Lecture 34 - Analysis of Sequential Logic Circuit
Lecture 35 - Conversion of Flip-Flops and Flip-Flop Timing Parameters
Lecture 36 - Register and Shift Register
Lecture 37 - Shift Register
Lecture 38 - Application of Shift Register
Lecture 39 - Linear Feedback Shift Register
Lecture 40 - Serial Addition, Multiplication and Division
Lecture 41 - Asynchronous Counter
Lecture 42 - Decoding Logic and Synchronous Counter
Lecture 43 - Cascading
Lecture 44 - Counter Design with Asynchronous Reset and Preset
Lecture 45 - Counter Design as Synthesis Problem and Few Other Uses of Counter
Lecture 46 - Synthesis of Sequential Logic Circuit
Lecture 47 - Moore Model and Mealy Model
Lecture 48 - Algorithmic State Machine (ASM) Chart and Synthesis of Sequential Logic Circuit
Lecture 49 - Circuit Realization from ASM Chart and State Minimization
Lecture 50 - State Minimization by Implication Table and Partitioning Method
Lecture 51 - Digital to Analog Conversion - I
Lecture 52 - Digital to Analog Conversion - II
Lecture 53 - Analog to Digital Conversion - I
Lecture 54 - Analog to Digital Conversion - II
Lecture 55 - Certain Performance Issue of ADC and DAC
Lecture 56 - Introduction to Memory
Lecture 57 - Static Random Access Memory (SRAM)
Lecture 58 - Dynamic RAM (DRAM) and Memory Expansion
Lecture 59 - Read Only Memory (ROM)
Lecture 60 - PAL, PLA, CPLD, FPGA

NPTEL Video Course - Electrical Engineering - NOC:Power System Dynamics, Control and Monitoring

Subject Co-ordinator - Prof. Debapriya Das

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Power System stability
Lecture 2 - Power System stability (Continued...)
Lecture 3 - Power System stability (Continued...)
Lecture 4 - Power System stability (Continued...)
Lecture 5 - Power System stability (Continued...)
Lecture 6 - Power System Stability (Continued...)
Lecture 7 - Power System Stability (Continued...)
Lecture 8 - Power System Stability (Continued...)
Lecture 9 - Power System Stability (Continued...)
Lecture 10 - Power System Stability (Continued...)
Lecture 11 - Power System Stability (Continued...)
Lecture 12 - Power System Stability (Continued...)
Lecture 13 - Power System Stability (Continued...)
Lecture 14 - Power System Stability (Continued...)
Lecture 15 - Power System Stability (Continued...)
Lecture 16 - Power System Stability (Continued...)
Lecture 17 - Power System Stability (Continued...)
Lecture 18 - Power System Stability (Continued...)
Lecture 19 - Power System Stability (Continued...)
Lecture 20 - Power System Stability (Continued...)
Lecture 21 - Power System stability (Continued...)
Lecture 22 - Power System stability, Eigen properties of the state matrix
Lecture 23 - Power System stability, Eigen properties of the state matrix (Continued...)
Lecture 24 - Power System stability, Eigen properties of the state matrix (Continued...)
Lecture 25 - Power System stability, Eigen properties of the state matrix (Continued...)
Lecture 26 - Power System stability, Eigen properties of the state matrix (Continued...)
Lecture 27 - Power System stability, Eigen properties of the state matrix, Transient stability
Lecture 28 - Transient stability
Lecture 29 - Transient stability (Continued...)

Lecture 30 - Transient stability (Continued...)
Lecture 31 - Transient stability
Lecture 32 - Transient stability, Automatic generation control conventional scenario
Lecture 33 - Automatic generation control conventional scenario
Lecture 34 - Automatic generation control conventional scenario
Lecture 35 - Automatic generation control conventional scenario
Lecture 36 - Automatic generation control conventional scenario
Lecture 37 - Automatic generation control conventional scenario
Lecture 38 - Automatic generation control conventional scenario
Lecture 39 - Automatic generation control conventional scenario
Lecture 40 - Automatic generation control conventional scenario
Lecture 41 - AGC in deregulated system
Lecture 42 - AGC in deregulated system (Continued...)
Lecture 43 - AGC in deregulated system (Continued...)
Lecture 44 - AGC in deregulated system (Continued...)
Lecture 45 - AGC in deregulated system (Continued...)
Lecture 46 - AGC in deregulated system (Continued...)
Lecture 47 - AGC in deregulated system (Continued...)
Lecture 48 - AGC in deregulated system (Continued...)
Lecture 49 - AGC in deregulated system, Reactive power and voltage control
Lecture 50 - Reactive power and voltage control
Lecture 51 - Reactive power and voltage control, State extimation in power system
Lecture 52 - State estimation in power system
Lecture 53 - State estimation in power system (Continued...)
Lecture 54 - State estimation in power system (Continued...)
Lecture 55 - State estimation in power system (Continued...)
Lecture 56 - State estimation in power system (Continued...)
Lecture 57 - Hydraulic turbine modelling
Lecture 58 - Hydraulic turbine modelling (Continued...)
Lecture 59 - Subsynchronous oscillation
Lecture 60 - Subsynchronous oscillation, Windup and non windup limits

NPTEL Video Course - Electrical Engineering - NOC:Evolution of Air Interface towards 5G

Subject Co-ordinator - Prof. Suvra Sekhar Das

Co-ordinating Institute - IIT - Kharagpur

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

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)
Lecture 32 - Comparison of waveforms
Lecture 33 - Channel models for performance evaluation - Part I
Lecture 34 - Channel models for performance evaluation - Part II
Lecture 35 - Channel models for performance evaluation - Part III
Lecture 36 - MIMO Signal Processing (Receive Diversity)
Lecture 37 - MIMO Signal Processing
Lecture 38 - MIMO Signal Processing (Capacity)
Lecture 39 - MIMO Signal Processing (Capacity and Massive MIMO)
Lecture 40 - Hybrid beamforming (mmWave)

NPTEL Video Course - Electrical Engineering - NOC:Electrical Measurement and Electronic Instruments

Subject Co-ordinator - Prof. Avishek Chatterjee

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - PMMC Instruments
Lecture 2 - Electrodynamic Instrument
Lecture 3 - Demonstration of PMMC and Electrodynamic Instruments
Lecture 4 - Features of PMMC and Electrodynamic Instruments
Lecture 5 - Moving Iron Instruments
Lecture 6 - Demonstration of Moving Iron Instrument
Lecture 7 - Electrostatic Instrument
Lecture 8 - Derivation of Deflecting Torque in Electrodynamic, Electrostatic and Moving Iron Instrument
Lecture 9 - Damping and Eddy Current Damping
Lecture 10 - Dynamics of the Moving Coil and Damping
Lecture 11 - Dynamics of the Moving Coil and Damping (Continued...)
Lecture 12 - Ballistic Galvanometer
Lecture 13 - Ammeter - I
Lecture 14 - Ammeter - II
Lecture 15 - Voltmeter
Lecture 16 - Ohmmeters - I
Lecture 17 - Ohmmeters - II
Lecture 18 - Rectifier based Voltmeters and Ammeter - I
Lecture 19 - Rectifier based Voltmetesr and Ammeter - II
Lecture 20 - Resistance measurement with a Voltmeter and an Ammeter
Lecture 21 - Four-Terminal Resistance
Lecture 22 - Problems
Lecture 23 - Error Calculation
Lecture 24 - Sensitivity, Accuracy, and Resolution of Wheatstone Bridge
Lecture 25 - Kelvin Double Bridge
Lecture 26 - High Resistance Measurement
Lecture 27 - Wattmeter Connection and Compensated Wattmeter
Lecture 28 - Single Phase Energy Meter
Lecture 29 - Demonstration

Lecture 30 - Single Phase Energy Meter (Continued...)
Lecture 31 - Connection of Energy Meter, Wattmeter, and Three Phase Supply
Lecture 32 - DC Potentiometer
Lecture 33 - AC Potentiometer
Lecture 34 - Polar potentiometer and phase shifter
Lecture 35 - Polar potentiometer
Lecture 36 - Co-ordinate potentiometer
Lecture 37 - Kelvin-Varley potential divider
Lecture 38 - Impedance measurement
Lecture 39 - AC bridges - I
Lecture 40 - AC bridges - II
Lecture 41 - AC bridges - III
Lecture 42 - Current transformer and potential transformer
Lecture 43 - Review of transformer and magnetic circuit
Lecture 44 - Errrors in Instrument ransformer
Lecture 45 - Flux density measurement with Ballistic Galvanometer
Lecture 46 - Flux density measurement with Ballistic Galvanometer (Continued...)
Lecture 47 - Background
Lecture 48 - Background
Lecture 49 - Background
Lecture 50 - Background
Lecture 51 - Background
Lecture 52 - Background
Lecture 53 - Inverting amplifier versus Schmitt Trigger
Lecture 54 - Non-inverting amplifier versus Schmitt Trigger
Lecture 55 - Difference amplifier - I
Lecture 56 - Difference amplifier - II
Lecture 57 - Difference amplifier - III
Lecture 58 - Digital frequency meter
Lecture 59 - Digital frequency meter and Schmitt Trigger
Lecture 60 - Schmitt Trigger
Lecture 61 - Schmitt Trigger
Lecture 62 - Digital frequency meter
Lecture 63 - Linear ramp type digital voltmeter
Lecture 64 - Dual slope digital voltmeter - I
Lecture 65 - Dual slope digital voltmeter - II
Lecture 66 - Dual slope digital voltmeter and Integrator circuit
Lecture 67 - Digital ramp type voltmeter
Lecture 68 - Digital ramp type voltmeter and Successive approximation type voltmeter

Lecture 69 - ADC and DAC - I
Lecture 70 - ADC and DAC - II
Lecture 71 - Why we need electronic Instruments
Lecture 72 - Instruments with op-amp based amplifiers - I
Lecture 73 - Instruments with op-amp based amplifiers - II
Lecture 74 - Instruments with op-amp based amplifiers - III
Lecture 75 - Instrumentation Amplifier
Lecture 76 - Function generator
Lecture 77 - 555-Timer circuit
Lecture 78 - Astable and monostable oscillator circuits
Lecture 79 - Pulse generator
Lecture 80 - Oscilloscope - I
Lecture 81 - Oscilloscope - II
Lecture 82 - Emitter follower voltmeter
Lecture 83 - Linear ohmmeter
Lecture 84 - Ramp generator

NPTEL Video Course - Electrical Engineering - NOC:Principles and Techniques of Modern Radar Systems

Subject Co-ordinator - Dr. Amitabha Bhattacharya

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Historical Development and Application
Lecture 2 - Radar Bands and System Modeling
Lecture 3 - Radar Equation
Lecture 4 - Some Basic Concepts of Pulsed Radar
Lecture 5 - Some Basic Concepts of Pulsed Radar (Continued...)
Lecture 6 - Some Basic Concepts of Pulsed Radar (Continued...)
Lecture 7 - Some Basic Concepts of Pulsed Radar (Continued...)
Lecture 8 - Tutorial Problems on Basic Concepts of Radar - Part I
Lecture 9 - Tutorial Problems on Basic Concepts of Radar - Part II
Lecture 10 - CW Radar
Lecture 11 - CW Radar Mathematical Model and Applications
Lecture 12 - FM-CW Radar
Lecture 13 - Double Frequency CW Radar
Lecture 14 - Pulsed Radar
Lecture 15 - MTI Filter
Lecture 16 - Clutter and Single DLC
Lecture 17 - Double DLC and Recursive MTI Filter
Lecture 18 - Multiple prf MTI Radar
Lecture 19 - Multiple prf MTI Radar and Clutter Attenuation
Lecture 20 - MTI Improvement Factor
Lecture 21 - Tutorial Problems on CW and Pulsed Radar - Part I
Lecture 22 - Tutorial Problems on CW and Pulsed Radar - Part II
Lecture 23 - Pulsed Doppler Radar
Lecture 24 - Pulsed Doppler Radar (Continued...) and Search Radar
Lecture 25 - Tracking Radar
Lecture 26 - Tracking Radar (Continued...)
Lecture 27 - Tracking Radar (Continued...)
Lecture 28 - Tracking Radar (Continued...)
Lecture 29 - Tracking Radar (Continued...)

Lecture 30 - Tracking Radar (Continued...)
Lecture 31 - Tracking Radar (Continued...)
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
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 Video Course - Electrical Engineering - NOC:Electrical Machines-I

Subject Co-ordinator - Prof.Tapas Kumar Bhattacharya

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Magnetic Circuit and Transformer
Lecture 2 - Magnetising Current from B-H Curve
Lecture 3 - Ideal Transformer, Dot Convention and Phasor Diagram
Lecture 4 - Operation of Ideal Operation with Load Connected
Lecture 5 - Equivalent Circuit of Ideal Transformer
Lecture 6 - Rating of Single Phase Transformer
Lecture 7 - Transformer with Multiple Coils
Lecture 8 - Modelling of Practical Transformer - I
Lecture 9 - Modelling of Practical Transformer - II
Lecture 10 - Modelling of Practical Transformer - III
Lecture 11 - Core Loss - Eddy Current Loss
Lecture 12 - Factors on Eddy Current Loss Depends
Lecture 13 - Hysteresis Loss
Lecture 14 - Exact Equivalent Circuit
Lecture 15 - Approximate Equivalent Circuit
Lecture 16 - Determination of Equivalent Circuit Parameters - No Load Test
Lecture 17 - Short Circuit Test
Lecture 18 - Choosing Sides to Carry Out O.C / S.C Test
Lecture 19 - Efficiency of Transformer - Losses
Lecture 20 - Efficiency (Continued...)
Lecture 21 - Condition for Maximum Efficiency When Load Power Factor Constant
Lecture 22 - Family of Efficiency Curve at Various Power Factor and Energy Efficiency
Lecture 23 - Load Description and Energy Efficiency
Lecture 24 - Regulation
Lecture 25 - Regulation
Lecture 26 - Auto Transformer - Introduction
Lecture 27 - AutoTransformer versus Two Winding Transformer
Lecture 28 - AutoTransformer versus Two Winding Transformer (Continued...)
Lecture 29 - Numerical Problems on Ideal Auto Transformer

Lecture 30 - Two Winding Transformer Connected as Auto Transformer
Lecture 31 - Practical Auto Transformer
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
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
Lecture 65 - O.C.C and Load Characteristic of Separately Excited Generators
Lecture 66 - Voltage Build Up in Shunt Generator
Lecture 67 - Load Characteristic of Shunt Generator
Lecture 68 - Qualitative Discussion on Armature Reaction

Lecture 69 - Ill Effects of Armature Reaction
Lecture 70 - Compensating and Interpoles
Lecture 71 - Armature Reaction (Continued...)
Lecture 72 - Field Flux Density, Armature Flux Density and Resultant Field Distribution
Lecture 73 - Field Patterns for Both Motor and Generators
Lecture 74 - Demagnetising and Cross Magnetising mmf for Brush Shifted Machine
Lecture 75 - Calculation of Compensating, Interpole and Series Field Turns
Lecture 76 - Estimating Armature and Field Resistance from its Rating
Lecture 77 - Power Flow Diagram, Rotational Loss
Lecture 78 - Shunt Motor
Lecture 79 - Starting of D.C Motor - 3-Point Starter
Lecture 80 - Speed Control of Shunt Motor - I
Lecture 81 - Speed Control of Shunt Motor - II
Lecture 82 - Speed Control of Shunt Motor - III
Lecture 83 - Field Control (Continued...)
Lecture 84 - D.C Motor Braking
Lecture 85 - Introduction to Series Motor
Lecture 86 - Series Motor Characteristics
Lecture 87 - Series Motor Speed Control
Lecture 88 - Universal Motor
Lecture 89 - Swinburne Test
Lecture 90 - Hopkinson Test
Lecture 91 - Efficiency Calculation
Lecture 92 - Field Test on D.C Series Motor
Lecture 93 - Simplex Wave winding
Lecture 94 - Wave Winding (Continued...)

NPTEL Video Course - Electrical Engineering - NOC:VLSI Signal Processing

Subject Co-ordinator - Prof. Mrityunjay Chakraborty

Co-ordinating Institute - IIT - Kharagpur

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

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 Video Course - Electrical Engineering - NOC:Analog Electronic Circuits

Subject Co-ordinator - Prof. Pradip Mandal

Co-ordinating Institute - IIT - Kharagpur

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

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
Lecture 32 - Common Source Amplifier - Part A
Lecture 33 - Common Source Amplifier - Part B
Lecture 34 - Common Source Amplifier (Continued...) Numerical examples and design guidelines - Part B
Lecture 35 - Frequency Response of CE and CS Amplifiers - Part A
Lecture 36 - Frequency Response of CE and CS Amplifiers - Part B
Lecture 37 - Frequency Response of CE and CS Amplifiers - Part C
Lecture 38 - Frequency Response of CE and CS Amplifiers (Continued...) - Part A
Lecture 39 - Frequency Response of CE And CS Amplifiers (Continued...) - Part B
Lecture 40 - Frequency Response of CE/CS Amplifiers Considering High Frequency Models of BJT and MOSFET - Par
Lecture 41 - Frequency Response of CE/CS Amplifiers Considering High Frequency Models of BJT and MOSFET - Par
Lecture 42 - Frequency Response of CE/CS Amplifiers Considering High Frequency Models of BJT And MOSFET - Par
Lecture 43 - Limitation of CE and CS Amplifiers in Cascading
Lecture 44 - Common Collector and Common Drain Amplifiers
Lecture 45 - Common Collector and Common Drain Amplifiers (Continued...)
Lecture 46 - Common Collector and Common Drain Amplifiers (Continued...)
Lecture 47 - Common Collector and Common Drain Amplifiers (Continued...)
Lecture 48 - Common Collector and Common Drain Amplifiers (Continued...)
Lecture 49 - Common Base and Common Gate Amplifiers
Lecture 50 - Common Base and Common Gate Amplifiers
Lecture 51 - Common Base and Common Gate Amplifiers (Continued...)
Lecture 52 - Common Base and Common Gate Amplifiers (Continued...)
Lecture 53 - Common Base and Common Gate Amplifiers (Continued...)
Lecture 54 - Common Base and Common Gate Amplifiers (Continued...)
Lecture 55 - Multi-Transistor Amplifiers
Lecture 56 - Multi-Transistor Amplifiers
Lecture 57 - Multi-Transistor Amplifiers
Lecture 58 - Multi-Transistor Amplifiers (Continued...)
Lecture 59 - Multi-Transistor Amplifiers (Continued...)
Lecture 60 - Multi-Transistor Amplifiers (Continued...)
Lecture 61 - Multi-Transistor Amplifiers
Lecture 62 - Multi-Transistor Amplifiers
Lecture 63 - Multi-Transistor Amplifiers
Lecture 64 - Multi-Transistor Amplifiers
Lecture 65 - Multi-Transistor Amplifiers
Lecture 66 - Multi-Transistor Amplifiers
Lecture 67 - Multi-Transistor Amplifiers
Lecture 68 - Multi-Transistor Amplifiers

Lecture 69 - Multi-Transistor Amplifiers
Lecture 70 - Single-ended Vs Differential Signaling and Basic Model of a Differential Amplifier
Lecture 71 - Single-ended Vs Differential Signaling and Basic Model of a Differential Amplifier (Continued...
Lecture 72 - Single-ended Vs Differential Signaling and Basic Model of a Differential Amplifier (Continued...
Lecture 73 - Single-ended Vs Differential Signaling and Basic Model of a Differential Amplifier (Continued...
Lecture 74 - Single-ended Vs Differential Signaling and Basic Model of a Differential Amplifier (Continued...
Lecture 75 - Differential Amplifier
Lecture 76 - Differential Amplifier
Lecture 77 - Differential Amplifier
Lecture 78 - Differential Amplifier
Lecture 79 - Differential Amplifier
Lecture 80 - Differential Amplifier
Lecture 81 - Current mirror circuits - Part A
Lecture 82 - Current mirror circuits - Part B
Lecture 83 - Usage of current mirror - Part A
Lecture 84 - Usage of current mirror - Part B
Lecture 85 - Usage of current mirror - Part C
Lecture 86 - Numerical examples on current mirror and its applications - Part A
Lecture 87 - Numerical examples on current mirror and its applications - Part B
Lecture 88 - Numerical examples on current mirror and its applications - Part C
Lecture 89 - Numerical examples on current mirror and its applications - Part D
Lecture 90 - Feedback system - Part A
Lecture 91 - Feedback system - Part B
Lecture 92 - Feedback system - Part C
Lecture 93 - Feedback system - Part D
Lecture 94 - Feedback system - Part E
Lecture 95 - Effect of feedback on frequency response - Part A
Lecture 96 - Effect of feedback on frequency response - Part B
Lecture 97 - Applications of feedback in amplifier circuits - Part A
Lecture 98 - Applications of feedback in amplifier circuits - Part B
Lecture 99 - Applications of feedback in amplifier circuits - Part C

NPTEL Video Course - Electrical Engineering - NOC:Network Analysis

Subject Co-ordinator - Prof. T.K. Bhattacharya

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction
Lecture 2 - Voltage and Current Sources
Lecture 3 - Simple Networks with Voltage and Current Sources
Lecture 4 - Mesh Analysis - I
Lecture 5 - Mesh Analysis - II
Lecture 6 - Nodal Analysis - I
Lecture 7 - Nodal Analysis - II
Lecture 8 - Nodal Analysis - III
Lecture 9 - Inductor - I
Lecture 10 - Initial Condition for Inductor
Lecture 11 - Energy Stored in Inductor with Example
Lecture 12 - R-L Series Circuit Analysis
Lecture 13 - Retrieving Energy or Discharging of Inductor Energy
Lecture 14 - Capacitor
Lecture 15 - Charging of a Capacitor - Voltage, Current and Energy During Charging
Lecture 16 - Discharge of a Charged Capacitor
Lecture 17 - Linearity of R,L,C - Inductor with Initial Current and Capacitor with Initial Voltage
Lecture 18 - General Method for Solving Linear Differential Equation - I
Lecture 19 - General Method for Solving Linear Differential Equation - II
Lecture 20 - General Method for Solving Linear Differential Equation - III
Lecture 21 - Problem Solving
Lecture 22 - R-L Circuit with Sinusoidal Excitation
Lecture 23 - R-C Circuit with Sinusoidal Exponential
Lecture 24 - Solution Due to Exponential Forcing Function
Lecture 25 - Mesh and Nodal Analysis with Time Varying Source
Lecture 26 - Circuit Analysis with Phasor - I
Lecture 27 - Circuit Analysis with Phasor - II
Lecture 28 - Circuit Analysis with Phasor - III
Lecture 29 - Concept of Active and Reactive Power in A.C Circuit - I

Lecture 30 - Concept of Active and Reactive Power in A.C Circuit - II
Lecture 31 - Expression for Complex Power in A.C Circuit
Lecture 32 - Numerical Example
Lecture 33 - Mesh and Nodal Analysis in A.C Circuit, Introduction to Impulse Function
Lecture 34 - Odd and Even Functions, Relation between Unit Step and Impulse Function
Lecture 35 - Solution of Differential Equation with Impulse Excitation
Lecture 36 - Numerical Example when Excitation is Impulse
Lecture 37 - Self and Mutual Inductances - I
Lecture 38 - Dot Convention in Mutually Coupled Coils
Lecture 39 - Mutually Coupled Coils in Series and Parallel
Lecture 40 - Energy Stored in Mutually Coupled Coils
Lecture 41 - Steady State Response with Sinusoidal Excitation when the Coils are Mutually Coupled
Lecture 42 - Basics of Signals in Brief
Lecture 43 - Laplace Transform - I
Lecture 44 - Laplace Transform - II
Lecture 45 - Laplace Transform Applied to Circuit Analysis - I
Lecture 46 - Laplace Transform Applied to Circuit Analysis - II
Lecture 47 - Numerical Examples - I
Lecture 48 - Numerical Examples - II
Lecture 49 - General Second Order Circuit Analysis with L.T - I
Lecture 50 - General Second Order Circuit Analysis with L.T - II
Lecture 51 - Network Theorem - I
Lecture 52 - Network Theorem - II
Lecture 53 - Norton's Theorem
Lecture 54 - Thevenin Theorem
Lecture 55 - Star-Delta and Delta-Star Transformation
Lecture 56 - Telligen's Theorem
Lecture 57 - Reciprocity Theorem
Lecture 58 - Maximum Power Transfer Theorem
Lecture 59 - Graph Theory Applied to Network Analysis - I
Lecture 60 - Graph Theory Applied to Network Analysis - II
Lecture 61 - Graph Theory Applied to Network Analysis - III
Lecture 62 - Graph Theory Applied to Network Analysis - IV
Lecture 63 - Graph Theory Applied to Network Analysis - V
Lecture 64 - Mesh Analysis with Graph Theory
Lecture 65 - Nodal Analysis with Graph Theory
Lecture 66 - Cut-Set Analysis with Graph Theory
Lecture 67 - Numerical Examples of Network Analysis with Graph Theory
Lecture 68 - Circuit Analysis with Dependent Sources - I

Lecture 69 - Circuit Analysis with Dependent Sources - II
Lecture 70 - Circuit Analysis with Dependent Sources - III
Lecture 71 - Two Port Network - I
Lecture 72 - Two Port Network - II
Lecture 73 - Two Port Network - III
Lecture 74 - Two Port Network - IV
Lecture 75 - Two Port Network - V
Lecture 76 - Two Port Network - VI
Lecture 77 - Two Port Network - VII
Lecture 78 - Gyrator
Lecture 79 - Ideal Op - Amp
Lecture 80 - Examples of Ideal Op-Amp Circuits - I
Lecture 81 - Examples of Ideal Op-Amp Circuits - II
Lecture 82 - General Impedance Transfer Circuit and Concluding Remarks

NPTEL Video Course - Electrical Engineering - NOC:Power System Protection

Subject Co-ordinator - Prof. Ashok Kumar Pradhan

Co-ordinating Institute - IIT - Kharagpur

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

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
Lecture 32 - Communication Assisted Relaying Scheme
Lecture 33 - Current Transformer - Part I
Lecture 34 - Current Transformer - Part II
Lecture 35 - Capacitor Voltage Transformer
Lecture 36 - Fiber Optic Sensors
Lecture 37 - Introduction to Transformer Protection
Lecture 38 - Differential Relay
Lecture 39 - Steps in Differential Relay Processing
Lecture 40 - Inrush Detection
Lecture 41 - CT Saturation, Negative Sequence Differential and Restricted Earth Fault Relay
Lecture 42 - Line Differential - Part I
Lecture 43 - Line Differential - Part II
Lecture 44 - Busbar Protection
Lecture 45 - Fault Characteristics of Renewable Sources
Lecture 46 - Protection Challenges of Distribution Systems with Renewables
Lecture 47 - Protection challenges of transmission systems with renewables
Lecture 48 - Traveling Wave Basics
Lecture 49 - Protection using Travelling Waves
Lecture 50 - Fault Location using Travelling Wave
Lecture 51 - Wide Area Measurement Basics
Lecture 52 - Wide Area Measurement for Protection

NPTEL Video Course - Electrical Engineering - NOC:Signal Processing for mm Wave communication for 5G and beyo

Subject Co-ordinator - Prof. Amit Kumar Dutta

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Tx- Rx Structure
Lecture 2 - Rx -Structure
Lecture 3 - Fundamental of Ray-Tracing model
Lecture 4 - General channel model - Part I
Lecture 5 - General channel model - Part I (Continued...)
Lecture 6 - General channel model - Part I (Continued...)
Lecture 7 - General channel model - Part II
Lecture 8 - Wireless channel-A ray tracing model - Part II
Lecture 9 - Wireless channel-A ray tracing model - Part II (Continued...)
Lecture 10 - Wireless channel-A ray tracing model - Part II (Continued...)
Lecture 11 - Wireless channel-A ray tracing model - Part II (Continued...)
Lecture 12 - RMS Delay spread and Doppler Effect on channel
Lecture 13 - Time Varing Model
Lecture 14 - Doppler Impact on coherence BW
Lecture 15 - Introduction to time series
Lecture 16 - AR,ARMA,MA process
Lecture 17 - Doppler with AR process model
Lecture 18 - Coherence time and parameter summery
Lecture 19 - Basic ISI channel
Lecture 20 - Channel estimation and Equalizer
Lecture 21 - precoder and MIMO
Lecture 22 - precoder and MIMO (Continued...)
Lecture 23 - Basics of mmwave spectrum
Lecture 24 - Angle of arrival and angle of departure
Lecture 25 - 3D concepts, AoA,AoD
Lecture 26 - mmWave channel model with RX beaming
Lecture 27 - mmWave channel model with RX beaming (Continued...)
Lecture 28 - mmWave channel model with RX beaming (Continued...)
Lecture 29 - mmWave channel model with RX beaming (Continued...)

Lecture 30 - mmwave channel model (Continued...)
Lecture 31 - mmWave channel model (Continued...) -Tx side multiple antenna
Lecture 32 - Basics of Beamforming
Lecture 33 - Single Antenna beamforming
Lecture 34 - Concept of antenna many fold vector
Lecture 35 - 3D Concept of antenna many fold vector
Lecture 36 - Different Geometry of antennafrom electrical point of view
Lecture 37 - Basics of Beamforming pattern - Part I
Lecture 38 - Basics of Beamforming pattern - Part II
Lecture 39 - SISO Beamforming
Lecture 40 - MIMO Beamforming
Lecture 41 - Structural implementation of MIMO Beamforming
Lecture 42 - Different Level of Beamforming
Lecture 43 - MIMO Beamforming in Transmitter side
Lecture 44 - MIMO Beamforming in Receiver side - Part I
Lecture 45 - MIMO Beamforming in Receiver side - Part II
Lecture 46 - Mathematical description of MIMO Beamforming (Continued...)
Lecture 47 - Equalizer based detector
Lecture 48 - Parameter to be designed in MIMO Beamforming
Lecture 49 - OFDM Data Model
Lecture 50 - OFDM Data model (Continued...)
Lecture 51 - General OFDM
Lecture 52 - OFDM spectrum and CFO
Lecture 53 - MIMO OFDM structure
Lecture 54 - MIMO OFDM decode and beamforming
Lecture 55 - Design parameter estimation - Part 1
Lecture 56 - Design parameter estimation - Part 2
Lecture 57 - Design parameter estimation - Part 3
Lecture 58 - Design parameter estimation - Part 4
Lecture 59 - Design parameter estimation - Part 5
Lecture 60 - MU System
Lecture 61 - CFO and other impairment and their effects
Lecture 62 - Multi User Hybrid beam and impairment and analysis - Part 3
Lecture 63 - Multi User Hybrid beam and Impairment and analysis - Part 4
Lecture 64 - Multi User Hybrid beam and Impairment and analysis - Part 5

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

Subject Co-ordinator - Prof. Santanu Kapat

Co-ordinating Institute - IIT - Kharagpur

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

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

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

NPTEL Video Course - Electrical Engineering - NOC:Advanced Microwave Guided-Structures and Analysis

Subject Co-ordinator - Prof. Bratin Ghosh

Co-ordinating Institute - IIT - Kharagpur

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

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....)
Lecture 32 - Rectangular waveguide - I
Lecture 33 - Rectangular waveguide - I Tutorials
Lecture 34 - Rectangular waveguide - II
Lecture 35 - Rectangular waveguide - II (Continued...)
Lecture 36 - Rectangular waveguide - II Tutorials
Lecture 37 - Rectangular waveguide - II Tutorials (Continued...)
Lecture 38 - Rectangular cavity resonator
Lecture 39 - Rectangular cavity resonator Tutorials
Lecture 40 - Rectangular cavity resonator Tutorials (Continued...)
Lecture 41 - The Reciprocity Theorem, Computation of Amplitudes of Forward and Backward (Continued...)
Lecture 42 - The Reciprocity Theorem, Computation of Amplitudes of Forward and Backward (Continued...)
Lecture 43 - The Reciprocity Theorem, Computation of Amplitudes Tutorials
Lecture 44 - The Reciprocity Theorem, Computation of Amplitudes Tutorials (Continued...)
Lecture 45 - Analysis of Guided Structures
Lecture 46 - Analysis of Guided Structures (Continued...)
Lecture 47 - Analysis of Guided Structures (Continued...)
Lecture 48 - Analysis of Guided Structures (Continued...)
Lecture 49 - Analysis of Guided Structures (Continued...)
Lecture 50 - Analysis of Guided Structures (Continued...)
Lecture 51 - Analysis of Guided Structures (Continued...)
Lecture 52 - Analysis of Guided Structures (Continued...)
Lecture 53 - Analysis of Guided Structures (Continued...)
Lecture 54 - Analysis of Guided Structures (Continued...)
Lecture 55 - Analysis of Guided Structures (Continued...)
Lecture 56 - Analysis of Guided Structures (Continued...)
Lecture 57 - Analysis of Guided Structures Tutorials
Lecture 58 - Analysis of Guided Structures Tutorials (Continued...)
Lecture 59 - Cylindrical Wave Functions
Lecture 60 - Cylindrical Wave Functions (Continued...)
Lecture 61 - Cylindrical Wave Functions (Continued...)
Lecture 62 - Circular Waveguide
Lecture 63 - Circular Cavity
Lecture 64 - Cylindrical Wave Functions Tutorials
Lecture 65 - Cylindrical Wave Functions Tutorials (Continued...)
Lecture 66 - Application to the Coupling Problem : Aperture-Coupled, Probe-Coupled and Waveguide
Lecture 67 - Application to the Coupling Problem : Aperture-Coupled, Probe-Coupled and Waveguide (Continued..
Lecture 68 - Application to the Coupling Problem : Aperture-Coupled, Probe-Coupled and Waveguide (Continued..

Lecture 69 - Application to the Coupling Problem : Aperture-Coupled, Probe-Coupled and Waveguide (Continued..

NPTEL Video Course - Electrical Engineering - NOC:Cognition and its Computation

Subject Co-ordinator - Prof. Rajlakshmi Guha, Prof. Sharba Bandyopadhyay

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction
Lecture 2 - Historical Origin of Cognition Studies
Lecture 3 - The Cognitive Revolution
Lecture 4 - Anatomical Structures of the Brain
Lecture 5 - Frontal Lobes and Cognition
Lecture 6 - Neuropsychological Testing
Lecture 7 - Eye Tracking and Cognition
Lecture 8 - EEG, fMRI, MEG
Lecture 9 - Single neuron level measurements
Lecture 10 - Single Neuron Imaging and Manipulation of Neural Activity
Lecture 11 - Introduction to Computation
Lecture 12 - Currency of Computation in Neurobiology - Action Potential
Lecture 13 - Synapse and Synaptic Transmission
Lecture 14 - Synaptic Plasticity
Lecture 15 - Short Term Plasticity and STDP
Lecture 16 - Coding by neurons
Lecture 17 - Sensory Circuits: Visual - I
Lecture 18 - Sensory Circuits: Visual - II
Lecture 19 - Sensory Circuits: Auditory - I
Lecture 20 - Sensory Circuits: Auditory - II
Lecture 21 - Sensory Circuits: Somatosensory
Lecture 22 - Sensory Circuits: Olfactory and Gustatory
Lecture 23 - Motor circuits - Sensory-motor
Lecture 24 - Reward Circuits
Lecture 25 - Executive Circuits
Lecture 26 - Types of Attention, Theories Broadbent Triessman
Lecture 27 - Alerting Orientation and Executive Network
Lecture 28 - Disorders of Attention
Lecture 29 - Basics of Perception - Object, Depth and Movement

Lecture 30 - Constancy and Illusions
Lecture 31 - Neurobiology of attention, Working Memory
Lecture 32 - Cholinergic System, Bottom up and Top down
Lecture 33 - Object Recognition
Lecture 34 - Visual Search and Pattern Recognition
Lecture 35 - Auditory Scene Analysis, McGurk Effect
Lecture 36 - Learning Processes
Lecture 37 - Learning Processes (Continued...)
Lecture 38 - Memory
Lecture 39 - Learning Disorders
Lecture 40 - Memory Failure - Forgetting
Lecture 41 - Learning in biological neural networks
Lecture 42 - Examples
Lecture 43 - Different types of Plasticity
Lecture 44 - Developmental Plasticity/Learning/Critical Period
Lecture 45 - Examples of Disorders in Plasticity
Lecture 46 - Introduction to speech and language (Development)
Lecture 47 - Components of Speech, Speech Production
Lecture 48 - Speech Perception
Lecture 49 - Lessons from Animal Communication
Lecture 50 - Language and Thought - Speech Language Disorders
Lecture 51 - Theories of Emotion
Lecture 52 - Neurophysiology of emotions - Limbic System
Lecture 53 - Problem Solving
Lecture 54 - Decision Making
Lecture 55 - Frontal cortex in decision making
Lecture 56 - Topics in current research - I
Lecture 57 - Topics in current research - II
Lecture 58 - Topics in current research - III
Lecture 59 - Topics in current research - IV
Lecture 60 - Topics in current research - V

NPTEL Video Course - Electrical Engineering - NOC:Digital Control in Switched Mode Power Converters and FPGA-

Subject Co-ordinator - Prof. Santanu Kapat

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Digital Control in Switched Mode Power Converters - Course Introduction
Lecture 2 - Digital Control of SMPCs - Course Instructions, Guidelines and Resources
Lecture 3 - Examples of Some Commercial Digital Control Solutions
Lecture 4 - Overview of Digital Control Implementation Platforms
Lecture 5 - Introducing Basic Digitization in Power Electronic Converters
Lecture 6 - Recap of Feedback and Feedforward Control Methods in SMPCs
Lecture 7 - Recap of Fixed and Variable Frequency Modulation Techniques
Lecture 8 - Levels of Digitization in Single-loop Feedback Control in SMPCs
Lecture 9 - Levels of Digitization in Multi-loop Feedback Control in SMPCs
Lecture 10 - SMPC Topologies and Power Stage Design for Hardware Demonstrations
Lecture 11 - Basics of Sampling under Fixed and Variable Frequency Modulation
Lecture 12 - Voltage Mode Digital Pulse Width Modulators and Sampling Methods
Lecture 13 - Overview of Digital Pulse Width Modulator Architectures
Lecture 14 - Sampling Methods under Fixed Frequency Current Mode Control
Lecture 15 - Overview of Fixed Frequency Current Mode Control Architectures
Lecture 16 - Sampling Methods under Constant On/Off - Time Digital Modulation
Lecture 17 - Constant On/Off- Time Mixed-Signal Current Mode Control Architectures
Lecture 18 - Sampling Methods under Digital Hysteresis Control Methods
Lecture 19 - Overview of Digital Hysteresis Control Architectures
Lecture 20 - Summary of Digital Current Mode Control Architectures
Lecture 21 - Recap of Voltage and Current Mode Control Implementation using MATLAB
Lecture 22 - MATLAB Model Development for Basic Digital Control Blocks
Lecture 23 - MATLAB Model Development for Fixed Frequency Digital Control
Lecture 24 - MATLAB Models for Digital Controllers using Difference Equations
Lecture 25 - MATLAB Model Development for Digital Voltage Mode Control
Lecture 26 - MATLAB Model Development for Mixed-Signal Current Mode Control
Lecture 27 - MATLAB Model Development for Fully Digital Current Mode Control
Lecture 28 - MATLAB Model Development for Constant-On Time Control
Lecture 29 - MATLAB Model Development for Constant-Off Time Control

Lecture 30 - MATLAB Model Development for Digital Current Hysteresis Control
Lecture 31 - Continuous-Time Small-Signal Modeling under Digital Control
Lecture 32 - Discrete Time Modeling with Closed Current Loop
Lecture 33 - State-Space Modeling and Steps For Deriving Discrete-Time Models
Lecture 34 - Derivation of Discrete-Time Large-Signal Models
Lecture 35 - Validation of Discrete-Time Large-Signal Models using MATLAB - Part I
Lecture 36 - Validation of Discrete-Time Large-Signal Models using MATLAB - Part II
Lecture 37 - Derivation of Discrete-Time Small-Signal Models - I
Lecture 38 - Derivation of Discrete-Time Small-Signal Models - II
Lecture 39 - Discrete-Time Transfer Functions and Closed Loop Block Diagrams
Lecture 40 - Model Accuracy with MATLAB Case Studies - Comparative Study
Lecture 41 - Continuous-Time to Discrete-Time Conversion Methods - A Summary
Lecture 42 - Recap of Frequency Domain Design of Analog VMC and CMC
Lecture 43 - Design under Digital Voltage Mode Control - Frequency Domain Approaches
Lecture 44 - Design under Digital Current Mode Control - Frequency Domain Approaches
Lecture 45 - Design Case Study and MATLAB Simulation of Digital Voltage Mode Control
Lecture 46 - Design Case Study and MATLAB Simulation of Digital Current Mode Control
Lecture 47 - Time Optimal Control of a Buck Converter and Identifying Performance Limits
Lecture 48 - Trajectory based CMC Design for Proximate Time Optimal Recovery
Lecture 49 - Trajectory based Digital CMC Tuning and MATLAB Case Studies
Lecture 50 - Digital Pulse Skipping Control and MATLAB Simulation Case Studies
Lecture 51 - Selection of ADC and DAC in Digitally Controlled SMPCs
Lecture 52 - High Frequency Current Sensing Techniques in Digitally Controlled SMPCs
Lecture 53 - Current Sensing Techniques in Digitally Controlled High Power Converters
Lecture 54 - Signal Conditioning Circuits and PCB Design for Mixed-Signal Implementation
Lecture 55 - Reference Power Stage Design and Schematic for Buck and Boost Converters - I
Lecture 56 - Reference Power Stage Design and Schematic for Buck and Boost Converters - II
Lecture 57 - Step-by-Step Guidelines for Digital Control Implementation using FPGA
Lecture 58 - Test and Measurement of a Buck Converter using Digital Storage Oscilloscope
Lecture 59 - Functionalities in Mixed Signal Oscilloscope for Validating Digital Control
Lecture 60 - Power Spectrum Analysis of SMPCs using Mixed-Signal Oscilloscope
Lecture 61 - Introduction to Verilog Hardware Description Language (HDL)
Lecture 62 - Guidelines for Verilog HDL Programming - Some Key Rules
Lecture 63 - Structural and Dataflow Modeling in Verilog HDL for Combinational Logics
Lecture 64 - Behavioral Modeling in Verilog HDL for Sequential Digital Circuits
Lecture 65 - Simulation of Verilog-HDL based Design using Xilinx Webpack - I
Lecture 66 - Simulation of Verilog-HDL based Design using Xilinx Webpack - II
Lecture 67 - Fixed Point Implementation in Embedded Control System
Lecture 68 - Fixed Point Arithmetic and Concept of Q Format

Lecture 69 - Counter-based DPWM with Deadtime and Verilog HDL Programming
Lecture 70 - Simulating Counter-based DPWM with Deadtime using Xilinx ISE Simulator
Lecture 71 - Top Down Design Methodology in Digital Voltage Mode Control - I
Lecture 72 - Top Down Design Methodology in Digital Voltage Mode Control - II
Lecture 73 - Digital PID Control Implementation using Verilog HDL Programming
Lecture 74 - Digital PID Controller - Hardware Implementation and Experimental Results
Lecture 75 - Top Down Design Methodology in Mixed-Signal Current Mode Control
Lecture 76 - Top Down Design Method and Verilog HDL Programming of Mixed-Signal CMC
Lecture 77 - Verilog HDL based Digital PI Control Implementation of Mixed-Signal CMC
Lecture 78 - Hardware Implementation of Mixed-Signal CMC and Experimental Results
Lecture 79 - Voltage based Digital Pulse Skip Modulation and Top Down Design Method
Lecture 80 - Implementing Digital Pulse Skip Modulation and Experimental Results
Lecture 81 - STM32 Overview and STM32G4x ecosystem
Lecture 82 - Getting started with STM32CubeMX - Part I
Lecture 83 - Getting started with STM32CubeMX - Part II
Lecture 84 - Practical implementation of LLC converters - Part I
Lecture 85 - Practical implementation of LLC converters - Part II
Lecture 86 - Texas Instruments C2000 Real-time Microcontroller Devices
Lecture 87 - Getting Started with C2000 - Software and Hardware Development
Lecture 88 - Texas Instruments C2000 key peripheral differentiations
Lecture 89 - Texas Instruments TIDM-02008 Reference Design Overview
Lecture 90 - Texas Instruments TIDM-02008 Reference Design Software Overview
Lecture 91 - Steps for FPGA Implementation of Digital Voltage Mode Control
Lecture 92 - Steps for FPGA Implementation of Mixed-Signal Current Mode Control
Lecture 93 - Instability in Digital CMC and Ramp Compensation with Experimental Results
Lecture 94 - Benefits of Constant Off-Time and On-Time Digital CMC Techniques
Lecture 95 - Top Down Design Methodology of Constant On/Off-Time Control
Lecture 96 - Verilog HDL Implementation of Voltage based Constant On-Time Control
Lecture 97 - FPGA Implementation of Constant On/Off-Time Mixed-Signal CMC
Lecture 98 - Stability Comparison of Fixed and Variable Freq. Digital CMC with Experimental Results
Lecture 99 - Assessment of Digital Control Techniques for Light Load DC-DC Converters
Lecture 100 - Adaptive On-Time Digital Control in DCM with Verilog HDL Implementation
Lecture 101 - MATLAB Simulation of a Practical Digital VMC Buck Converter in CCM
Lecture 102 - Data Acquisition and Steps for Validating Simulation and Experimental Results
Lecture 103 - Loop Shaping and Design of Digital Voltage Mode Control in a Buck Converter
Lecture 104 - Digital VMC Design for Shaping Output Impedance in a Buck Converter
Lecture 105 - Hardware Case Studies and Transient Performance in Digital VMC Buck Converter
Lecture 106 - Design and Simulation Case Studies in a Mixed-Signal CMC Buck Converter
Lecture 107 - Hardware Case Studies and Transient Performance in a Digital CMC Buck Converter

Lecture 108 - Analysis of Output Impedance in Digital CMC with Load Current Feedforward
Lecture 109 - Load Current Feedforward in Digital CMC Buck Converter: Experimental Results
Lecture 110 - Need for Multi-Mode Digital Control and Design Requirements in SMPCs
Lecture 111 - Implementing Bi-frequency Spread Spectrum in Digital VMC using Verilog HDL
Lecture 112 - Performance of Bi-frequency Spread Spectrum DPWM and Experimental Results
Lecture 113 - Top Down Design Methodology of PWM/PSM Multi-Mode Digital Control
Lecture 114 - Verilog HDL based FPGA Prototyping of PWM/PSM Multi-Mode Digital Control
Lecture 115 - FPGA Prototyping of Peak Current based PWM/PFM Multi-Mode Digital Control - I
Lecture 116 - FPGA Prototyping of Peak Current based PWM/PFM Multi-Mode Digital Control - II
Lecture 117 - Industry-Driven Architectures for Digital Control IC in High Frequency SMPC
Lecture 118 - Industry-Driven Architectures for Digital Control System Solutions in SMPCs
Lecture 119 - Exploration of Architectures, Modeling, Design, and Control - Course Summary
Lecture 120 - Key Takeaways and Course Usefulness for Skilled Manpower Development

NPTEL Video Course - Electrical Engineering - NOC:VLSI Interconnects

Subject Co-ordinator - Prof. Sarang Pendharker

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to VLSI interconnects
Lecture 2 - The distributed RC interconnect model
Lecture 3 - The Elmore delay
Lecture 4 - Elmore delay in interconnects
Lecture 5 - Elmore delay in branched RC interconnects
Lecture 6 - Equivalent circuit for RC interconnects
Lecture 7 - Scaling effects in interconnects
Lecture 8 - Delay mitigation in RC interconnects
Lecture 9 - RC interconnect simulation
Lecture 10 - Inductive effects in interconnects
Lecture 11 - Distributed RLC interconnect model
Lecture 12 - Transmission line equations
Lecture 13 - When to consider the inductive effects?
Lecture 14 - The transfer function of an RLC interconnect
Lecture 15 - Time domain response of a lumped RLC circuit
Lecture 16 - Equivalent Elmore model for RLC interconnects
Lecture 17 - Two-pole model of RLC interconnects from ABCD parameters
Lecture 18 - RLC interconnect simulation
Lecture 19 - Origin of the skin effect
Lecture 20 - Effective resistance at high frequencies
Lecture 21 - Equivalent circuit to simulate skin effect
Lecture 22 - Power dissipation due to interconnects
Lecture 23 - Optimum interconnect width for minimizing total power dissipation
Lecture 24 - Heating effects and thermal modeling
Lecture 25 - Compact thermal modeling with equivalent electrical circuits
Lecture 26 - Electromigration in interconnects
Lecture 27 - Mitigation of electromigration
Lecture 28 - Capacitive coupling in interconnects
Lecture 29 - Cross-talk and timing jitters in two identical interconnects

Lecture 30 - Coupling effects and mitigation techniques
Lecture 31 - Matrix formulation of coupled interconnects
Lecture 32 - Coupled RLC interconnects
Lecture 33 - Decoupling of interconnects by diagonalization of matrix
Lecture 34 - Analysis of coupled interconnects: Examples - 1
Lecture 35 - Analysis of coupled interconnects: Examples - 2
Lecture 36 - Simulation of RC coupled interconnects
Lecture 37 - Extraction of capacitance - Part 1
Lecture 38 - Extraction of capacitance - Part 2
Lecture 39 - Extraction of inductance - Part 1
Lecture 40 - Extraction of inductance - Part 2
Lecture 41 - Estimation of interconnect parameters from S-parameters

NPTEL Video Course - Electrical Engineering - NOC:Semiconductor Device Modeling and Simulation

Subject Co-ordinator - Prof. Vivek Dixit

Co-ordinating Institute - IIT - Kharagpur

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

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
Lecture 32 - MOSFET (Continued...)
Lecture 33 - Problem Session - 5
Lecture 34 - Semiclassical Transport
Lecture 35 - Semiclassical Transport (Continued...)
Lecture 36 - Semiclassical Transport (Continued...)
Lecture 37 - Semiclassical Transport (Continued...)
Lecture 38 - Semiclassical Transport (Continued...)
Lecture 39 - Problem Session - 6
Lecture 40 - Drift-diffusion model
Lecture 41 - Drift-diffusion model (Continued...)
Lecture 42 - Drift-diffusion model (Continued...)
Lecture 43 - Drift-diffusion model (Continued...)
Lecture 44 - Generation-Recombination
Lecture 45 - Generation-Recombination (Continued...)
Lecture 46 - Solving DD Equations (Continued...)
Lecture 47 - Solving DD Equations (Continued...)
Lecture 48 - Problem Session - 7
Lecture 49 - Hydrodynamic Model
Lecture 50 - Hydrodynamic Model (Continued...)
Lecture 51 - Hydrodynamic Model (Continued...)
Lecture 52 - Monte Carlo simuations
Lecture 53 - Problem Session - 8
Lecture 54 - Quantum Mechanics
Lecture 55 - Solving Schrodinger Equation
Lecture 56 - Quantum Correction Models
Lecture 57 - Quantum Transport
Lecture 58 - Transfer Matrix Approach
Lecture 59 - TCAD Tools
Lecture 60 - ATLAS SILVACO
Lecture 61 - Simulating Junctions
Lecture 62 - Models and Simulation Concepts
Lecture 63 - Mixed-mode Simulation

NPTEL Video Course - Electrical Engineering - NOC:RF and Microwave Networks

Subject Co-ordinator - Prof. Bratin Ghosh

Co-ordinating Institute - IIT - Kharagpur

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

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
Lecture 65 - Aperture coupling to cavities
Lecture 66 - Aperture coupling to cavities (Continued...)
Lecture 67 - Wave interaction with cylindrical structures
Lecture 68 - Wave interaction with cylindrical structures (Continued...)

Lecture 69 - Wave interaction with cylindrical structures (Continued...)
Lecture 70 - Wave interaction with cylindrical structures (Continued...)
Lecture 71 - Wave interaction with cylindrical structures (Continued...)
Lecture 72 - Wave interaction with cylindrical structures (Continued...)
Lecture 73 - Wave interaction with cylindrical structures (Continued...)
Lecture 74 - Wave interaction with cylindrical structures (Continued...)
Lecture 75 - Tutorial - 12

NPTEL Video Course - Electrical Engineering - NOC:Introduction to Adaptive Signal Processing

Subject Co-ordinator - Prof. Mrityunjoy Chakraborty

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to Adaptive Filters
Lecture 2 - Probability and Random Variables
Lecture 3 - General Set of Random Variables
Lecture 4 - Statistical Impedance, Covariance Matrices
Lecture 5 - Multivariate Gaussian Density
Lecture 6 - Complex Random Variables
Lecture 7 - Introduction to Hermitian Matrices
Lecture 8 - Eigenvalues and eigenvectors of Hermitian Matrices
Lecture 9 - Spectral Decomposition of Hermitian Matrices
Lecture 10 - Positive Definite and Semidefinite Matrices
Lecture 11 - Introduction to Discrete Time Random Processes
Lecture 12 - Power Spectral Density (PSD)
Lecture 13 - PSD and Linear Time Invariant Systems
Lecture 14 - Optimal FIR Filter
Lecture 15 - Optimal FIR Filter (Continued...)
Lecture 16 - LMS Algorithm
Lecture 17 - Convergence Proof of LMS Algorithm
Lecture 18 - Convergence Proof of LMS Algorithm (Continued...)
Lecture 19 - Application of Adaptive Filter
Lecture 20 - Application of Adaptive Filter (Continued...)
Lecture 21 - Application of Adaptive Filter (Continued...)
Lecture 22 - Applications of Adaptive Filter
Lecture 23 - Applications of Adaptive Filter
Lecture 24 - Second Order Analysis of LMS Algorithm
Lecture 25 - Second Order Analysis of LMS Algorithm (Continued...)
Lecture 26 - Second Order Analysis of LMS Algorithm (Continued...)
Lecture 27 - Second Order Analysis of LMS Algorithm (Continued...)
Lecture 28 - NLMS Algorithm
Lecture 29 - NLMS Algorithm

Lecture 30 - Affine Projection Algorithm (APA)
Lecture 31 - Affine Projection Algorithm (APA)
Lecture 32 - Introduction to RLS Algorithm
Lecture 33 - Introduction to RLS Algorithm (Continued...)
Lecture 34 - Introduction to RLS Algorithm (Continued...)
Lecture 35 - Formulation of the RLS Algorithm
Lecture 36 - Introduction to RLS Algorithm
Lecture 37 - Introduction to RLS Algorithm
Lecture 38 - Formulation of the RLS Algorithm
Lecture 39 - Derivation of the RLS transversal adaptive filter
Lecture 40 - Derivation of the RLS transversal adaptive filter
Lecture 41 - Derivation of the RLS transversal adaptive filter

NPTEL Video Course - Electrical Engineering - NOC:Nanobiophotonics: Touching Our Daily Life

Subject Co-ordinator - Dr. Basudev Lahiri

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - What is Nano Bio Photonics?
Lecture 2 - Why is Nano Bio Photonics?
Lecture 3 - Why do this?
Lecture 4 - Why Photonics?
Lecture 5 - Why Biology?
Lecture 6 - Nature of Light
Lecture 7 - Light-Matter Interactions
Lecture 8 - Introduction to Fluorescence
Lecture 9 - The Cell
Lecture 10 - The Central Dogma
Lecture 11 - Facts of Matter
Lecture 12 - Introduction to Nanotechnology
Lecture 13 - Nanotechnology: The art of small
Lecture 14 - Synthesis of Nanomaterials : Top-Down Approach
Lecture 15 - Applications of Nanomaterials in Photonics
Lecture 16 - Interaction of Light with Cells
Lecture 17 - Light-matter interactions in molecules (Basic of Spectroscopy)
Lecture 18 - Imaging for Biological Matters
Lecture 19 - Fluorophores and Fluorescence Microscopy Techniques
Lecture 20 - Primary Examples
Lecture 21 - Basics of Flow Cytometry - Part 1
Lecture 22 - Basics of Flow Cytometry - Part 2
Lecture 23 - Data manipulation and presentation
Lecture 24 - Application of Flow cytometry in Biology
Lecture 25 - Raman Assisted Flow cytometry
Lecture 26 - Genetic Code
Lecture 27 - Biosensing Background
Lecture 28 - Basics of Microarray Technology
Lecture 29 - DNA Microarray Technology

Lecture 30 - Protein Microarray Technology
Lecture 31 - Laser Principles and Operation
Lecture 32 - Nonlinear Optical Processes
Lecture 33 - In Vivo Photoexcitation
Lecture 34 - Light/Laser Activated Therapy
Lecture 35 - Laser Tissue Contouring
Lecture 36 - Metamaterials
Lecture 37 - Metamaterials as Biosensors
Lecture 38 - Biosensing with Optical Nano-Antennas
Lecture 39 - Nanoscale Chemical Imaging
Lecture 40 - Optical Tweezers
Lecture 41 - Introduction to Optogenetics
Lecture 42 - Controlling the Brain with Light
Lecture 43 - The Nervous System
Lecture 44 - The Neural Circuits
Lecture 45 - Optical Neuroimaging and Tomography
Lecture 46 - Functional Near-Infrared Spectroscopy (fNIRS) of the Brain
Lecture 47 - Neuro imaging with Light-Sheet Microscopy
Lecture 48 - Brain imaging with Two Photon Microscopy
Lecture 49 - Brain imaging with functional optoacoustic Imaging
Lecture 50 - Tomographic technique for Brain imaging
Lecture 51 - Optogenetic Modulation of Neural Circuits
Lecture 52 - Nanoparticles for Optical Modulation of Neuronal Behavior
Lecture 53 - Optical Stimulation of Neural Circuits in Freely Moving Animals
Lecture 54 - Higher Harmonic Generation Imaging for Neuropathology
Lecture 55 - Multi-Photon Nanosurgery
Lecture 56 - Bioinspired materials for photonics
Lecture 57 - Bioderived Materials
Lecture 58 - Bioinspired Materials
Lecture 59 - Biotemplates
Lecture 60 - Summary and Revisiting Few Topics

NPTEL Video Course - Electrical Engineering - NOC:EMI-EMC and Signal Integrity: Principles, Techniques and Ap

Subject Co-ordinator - Prof. Amitabha Bhattacharya

Co-ordinating Institute - IIT - Kharagpur

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

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...)
Lecture 32 - Crosstalk
Lecture 33 - Development of Multi Conductor Transmission Line Equation
Lecture 34 - Per Unit Length Parameter of a Three Conductor System
Lecture 35 - Parameters of Three Conductor Systems (Continued...)
Lecture 36 - Parameters of Three Conductor Systems (Continued...)
Lecture 37 - Development of crosstalk model infrequency domain
Lecture 38 - Determination of Terminal Currents of a three conductor system
Lecture 39 - Derivation of Chain Parameter Matrix
Lecture 40 - Determination of Crosstalk in a Lossless Line Immersed in Homogeneous Medium
Lecture 41 - Determination of Crosstalk (Continued...)
Lecture 42 - Determination of Crosstalk (Continued...)
Lecture 43 - Determination of Crosstalk (Continued...)
Lecture 44 - Inductive and Capacitive coupling
Lecture 45 - Time Domain Crosstalk
Lecture 46 - Time Domain Crosstalk (Continued...)
Lecture 47 - Inclusion of Losses in Transient Crosstalk
Lecture 48 - Conducted emission and susceptibility
Lecture 49 - Shielding
Lecture 50 - Shielding Effectiveness for Farfield Source
Lecture 51 - Shielding Effectiveness Due to Farfield Source (Continued...)
Lecture 52 - SE Due to Farfield Sources (Continued...) and Free Space Impedance Ar Nearfield
Lecture 53 - Shielding for Nearfield Source
Lecture 54 - EMC System Aspect for Shielding
Lecture 55 - Grounding
Lecture 56 - Grounding (Continued...)
Lecture 57 - Bonds and Joints
Lecture 58 - EMC Case Studies
Lecture 59 - Electrostatic Discharge (ESD)

NPTEL Video Course - Electrical Engineering - NOC:Embedded Sensing, Actuation and Interfacing Systems

Subject Co-ordinator - Prof. Banibrata Mukherjee

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction
Lecture 2 - Real-life Examples Illustration
Lecture 3 - Sensor Structure and Characteristics
Lecture 4 - Sensor and Actuator Characteristics and Numerical Problem
Lecture 5 - Temperature Sensors and its Signal Conditioning Circuits
Lecture 6 - Motion Sensors and its Interfacing Aspects
Lecture 7 - Gyroscope and Strain Gauge
Lecture 8 - Strain Gauge and Optical Sensor
Lecture 9 - Optical Encoder, Gas Sensor and Chemical Sensor
Lecture 10 - Magnetic Sensor and Actuator
Lecture 11 - Electrical Actuator
Lecture 12 - Electrical Actuator: Stepper Motor and Heater
Lecture 13 - Smart Material Actuator
Lecture 14 - Metamaterial and Other Actuators
Lecture 15 - Op-amp based circuits and amplifier
Lecture 16 - Various Op-amp Configurations
Lecture 17 - Instrumentation Amplifier and Filter
Lecture 18 - Passive and Active Filters
Lecture 19 - Universal Filter and Data Converter
Lecture 20 - ADC and DAC
Lecture 21 - Sampling Issue and Communication Protocol
Lecture 22 - Bridge Circuits and their Linearity Improvement
Lecture 23 - Linearization and error reduction schemes
Lecture 24 - Principle of Direct Interfacing Scheme
Lecture 25 - Various Aspects of Direct Interfacing
Lecture 26 - Direct Interfacing for Differential and Bridge Type Resistive Sensor
Lecture 27 - Measurement Uncertainties and Interface of Sensor Array
Lecture 28 - Various Configurations of Capacitive Sensors
Lecture 29 - Analog Interface Circuit and Direct Interfacing Scheme

Lecture 30 - Direct Interfacing Scheme for Differential Capacitive Sensor
Lecture 31 - Lossy Capacitive Sensor and its Interfacing Aspect
Lecture 32 - Advanced Interfacing Circuits for Lossy Capacitive Sensor
Lecture 33 - Autobalance Active Bridge Interfacing Circuit
Lecture 34 - Background of Miniaturization
Lecture 35 - Micromachining Technology for MEMS Devices
Lecture 36 - Bulk and Surface Micromachining and Fabrication Steps
Lecture 37 - MEMS Fabrication Process - Part 1
Lecture 38 - MEMS Fabrication Process - Part 2
Lecture 39 - MEMS Fabrication Process - Part 3
Lecture 40 - MEMS Fabrication Process - Part 4
Lecture 41 - MEMS-IC Integration Aspects and Miniaturized Sensor
Lecture 42 - MEMS Pressure Sensor and Interfacing Electronics
Lecture 43 - MEMS Accelerometer
Lecture 44 - MEMS Capacitive Accelerometer and Interfacing Electronics
Lecture 45 - Interfacing Electronics Details for MEMS Accelerometer
Lecture 46 - MEMS Gyroscope and Flow sensor
Lecture 47 - MEMS Actuator
Lecture 48 - MEMS Electrostatic Actuator Analysis
Lecture 49 - Background of Renewable Energy Harvesting
Lecture 50 - Various Transduction Mechanisms for Energy Harvester
Lecture 51 - Vibration Energy Harvester and its Interfacing Aspects
Lecture 52 - Interfacing Power Management Circuit for Vibration Energy Harvester
Lecture 53 - Demonstration of Energy Harvester Set-up and Self-powered Embedded System
Lecture 54 - Background of Embedded Sensors and Actuators in Automotives
Lecture 55 - Applications in Safety System of Automotive
Lecture 56 - Applications in Safety System and Engine Control System
Lecture 57 - Application in Cardiovascular Measurements
Lecture 58 - Applications in Remote Healthcare and Smart Medical Devices
Lecture 59 - Electronic Nose and its Applications in Disease Detection
Lecture 60 - Virtual Sensing, Research Scopes, Summary and Key Takeaways of the Course

NPTEL Video Course - Electrical Engineering - NOC:A Basic Course on Electric and Magnetic Circuits

Subject Co-ordinator - Prof. Ashok Kumar Pradhan

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Electric systems
Lecture 2 - Resistive circuit connections
Lecture 3 - Nodal analysis
Lecture 4 - Mesh Analysis / Loop Analysis
Lecture 5 - Mixed sources - Meshand Nodal analysis
Lecture 6 - Superposition Theorem
Lecture 7 - Thevenin's Theorem and its applications
Lecture 8 - Norton's theorem and Maximum power transfer theorem
Lecture 9 - Review problems on DC circuits
Lecture 10 - Average and RMS values Phasor representation of sinusoids Reactance
Lecture 11 - Series AC circuits, R-L, R-C, R-L-C
Lecture 12 - KVL and KCL Series and parallel combination of impedance Star - delta transformations
Lecture 13 - Power Curves for AC circuits
Lecture 14 - Real and Reactive Power
Lecture 15 - Loop current method, nodal analysis and theorems
Lecture 16 - Theorem-examples, maximum power transfer theorem
Lecture 17 - Resonance
Lecture 18 - Power Factor Improvement
Lecture 19 - Review problems on AC circuits
Lecture 20 - Capacitor - properties series - parallel combinations
Lecture 21 - Inductor - properties series - parallel combinations
Lecture 22 - Source free RC and RL circuits
Lecture 23 - Step response of RC and RL circuits
Lecture 24 - Review Problems on RL and RC transients
Lecture 25 - Basics on three phase systems
Lecture 26 - Line and phase currents and voltages in star connected systems
Lecture 27 - Line and phase voltages and currents in delta connected systems
Lecture 28 - Three phase power
Lecture 29 - Three phase power and Power factor

Lecture 30 - Measurement of 3 - phase power
Lecture 31 - Magnetic flux, flux density, magnetic field strength
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 Video Course - Electrical Engineering - NOC:Deep Learning for Natural Language Processing

Subject Co-ordinator - Prof. Pawan Goyal

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction to the Course
Lecture 2 - Text Processing Basics, Tokenization
Lecture 3 - N-gram Language Models - Part 1
Lecture 4 - N-gram Language Models - Part 2
Lecture 5 - NLP Tasks and Paradigms
Lecture 6 - Tutorial 1
Lecture 7 - Supervised Learning
Lecture 8 - Shallow Neural Networks
Lecture 9 - Deep Neural Networks
Lecture 10 - Backpropagation
Lecture 11 - Gradient Descent and Initialization
Lecture 12 - Tutorial 2
Lecture 13 - Word Representation
Lecture 14 - Learning Word Representation - Part I
Lecture 15 - Learning Word Representation - Part II
Lecture 16 - Word Vectors: Other Extensions
Lecture 17 - Cross-Lingual Representations
Lecture 18 - Tutorial 3
Lecture 19 - RNN Language Models
Lecture 20 - RNN Applications : Text Generation, Sequence Labeling, Text Classification
Lecture 21 - RNN for Sequence to Sequence
Lecture 22 - Decoding Strategies
Lecture 23 - Better RNN Units : GRU, LSTM
Lecture 24 - Tutorial 4
Lecture 25 - Introduction to Transformers
Lecture 26 - Transformers - Part 2
Lecture 27 - Transformers - Part 3
Lecture 28 - Transformers - Part 4
Lecture 29 - Efficient Transformers

Lecture 30 - Tutorial 5
Lecture 31 - Pretraining
Lecture 32 - Pretraining Transformer Encoder
Lecture 33 - Pretraining Transformer Encoder, Encoder-Decoder
Lecture 34 - Pretraining Transformer Decoder
Lecture 35 - More on Pretraining
Lecture 36 - Tutorial 6
Lecture 37 - Applications : Question Answering - I
Lecture 38 - Applications : Question Answering - II
Lecture 39 - Applications : Dialogue Systems - I
Lecture 40 - Applications : Dialogue Systems - II
Lecture 41 - Applications : Text Summarization
Lecture 42 - Tutorial 7
Lecture 43 - Instruction Fine-Tuning - I
Lecture 44 - Instruction Fine-Tuning - II
Lecture 45 - Reinforcement Learning from Human Feedback - I
Lecture 46 - Reinforcement Learning from Human Feedback - II
Lecture 47 - Aligning to User Preferences via Direct Preference Optimization
Lecture 48 - Tutorial 8
Lecture 49 - Prompting - I
Lecture 50 - Prompting : Why does in-context learning work?
Lecture 51 - Advanced Prompting Techniques
Lecture 52 - Tool-aided Language Models
Lecture 53 - Automatic Prompt Engineering
Lecture 54 - Tutorial 9
Lecture 55 - Parameter-efficient fine-tuning - I
Lecture 56 - Parameter-efficient fine-tuning - II
Lecture 57 - Efficient fine-tuning for quantized LMs - I
Lecture 58 - Efficient fine-tuning for quantized LMs - II
Lecture 59 - Other Parameter Efficient Methods: Pruning, Distillation
Lecture 60 - Tutorial 10
Lecture 61 - Scaling Laws of LLMs
Lecture 62 - Modern LLMs and Architecture Variations - I
Lecture 63 - Modern LLMs and Architecture Variations: Positional Embeddings
Lecture 64 - Long Sequence Modeling
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 Video Course - Electrical Engineering - Modelling and Analysis of Electric Machines

Subject Co-ordinator - Dr. Krishna Vasudevan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction
Lecture 2 - Magnetic Fields
Lecture 3 - Magnetic Circuit
Lecture 4 - Singly Excited Linear Motion System
Lecture 5 - Linear and Cylindrical Motion Systems
Lecture 6 - Systems with Multiple Excitations
Lecture 7 - Non-linear Magnetic Systems
Lecture 8 - Inductances in Constant Air gap Machines
Lecture 9 - Inductance in Salient Pole Machine - I
Lecture 10 - Inductance in Salient Pole Machine - II
Lecture 11 - Inductance in Salient Pole Machine - III
Lecture 12 - Inductance in Salient Pole Machine - IV
Lecture 13 - Inductance in Salient Pole Machine - V
Lecture 14 - Inductances of Distributed Winding - I
Lecture 15 - Inductances of Distributed Winding - II
Lecture 16 - Inductances of Distributed Winding - III
Lecture 17 - Dynamic Equations of Induction Machines
Lecture 18 - Dynamic Equations of Salient Pole Synchronous Machine
Lecture 19 - Three-to-Two Phase Transformation
Lecture 20 - Induction Machine in Two-Phase Reference Frame
Lecture 21 - The Pseudo-Stationary Reference Frame
Lecture 22 - Induction Machine in Pseudo-Stationary Reference Frame
Lecture 23 - The Primitive Machine Equations
Lecture 24 - Dynamic Equations of DC Machines
Lecture 25 - Small Signal Model of DC Machine
Lecture 26 - Small Signal Behaviour of DC Machine
Lecture 27 - The Arbitrary Reference Frame
Lecture 28 - Induction Machine Equations in Arbitrary, Synchronous Reference Frames and Small Signal Modellin
Lecture 29 - Introduction to Field Oriented Control of Induction Machines

Lecture 30 - Space Vector Formulation of Induction Machine Equations
Lecture 31 - Modelling of Salient Pole Synchronous Machines - I
Lecture 32 - Modelling of Salient Pole Synchronous Machines - II
Lecture 33 - Modelling of Salient Pole Synchronous Machines - III
Lecture 34 - Steady State Models - Induction Machine
Lecture 35 - Steady State Models - Salient Pole Synchronous Machine
Lecture 36 - Solution of Dynamic Equations of Induction Machine - I
Lecture 37 - Solution of Dynamic Equations of Induction Machine - II
Lecture 38 - Reactances of Salient Pole Synchronous Machines - I
Lecture 39 - Reactances of Salient Pole Synchronous Machines - II
Lecture 40 - Reactances of Salient Pole Synchronous Machines - III
Lecture 41 - Suddent Short Circuit of Three Phase Alternator - Analytical Solution
Lecture 42 - Suddent Short Circuit of Three Phase Alternator - Numerical Simulation
Lecture 43 - Course Recapitulation and Assignments

NPTEL Video Course - Electrical Engineering - Analog ICs

Subject Co-ordinator - Prof. K. Radhakrishna Rao

Co-ordinating Institute - IIT - Madras | Texas Instruments - India

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

Lecture 1 - Basic Building Blocks In Analog ICs
Lecture 2 - Current Mirrors
Lecture 3 - Translinear Networks
Lecture 4 - Differential Amplifier
Lecture 5 - Differential Amplifier Characteristics
Lecture 6 - Video Amplifier and RF/IF Amplifiers
Lecture 7 - Cascade Amplifier
Lecture 8 - IC Negative Feedback Wide Band Amplifiers
Lecture 9 - IC Negative Feedback Amplifiers
Lecture 10 - Voltage Sources And References
Lecture 11 - IC Voltage Regulator
Lecture 12 - Characteristics and Parameters Of Voltage
Lecture 13 - Protection Circuitry For Voltage Regulator
Lecture 14 - Switched Mode Regulator And Operational
Lecture 15 - IC Operational Voltage Amplifier
Lecture 16 - General Purpose Operational Amplifier-747
Lecture 17 - Transconductance Operational Amplifier
Lecture 18 - Audio Power Amplifier and Norton's Amplifier
Lecture 19 - Analog Multipliers
Lecture 20 - Analog Multipliers
Lecture 21 - Voltage Controlled Oscillator
Lecture 22 - Voltage Controlled Oscillator
Lecture 23 - Self Tuned Filter
Lecture 24 - Phase Locked Loop24 Phase Locked Loop
Lecture 25 - Phase Locked Loop
Lecture 26 - Phase Locked Loop
Lecture 27 - Phase Locked Loop
Lecture 28 - Current Mode ICs

NPTEL Video Course - Electrical Engineering - Digital Integrated Circuits

Subject Co-ordinator - Prof. Amitava Dasgupta

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Semiconductors
Lecture 2 - Modelling of PN Junction Diodes
Lecture 3 - Modelling of BJTs
Lecture 4 - Diode and BJT Model Parameter Extraction
Lecture 5 - BJT Inverters DC and Switching Characteristics
Lecture 6 - Schottky Transistor
Lecture 7 - Specifications of Logic Circuits
Lecture 8 - Qualitative discussion on TTL Circuits
Lecture 9 - Standard TTL Circuits
Lecture 10 - Schottky (74s..) and Low power Schottky (74ls)
Lecture 11 - Advanced TTL Circuits
Lecture 12 - I2 L Technology
Lecture 13 - Edge triggered D-F/F
Lecture 14 - I2 L - Condition for Proper Operation
Lecture 15 - I2 L - Propagation delay Self aligned
Lecture 16 - Schottky Transistor Logic
Lecture 17 - Stacked I2 L
Lecture 18 - ECL Basic Operation
Lecture 19 - Quantitative analysis of ECL 10k Series gates
Lecture 20 - ECL 100k series; Stacked ECL gates; D-F/F
Lecture 21 - Emitter Function Logic;Low Power ECL
Lecture 22 - Polyemitter Bipolar Transistor In ECL;Propagation
Lecture 23 - Heterojunction Bipolar Transistor Based ECL;ECL
Lecture 24 - nMOS Logic Circuits
Lecture 25 - nMOS Logic Circuits(contd); CMOS
Lecture 26 - CMOS Inverter
Lecture 27 - CMOS NAND,NOR and Other Gates
Lecture 28 - Dynamic CMOS ;Transmission Gates;Realization Of MUX,decoder, D-F/F
Lecture 29 - BiCMOS Gates

Lecture 30 - BiCMOS Driver;BiCMOS 32-bit Adder
Lecture 31 - Digital Integrated Circuits
Lecture 32 - Digital Integrated Circuits
Lecture 33 - CMOS SRAM
Lecture 34 - BiCMOS SRAM
Lecture 35 - DRAM-CMOS and BiCMOS
Lecture 36 - ROM-EPROM,EEPROM and Flash EPROM
Lecture 37 - GaAs MESFET Characteristics and Equivalent Circuits
Lecture 38 - Direct Coupled FET Logic; Superbuffer FET Logic
Lecture 39 - Buffered FET Logic; Schottky Diode FET Logic
Lecture 40 - Transmission Line Effects

NPTEL Video Course - Electrical Engineering - Electromagnetic Fields

Subject Co-ordinator - Prof. Harishankar Ramachandran

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction To Vector
Lecture 2 - Introduction To Vector (Continued...)
Lecture 3 - Coulomb's Law
Lecture 4 - Electric Field
Lecture 5 - Electro Static Potential
Lecture 6 - The Gradient
Lecture 7 - Gauss's Law
Lecture 8 - Poisson's Equation
Lecture 9 - Energy In The Field
Lecture 10 - Sample Problems In Electrostatics
Lecture 11 - Fields In Materials
Lecture 12 - Fields In Material Bodies
Lecture 13 - Displacement Vectors
Lecture 14 - Capacitors
Lecture 15 - Method Of Images
Lecture 16 - Poisson's Equation 2 Dimensions
Lecture 17 - Field Near Sharp Edges And Points
Lecture 18 - Magnetic Field 1
Lecture 19 - Magnetic Field 2
Lecture 20 - Stokes Theorems
Lecture 21 - The curl
Lecture 22 - Field due to current loop
Lecture 23 - Ampere's law
Lecture 24 - Examples of Ampere's law
Lecture 25 - Inductance
Lecture 26 - Mutual Inductance
Lecture 27 - Faraday's law
Lecture 28 - Magnetic Energy
Lecture 29 - Magnetic Energy (Continued...)

Lecture 30 - Magnetic Energy (Continued...)
Lecture 31 - Generalised Ampere's Law
Lecture 32 - The Wave Equation
Lecture 33 - The Wave Equation
Lecture 34 - Poynting Theorem
Lecture 35 - Skin Effect
Lecture 36 - Skin Effect (Continued...)
Lecture 37 - Radiation And Circuits
Lecture 38 - Phasor Form Of Poynting Theorem
Lecture 39 - Reflection At Dielectric Boundaries
Lecture 40 - Reflection At Dielectric Boundaries (Continued...)
Lecture 41 - Transmission Lines
Lecture 42 - Transmission Lines (Continued...) and Conclusion

NPTEL Video Course - Electrical Engineering - Networks and Systems

Subject Co-ordinator - Prof. V.G.K. Murti

Co-ordinating Institute - IIT - Madras

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

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
Lecture 32 - Network Functions - 3
Lecture 33 - Network Functions - 4
Lecture 34 - Network Theorems - 1
Lecture 35 - Network Theorems - 2
Lecture 36 - Network Theorems - 3
Lecture 37 - Network Theorems - 4
Lecture 38 - Discrete - Time Systems - 1
Lecture 39 - Discrete - Time Systems - 2
Lecture 40 - Discrete - Time Systems - 3
Lecture 41 - Discrete - Time Systems - 4
Lecture 42 - Discrete - Time Systems - 5
Lecture 43 - Discrete - Time Systems - 6
Lecture 44 - Discrete - Time Systems - 7
Lecture 45 - State-Variable Methods - 1
Lecture 46 - State-Variable Methods - 2
Lecture 47 - State Variable Methods - 3
Lecture 48 - State Variable Methods - 4
Lecture 49 - State Variable Methods - 5
Lecture 50 - State Variable Methods - 6

NPTEL Video Course - Electrical Engineering - Probability Foundation for Electrical Engineers

Subject Co-ordinator - Dr. Krishna Jagannathan

Co-ordinating Institute - IIT - Madras

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

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 - Ï -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 Ï -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 Ï -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
Lecture 65 - Fatouâ s Lemma
Lecture 66 - Dominated Convergence Theorem
Lecture 67 - Variance
Lecture 68 - Covariance

Lecture 69 - Covariance Correlation Coefficient - 1
Lecture 70 - Covariance Correlation Coefficient - 2
Lecture 71 - Conditional Expectation
Lecture 72 - Properties of Conditional Expectation
Lecture 73 - MMSE Estimator
Lecture 74 - Transforms
Lecture 75 - Moment Generating Function - 1
Lecture 76 - Moment Generating Function - 2
Lecture 77 - Characteristic Function - 1
Lecture 78 - Characteristic Function - 2
Lecture 79 - Characteristic Function - 3
Lecture 80 - Characteristic Function - 4
Lecture 81 - Concentration Inequalities - 1
Lecture 82 - Concentration Inequalities - 2
Lecture 83 - Convergence of Random Variables - 1
Lecture 84 - Convergence of Random Variables - 2
Lecture 85 - Convergence of Random Variables - 3
Lecture 86 - Convergence of Random Variables - 4
Lecture 87 - Convergence of Random Variables - 5
Lecture 88 - Convergence of Random Variables - 6
Lecture 89 - Convergence Of Characteristic Functions
Lecture 90 - Limit Theorems
Lecture 91 - The Law of Large Numbers - 1
Lecture 92 - The Law of Large Numbers - 2
Lecture 93 - The Central Limit Theorem - 1
Lecture 94 - The Central Limit Theorem - 2
Lecture 95 - A Brief Overview of Multivariate Gaussians - 1
Lecture 96 - A Brief Overview of Multivariate Gaussians - 2

NPTEL Video Course - Electrical Engineering - NOC:Analog Circuits

Subject Co-ordinator - Dr. Nagendra Krishnapura

Co-ordinating Institute - IIT - Madras

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

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 32 - Constraint on the output coupling capacitor
Lecture 33 - Dependence of ID on VDS
Lecture 34 - Small signal output conductance of a MOS transistor
Lecture 35 - Effect of gds on a common source amplifier; Inherent gain limit of a transistor
Lecture 36 - Variation gm with transistor parameters
Lecture 37 - Variation of gm with constant VGS and constant drain current bias
Lecture 38 - Negative feedback control for constant drain current bias
Lecture 39 - Types of feedback for constant drain current bias
Lecture 40 - Sense at the drain and feedback to the gate-Drain feedback
Lecture 41 - Intuitive explanation of low sensitivity with drain feedback
Lecture 42 - Common source amplifier with drain feedback bias
Lecture 43 - Constraint on the gate bias resistor
Lecture 44 - Constraint on the input coupling capacitor
Lecture 45 - Constraint on the output coupling capacitor
Lecture 46 - Input and output resistances of the common source amplifier with constant VGS bias
Lecture 47 - Current mirror
Lecture 48 - Common souce amplifier with current mirror bias
Lecture 49 - Constraint on coupling capacitors and bias resistance
Lecture 50 - Diode connected transistor
Lecture 51 - Source feedback biasing
Lecture 52 - Common source amplifier with source feedback bias
Lecture 53 - Constraints on capacitor values
Lecture 54 - Sensing at the drain and feeding back to the source
Lecture 55 - Sensing at the source and feeding back to the gate
Lecture 56 - Ensuring that transistor is in saturation
Lecture 57 - Using a resistor instead of current source for biasing
Lecture 58 - Controlled sources using a MOS transistor-Introduction
Lecture 59 - Voltage controlled voltage source
Lecture 60 - VCVS using a MOS transistor
Lecture 61 - VCVS using a MOS transistor - Small signal picture
Lecture 62 - VCVS using a MOS transistor - Complete circuit
Lecture 63 - Source follower: Effect of output conductance; Constraints on coupling capacitors
Lecture 64 - VCCS using a MOS transistor
Lecture 65 - VCCS using a MOS transistor: Small signal picture
Lecture 66 - VCCS using a MOS transistor: Complete circuit
Lecture 67 - VCCS using a MOS transistor: AC coupling the output
Lecture 68 - Source degenrated CS amplifier

Lecture 69 - CCCS using a MOS transistor
Lecture 70 - CCCS using a MOS transistor: Small signal picture
Lecture 71 - CCCS using a MOS transistor: Complete circuit
Lecture 72 - CCVS using a MOS transistor
Lecture 73 - CCVS using a MOS transistor: Gain
Lecture 74 - CCVS using a MOS transistor: Input and output resistances
Lecture 75 - CCVS using a MOS transistor: Complete circuit
Lecture 76 - VCVS using an opamp
Lecture 77 - CCVS using an opamp
Lecture 78 - Negative feedback and virtual short in an opamp
Lecture 79 - Negative feedback and virtual short in a transistor
Lecture 80 - Constraints on controlled sources using opamps and transistors
Lecture 81 - Quick tour of amplifying devices
Lecture 82 - Signal swing limits in amplifiers
Lecture 83 - Swing limit due to transistor entering triode region
Lecture 84 - Swing limit due to transistor entering cutoff region
Lecture 85 - Swing limit calculation example
Lecture 86 - Swing limits-more calculations
Lecture 87 - pMOS transistor
Lecture 88 - Small signal model of the pMOS transistor
Lecture 89 - Common source amplifier using the pMOS transistor
Lecture 90 - Swing limits of the pMOS common source amplifier
Lecture 91 - Biasing a pMOS transistor at a constant current; pMOS current mirror
Lecture 92 - Converting nMOS transistor circuits to pMOS
Lecture 93 - Bias current generation
Lecture 94 - Examples of more than one transistor in feedback
Lecture 95 - Gain limitation in a common source amplifier with resistive load
Lecture 96 - nMOS active load for pMOS common source amplifier
Lecture 97 - CMOS inverter
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 Video Course - Electrical Engineering - NOC:Introduction to Non Linear Dynamics

Subject Co-ordinator - Prof. Gaurav Raina

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - A brief introduction to modelling
Lecture 2 - Dynamics and Nonlinear systems
Lecture 3 - 1-Dimensional Flows, Flows on the Line, Lecture 1
Lecture 4 - 1-Dimensional Flows, Flows on the Line, Lecture 2
Lecture 5 - 1-Dimensional Flows, Flows on the Line, Lecture 3
Lecture 6 - 1-Dimensional Flows, Flows on the Line, Lecture 4
Lecture 7 - 1-Dimensional Flows, Flows on the Line, Lecture 5
Lecture 8 - 1-Dimensional Flows, Flows on the Line, Lecture 6
Lecture 9 - 1-Dimensional Flows, Bifurcations, Lecture 1
Lecture 10 - 1-Dimensional Flows, Bifurcations, Lecture 2
Lecture 11 - 1-Dimensional Flows, Bifurcations, Lecture 3
Lecture 12 - 1-Dimensional Flows, Bifurcations, Lecture 4
Lecture 13 - 1-Dimensional Flows, Bifurcations, Lecture 5
Lecture 14 - 1-Dimensional Flows, Bifurcations, Lecture 6
Lecture 15 - 1-Dimensional Flows, Flows on the Circle, Lecture 1
Lecture 16 - 1-Dimensional Flows, Flows on the Circle, Lecture 2
Lecture 17 - 2-Dimensional Flows, Linear Systems, Lecture 1
Lecture 18 - 2-Dimensional Flows, Linear Systems, Lecture 2
Lecture 19 - 2-Dimensional Flows, Linear Systems, Lecture 3
Lecture 20 - 2-Dimensional Flows, Linear Systems, Lecture 4
Lecture 21 - 2-Dimensional Flows, Phase Plane, Lecture 1
Lecture 22 - 2-Dimensional Flows, Phase Plane, Lecture 2
Lecture 23 - 2-Dimensional Flows, Phase Plane, Lecture 3
Lecture 24 - 2-Dimensional Flows, Limit Cycles, Lecture 1
Lecture 25 - 2-Dimensional Flows, Limit Cycles, Lecture 2
Lecture 26 - 2-Dimensional Flows, Limit Cycles, Lecture 3
Lecture 27 - 2-Dimensional Flows, Bifurcations, Lecture 1
Lecture 28 - 2-Dimensional Flows, Bifurcations, Lecture 2
Lecture 29 - 2-Dimensional Flows, Bifurcations, Lecture 3

NPTEL Video Course - Electrical Engineering - NOC:Control Engineering

Subject Co-ordinator - Prof. Ramkrishna.P

Co-ordinating Institute - IIT - Madras

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

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
Lecture 32 - Control design in time domain and discusses the lead compensator
Lecture 33 - Improvement of the Transient Response using lead compensation
Lecture 34 - Design of control using lag compensators
Lecture 35 - The design of Lead-Lag compensators using root locus
Lecture 36 - Introduction design of control in frequency domain
Lecture 37 - Design of Lead Compensator using Bode Plots
Lecture 38 - Design of Lag Compensators using Bode Plots
Lecture 39 - Design of Lead-Lag Compensators using Bode plots
Lecture 40 - Experimental Determination of Transfer Function
Lecture 41 - Effect of Zeros on System Response
Lecture 42 - Navigation - Stories and Some Basics
Lecture 43 - Navigation - Dead Reckoning and Reference Frames
Lecture 44 - Inertial Sensors and Their Characteristics
Lecture 45 - Filter Design to Attentuate Inertial Sensor Noise
Lecture 46 - Complementary Filter
Lecture 47 - Complementary Filter - 1
Lecture 48 - Introduction to State Space Systems
Lecture 49 - Linearization of State Space Dynamics
Lecture 50 - Linearization of State Space Dynamics - 1
Lecture 51 - Controllability and Observability

NPTEL Video Course - Electronics and Communication Engineering - NOC:Analog IC Design

Subject Co-ordinator - Prof. S. Aniruddhan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to MOSFETs
Lecture 2 - Simple MOSFET Circuits
Lecture 3 - MOSFET Current Mirrors
Lecture 4 - Cascode Amplifiers
Lecture 5 - MOSFET in Integrated Circuits
Lecture 6 - MOSFET Capacitances
Lecture 7 - Noise
Lecture 8 - Noise of Simple Circuits
Lecture 9 - Systematic Mismatch
Lecture 10 - Random Mismatch
Lecture 11 - Differential Amplifiers
Lecture 12 - Negative Feedback
Lecture 13 - Stability of Negative Feedback Systems
Lecture 14 - Dominant Pole Compensation
Lecture 15 - Active Load
Lecture 16 - One Stage OpAmps - 1
Lecture 17 - One Stage OpAmps - 2
Lecture 18 - One Stage OpAmps - 3
Lecture 19 - Differential Amplifiers Offset
Lecture 20 - One Stage OpAmps - Noise and Offset
Lecture 21 - One Stage OpAmps - Slew Rate
Lecture 22 - One Stage OpAmps - Datasheet
Lecture 23 - One Stage OpAmps - Example 1
Lecture 24 - One Stage OpAmps - Example 2
Lecture 25 - Telescopic OpAmp - 1
Lecture 26 - Telescopic OpAmp - 2
Lecture 27 - Telescopic OpAmp - 3
Lecture 28 - Telescopic OpAmp - 4
Lecture 29 - Telescopic OpAmp - 5

Lecture 30 - Telescopic OpAmp - Datasheet
Lecture 31 - Telescopic OpAmp - Design Example
Lecture 32 - Folded-Cascode OpAmp - 1
Lecture 33 - Folded-Cascode OpAmp - 2
Lecture 34 - Folded-Cascode OpAmp - 3
Lecture 35 - Folded-Cascode OpAmp - 4
Lecture 36 - Folded-Cascode OpAmp - 5
Lecture 37 - Negative feedback amplifier
Lecture 38 - Step response, sinusoidal steady state response
Lecture 39 - Loop gain and unity loop gain frequency; Opamp
Lecture 40 - Opamp realization using controlled sources; Delay in the loop
Lecture 41 - Negative feedback amplifier with ideal delay-small delays
Lecture 42 - Negative feedback amplifier with ideal delay-large delays
Lecture 43 - Negative feedback amplifier with parasitic poles and zeros
Lecture 44 - Negative feedback amplifier with parasitic poles and zeros; Nyquist criterion
Lecture 45 - Nyquist criterion; Phase margin
Lecture 46 - Phase margin
Lecture 47 - Single stage opamp realization
Lecture 48 - Two stage miller compensated opamp
Lecture 49 - Two stage miller compensated opamp.
Lecture 50 - Two and three stage miller compensated opamps; Feedforward compensated opamp
Lecture 51 - Two Stage Opamp
Lecture 52 - Two Stage Opamp ; Three Stage and Triple Cascade Opamps
Lecture 53 - Common Mode Rejection Ratio ; Example
Lecture 54 - Fully differential single stage opamp
Lecture 55 - Common mode feedback
Lecture 56 - Fully differential single stage opamp-2
Lecture 57 - Fully differential two stage opamp; Fully differential versus pseudo-differential

NPTEL Video Course - Electrical Engineering - NOC:Probability Foundations for Electrical Engineers

Subject Co-ordinator - Prof. R.Aravind, Dr. Andrew Thangaraj

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Experiments, Outcomes and Events
Lecture 2 - Examples
Lecture 3 - Operations on Events
Lecture 4 - Examples
Lecture 5 - Sigma Fields and Probability
Lecture 6 - Discrete Sample Spaces
Lecture 7 - Union and Partition
Lecture 8 - Examples
Lecture 9 - Definition and Basic Properties
Lecture 10 - Bayes' Rule for Partitions
Lecture 11 - Examples
Lecture 12 - Example of Detection
Lecture 13 - Example
Lecture 14 - Independence of Events
Lecture 15 - Examples
Lecture 16 - Combining Independent Experiments
Lecture 17 - Conditional Independence
Lecture 18 - Examples and Computations with Conditional Independence
Lecture 19 - Binomial and Geometric Models
Lecture 20 - Examples
Lecture 21 - Definition and Discrete Setting
Lecture 22 - RandomVariables and Events
Lecture 23 - Examples
Lecture 24 - Important distributions
Lecture 25 - Examples
Lecture 26 - Real-life modeling example
Lecture 27 - More Distributions
Lecture 28 - Conditional PMFs, Conditioning on an event, Indicator random variables
Lecture 29 - Example

Lecture 30 - Multiple random variables and joint distribution
Lecture 31 - Example
Lecture 32 - Marginal PMF
Lecture 33 - Trinomial joint PMF
Lecture 34 - Events and Conditioning with Two Random Variables
Lecture 35 - Example
Lecture 36 - Independent random variables
Lecture 37 - More on independence
Lecture 38 - Example
Lecture 39 - Addition of Random Variables
Lecture 40 - Sum, Difference and Max of Two Random Variables
Lecture 41 - More Computations
Lecture 42 - Example
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
Lecture 57 - Prob[X > Y]
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
Lecture 65 - Expectation Computations for Important Distributions
Lecture 66 - Variance
Lecture 67 - Examples of Variance
Lecture 68 - Expectations with Two Random Variables

Lecture 69 - Correlation and Covariance
Lecture 70 - Examples
Lecture 71 - Examples
Lecture 72 - Examples
Lecture 73 - Live Session

NPTEL Video Course - Electrical Engineering - NOC:Introduction to Photonics

Subject Co-ordinator - Prof. Balaji Srinivasan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to Photonics
Lecture 2 - Diffraction and Interference
Lecture 3 - Tutorial on Ray Optics and Wave Optics
Lecture 4 - Lab Demonstration
Lecture 5 - Interferometers
Lecture 6 - Coherence
Lecture 7 - Spatial and Temporal Coherence
Lecture 8 - Tutorial on Wave Optics
Lecture 9 - Lab Demonstration
Lecture 10 - Electromagnetic Optics
Lecture 11 - Fiber Optics
Lecture 12 - Photon Properties
Lecture 13 - Lab Demonstration
Lecture 14 - Photon Optics
Lecture 15 - Tutorial on Photon optics
Lecture 16 - Photon interaction - 1
Lecture 17 - Photon interaction - 2
Lecture 18 - Lab Demonstration
Lecture 19 - Optical Amplification
Lecture 20 - Three Level systems
Lecture 21 - Four Level Systems
Lecture 22 - EDFA Introduction
Lecture 23 - EDFA Tutorial
Lecture 24 - Lasers Part - 1
Lecture 25 - Lab Demonstration
Lecture 26 - Lasers part- 2
Lecture 27 - Lasers part- 3
Lecture 28 - Lasers part- 4
Lecture 29 - Lab Demonstration

Lecture 30 - Semiconductor light Source and detector - Band structure
Lecture 31 - Semiconductor light Source and detector - Light emission
Lecture 32 - Semiconductor light Source and detector LED Characteristics
Lecture 33 - Lab Demonstration
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
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
Lecture 44 - Non-linear optics-Pockels effect
Lecture 45 - Non-linear optics-Kerr Effect
Lecture 46 - Lab Demonstration
Lecture 47 - Non-linear optics-stimulated Brillouin scattering
Lecture 48 - Non-linear optics-stimulated Raman scattering

NPTEL Video Course - Electrical Engineering - NOC:Multirate DSP

Subject Co-ordinator - Prof. David Kovil Pillai

Co-ordinating Institute - IIT - Madras

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

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
Lecture 17 - Properties of Upsampler and Downsampler
Lecture 18 - Fractional sampling rate change - Part 1
Lecture 19 - Fractional sampling rate change - Part 2
Lecture 20 - Multiplexer/ demultiplexer interpretation
Lecture 21 - Noble identities and polyphase decomposition - Part 1
Lecture 22 - Noble identities and polyphase decomposition - Part 2
Lecture 23 - Polyphase decomposition continued - Part 1
Lecture 24 - Polyphase decomposition continued - Part 2
Lecture 25 - Introduction to Multirate Filter Banks
Lecture 26 - Applications of Multirate - Part 1
Lecture 27 - Applications of Multirate - Part 2
Lecture 28 - Spectral Analysis of Filter Bank - Part 1
Lecture 29 - Spectral Analysis of Filter Bank - Part 2

Lecture 30 - DFT and High Resolution Spectral Analysis - Part 1
Lecture 31 - DFT and High Resolution Spectral Analysis - Part 2
Lecture 32 - Transmultiplexer and Maximally Decimated Filterbanks - Part 1
Lecture 33 - Transmultiplexer and Maximally Decimated Filterbanks - Part 2
Lecture 34 - Maximally Decimated Filterbanks 2 - Part 1
Lecture 35 - Maximally Decimated Filterbanks 2 - Part 2
Lecture 36 - Study of Two-channel filter bank
Lecture 37 - Introduction to Quadrature Mirror Filters (QMF)
Lecture 38 - 2-channel QMF Filter Bank Design
Lecture 39 - Study of All-pass filters
Lecture 40 - Study of All-pass lattice
Lecture 41 - All-pass decomposition, the study of Mth band and Nyquist filters
Lecture 42 - Study of two-channel filter bank with perfect reconstruction
Lecture 43 - First part name
Lecture 44 - First part name
Lecture 45 - Capacity of wireless channels - CSIR - Part 1
Lecture 46 - Capacity of wireless channels - CSIT - Part 2
Lecture 47 - Capacity of wireless channels - Formulation of capacity calculation - Part 3
Lecture 48 - Capacity of wireless channels - Formulation of capacity calculation (Continued...) - Part 1
Lecture 49 - Capacity of wireless channels - Formulation of capacity calculation (Continued...) - Part 2
Lecture 50 - Capacity of wireless channels - Time-invariant Frequency selective channel - Part 3
Lecture 51 - Capacity of wireless channels - Time varying Frequency selective channels - Part 1
Lecture 52 - Multi-rate DSP framework for Multi-carrier Modulation - Part 2
Lecture 53 - MCM with overlapping spectra - Part 1
Lecture 54 - Recap of multirate DSP concepts for building OFDM - Part 2
Lecture 55 - Introduction to Redundancy and it's implementation in multi-rate framework - Part 3
Lecture 56 - M-channel multicarrier Transceiver - Part 1
Lecture 57 - M-channel multicarrier Transceiver - Part 2
Lecture 58 - M-channel multicarrier Transceiver - Part 3
Lecture 59 - Pseudo -circulant structure - Part 1
Lecture 60 - Pseudo -circulant structure - Part 2
Lecture 61 - MCM impairments and CP - Part 1
Lecture 62 - MCM impairments and CP - Part 2
Lecture 63 - Orthogonal Frequency Division Multiplexing - Part 1
Lecture 64 - Orthogonal Frequency Division Multiplexing - Part 2
Lecture 65 - Review of OFDM with CP
Lecture 66 - Review of Lec 1-28
Lecture 67 - OFDM applications - Quantization - Part 1
Lecture 68 - OFDM applications - Quantization - Part 2

Lecture 69 - Some more applications of MDSP

NPTEL Video Course - Electrical Engineering - NOC:LDPC and Polar Codes in 5G Standard

Subject Co-ordinator - Dr. Andrew Thangaraj

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Additive White Gaussian Noise (AWGN) Channel and BPSK
Lecture 2 - Bit Error Rate (BER) and Signal to Noise Ratio (SNR)
Lecture 3 - Error Correction Coding in a Digital Communication System
Lecture 4 - Complementary Error Function
Lecture 5 - Simulation of Uncoded BPSK and BER v/s Eb/N0 plot Generation in MATLAB/Octave
Lecture 6 - n = 3 Repetition Code
Lecture 7 - Implementation of n = 3 Repetition Code in MATLAB
Lecture 8 - (7,4) Hamming Code
Lecture 9 - A Brief Introduction to Linear Block Codes
Lecture 10 - Simulation of (7,4) Hamming Code in MATLAB
Lecture 11 - Low Density Parity Check Codes
Lecture 12 - LDPC Codes in 5G
Lecture 13 - Encoding LDPC codes in 5G
Lecture 14 - MATLAB programs for encoding LDPC codes
Lecture 15 - Log-Likelihood Ratio and Soft Input and Soft Output (SISO) Decoder for the Repetition Code
Lecture 16 - Soft Input and Soft Output (SISO) Decoder for the Single Parity Check (SPC) Code
Lecture 17 - Illustration of SISO decoder for (3,2) SPC code and min-sum approximation
Lecture 18 - SISO decoder for a general (n,n-1) SPC code
Lecture 19 - Soft-Input Soft-Output Iterative Message Passing Decoder for LDPC Codes
Lecture 20 - A Toy Example Illustration of the SISO MInsum Iterative Message Passing Decoder
Lecture 21 - Modifications to the Decoder
Lecture 22 - Implementation of SISO Layered Minsum Iterative Message Passing Decoder in MATLAB
Lecture 23 - Debugging and Improvements to the MATLAB Implementation
Lecture 24 - Rate Matching in LDPC Codes using Puncturing and Shortening
Lecture 25 - Implementation of Fixed Point Quantization and Offset Minsum in the Decoder
Lecture 26 - Introduction to Polar Codes
Lecture 27 - Channel Polarization, Definition of (N,K) Polar Code and Encoding
Lecture 28 - MATLAB Implementation for Encoding Polar Codes
Lecture 29 - Successive Cancellation (SC) Decoder for Polar Codes

Lecture 30 - Successive Cancellation (SC) Decoder for a General (N,K) Polar Code
Lecture 31 - MATLAB Implementation of Successive Cancellation Decoder - Part 1
Lecture 32 - MATLAB Implementation of Successive Cancellation Decoder - Part 2
Lecture 33 - Successive Cancellation List Decoding
Lecture 34 - Fixed Point Quantization for SC Decoder and LDPC Decoder
Lecture 35 - MATLAB Implementation of Successive Cancellation List Decoding
Lecture 36 - Rate Matching for LDPC codes
Lecture 37 - Performance Comparison of LDPC codes and Polar Codes in 5G

NPTEL Video Course - Electrical Engineering - NOC:Electromagnetic Compatibility, EMC

Subject Co-ordinator - Prof. Daniel Mansson, Prof. Rajeev Thottappillil

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to EMC - Definitions
Lecture 2 - Introduction to EMC - Sources, units etc
Lecture 3 - Electromagnetic principles - Faraday's and Ampere's equations
Lecture 4 - Electromagnetic principles - Gauss's equation, boundary conditions
Lecture 5 - Electromagnetic principles - Uniform plane wave
Lecture 6 - Electromagnetic principles - Transmission lines
Lecture 7 - Electromagnetic principles - Dipoles
Lecture 8 - High-frequency behaviour of components - Conductors
Lecture 9 - High-frequency behaviour of components - Capacitors, inductors, resistors
Lecture 10 - High-frequency behaviour of components - Mechanical switches and transformers
Lecture 11 - Crosstalk or near-field coupling - Capacitive coupling, inductive coupling, common-impedance cou
Lecture 12 - Crosstalk or near-field coupling - Crosstalk combinations
Lecture 13 - Crosstalk or near-field coupling - Coupling to shielded cables
Lecture 14 - Electromagnetic coupling in the far-field
Lecture 15 - Field Coupling - Exercises
Lecture 16 - Solutions to EMC problems - Lay out and control of interfaces
Lecture 17 - Solutions to EMC problems - Grounding or earthing
Lecture 18 - Solutions to EMC problems - Electromagnetic Shielding
Lecture 19 - Solutions to EMC problems - Electromagnetic Shielding (Continued...)
Lecture 20 - Solutions to EMC problems - Shielded cables
Lecture 21 - Solutions to EMC problems - Filters and Surge protectors
Lecture 22 - Lightning Protection - Introduction
Lecture 23 - Lightning protection - Currents, charges and fields
Lecture 24 - Lightning Protection - Buildings
Lecture 25 - Lightning Protection - Towers, Lightning safety
Lecture 26 - EMC Requirements and Standard, Testing and Difficulties - 1
Lecture 27 - EMC Requirements and Standard, Testing and Difficulties - 2
Lecture 28 - Intentional Electromagnetic Interference or IEMI - 1
Lecture 29 - Intentional Electromagnetic Interference or IEMI - 2

NPTEL Video Course - Electrical Engineering - NOC:Mapping Signal Processing Algorithms to Architectures

Subject Co-ordinator - Prof. Nitin Chandrachoodan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction
Lecture 2 - Review of digital logic
Lecture 3 - Timing and Power in digital circuits
Lecture 4 - Implementation Costs and Metrics
Lecture 5 - Example
Lecture 6 - Example
Lecture 7 - Architecture cost components
Lecture 8 - Examples of Architectures
Lecture 9 - Multi-objective Optimization
Lecture 10 - Number representation
Lecture 11 - Scientific notation and Floating point
Lecture 12 - Basic FIR filter
Lecture 13 - Serial FIR filter architectures
Lecture 14 - Simple programmable architecture
Lecture 15 - Block diagrams and SFGs
Lecture 16 - Dataflow Graphs
Lecture 17 - Iteration period
Lecture 18 - FIR filter iteration period
Lecture 19 - IIR filter iteration period
Lecture 20 - Computation Model
Lecture 21 - Constraint analysis for IPB computation
Lecture 22 - Motivational examples for IPB
Lecture 23 - General IPB computation
Lecture 24 - Sample period calculation
Lecture 25 - Parallel architecture
Lecture 26 - Odd-even register reuse
Lecture 27 - Power consumption
Lecture 28 - Pipelining
Lecture 29 - Time-invariant systems

Lecture 30 - Valid pipelining examples
Lecture 31 - Feedforward cutsets
Lecture 32 - Balanced pipeline
Lecture 33 - Retiming basic concept
Lecture 34 - Retiming basic concept
Lecture 35 - (Missing Title)
Lecture 36 - Resource sharing
Lecture 37 - Changing iteration period
Lecture 38 - Hardware assumptions and constraint analysis
Lecture 39 - Mathematical formulation
Lecture 40 - Examples with formulation
Lecture 41 - Example
Lecture 42 - Hardware architecture
Lecture 43 - Review biquad folding sets
Lecture 44 - Complete biquad hardware
Lecture 45 - DEMO
Lecture 46 - DEMO
Lecture 47 - Obtaining a folding schedule
Lecture 48 - ASAP schedule
Lecture 49 - Utilization Efficiency
Lecture 50 - ALAP schedule
Lecture 51 - Iteration period bound and scheduling
Lecture 52 - Retiming for scheduling
Lecture 53 - Blocked schedules
Lecture 54 - Overlapped schedules
Lecture 55 - Improved blocked schedule
Lecture 56 - Allocation, Binding and Scheduling
Lecture 57 - DEMO
Lecture 58 - DEMO
Lecture 59 - Scheduling
Lecture 60 - Example
Lecture 61 - Heuristic approaches to scheduling
Lecture 62 - Mathematical formulation
Lecture 63 - ILP formulation
Lecture 64 - List scheduling
Lecture 65 - Hardware model
Lecture 66 - Force Directed Scheduling
Lecture 67 - DEMO
Lecture 68 - DEMO

Lecture 69 - DEMO
Lecture 70 - Software Compilation
Lecture 71 - Optimization Examples
Lecture 72 - Loop optimizations - 1
Lecture 73 - Loop optimizations - 2
Lecture 74 - Loop optimizations - 3
Lecture 75 - Software pipelining - 1
Lecture 76 - Software pipelining - 2
Lecture 77 - FFT Optimization
Lecture 78 - Demo
Lecture 79 - Background
Lecture 80 - Demo
Lecture 81 - Demo
Lecture 82 - Demo
Lecture 83 - Demo
Lecture 84 - Background
Lecture 85 - On-chip communication basics
Lecture 86 - Many-to-Many communication
Lecture 87 - AXI bus handshaking
Lecture 88 - AXI bus (Continued...)
Lecture 89 - Demo
Lecture 90 - Demo
Lecture 91 - Demo
Lecture 92 - DMA and arbitration
Lecture 93 - Network-on-chip basics
Lecture 94 - NoC - Topologies and metrics
Lecture 95 - NoC - Routing
Lecture 96 - NoC - Switching and flow control
Lecture 97 - Systolic Arrays - Background
Lecture 98 - Systolic Arrays - Examples
Lecture 99 - CORDIC algorithm
Lecture 100 - Parallel implementation of FIR filters
Lecture 101 - Unfolding Transformation
Lecture 102 - Lookahead Transformation
Lecture 103 - Introduction to GPUs and Matrix multiplication

NPTEL Video Course - Electrical Engineering - NOC:Linear System Theory

Subject Co-ordinator - Prof. Ramakrishna Pasumarthi

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to Linear Systems
Lecture 2 - System Models
Lecture 3 - System Models - Part 1
Lecture 4 - System Models - Part 2
Lecture 5 - General Representation
Lecture 6 - Sets, Functions and Fields
Lecture 7 - Linear Algebra - Vector Spaces and Metric Spaces
Lecture 8 - Linear Algebra - Span, Basis and Subspaces
Lecture 9 - Linear Algebra - Linear Maps and Matrices
Lecture 10 - Linear Algebra - Fundamental Subspaces and Rank-Nullity
Lecture 11 - Tutorial 1 on Linear Algebra
Lecture 12 - Linear Algebra - Change of Basis and Similarity Transformation
Lecture 13 - Linear Algebra - Invariant Subspaces, Eigen Values and Eigen Vectors
Lecture 14 - Linear Algebra - Diagonalization and Jordan Forms
Lecture 15 - Linear Algebra - Eigen Decomposition and Singular Value Decomposition
Lecture 16 - Tutorial 2 on Linear Algebra
Lecture 17 - Solutions to LTI Systems
Lecture 18 - State Transition Matrix for LTI systems
Lecture 19 - Forced Reponse of Continuous and Discrete LTI system
Lecture 20 - State Transition Matrix and Solutions to LTV systems
Lecture 21 - Equilibrium Points
Lecture 22 - Limit Cycles and Linearisation
Lecture 23 - Stability Analysis and Types of Stability
Lecture 24 - Lyapunov Stability
Lecture 25 - Stability of Discrete Time Systems
Lecture 26 - Supplementary Lecture
Lecture 27 - Controllability and Reachability
Lecture 28 - Controllability Matrix and Controllable Systems
Lecture 29 - Controllability Tests

Lecture 30 - Controllability of Discrete Time Systems
Lecture 31 - Controllable Decomposition
Lecture 32 - Stabilizability
Lecture 33 - Observability
Lecture 34 - Gramians and Duality
Lecture 35 - Observability for Discrete Time Systems and Observability Tests
Lecture 36 - Observable Decompositon and Detectability
Lecture 37 - Kalman Decomposition and Minimal Realisation
Lecture 38 - Canonical Forms and State Feedback Control
Lecture 39 - Control Design using Pole Placement
Lecture 40 - Tutorial for Modules 9 and 10
Lecture 41 - State Estimation and Output Feedback
Lecture 42 - Design of Observer and Observer based Controller
Lecture 43 - Optimal Control and Linear Quadratic Regulator (LQR)
Lecture 44 - Feedback Invariant and Algebraic Ricatti Equation
Lecture 45 - Tutorial for Module 11
Lecture 46 - Linear Matrix Inequalities
Lecture 47 - Properties of LMIs and Delay LMIs

NPTEL Video Course - Electrical Engineering - NOC:Digital Signal Processing

Subject Co-ordinator - C. S. Ramalingam

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Signal Definition and Classification
Lecture 2 - Affine Transform
Lecture 3 - Recap of Affine Transform
Lecture 4 - Even and Odd Parts of a Signal
Lecture 5 - The Unit Step Sequence
Lecture 6 - The Unit Impulse
Lecture 7 - The Unit Impulse (Continued...)
Lecture 8 - Exponential Signals and Sinusoids
Lecture 9 - Sinusoids (Continued...)
Lecture 10 - When are two sinusoids independent?
Lecture 11 - Another Difference Between CT and DT Sinusoids
Lecture 12 - System definition and properties (linearity)
Lecture 13 - Time-invariance, memory, causality, and stability
Lecture 14 - LTI systems, impulse response, and convolution
Lecture 15 - Properties of convolution, system interconnections
Lecture 16 - Java applet demo of convolution
Lecture 17 - Systems governed by LCCDE
Lecture 18 - FIR and IIR systems
Lecture 19 - Karplus-Strong algorithm
Lecture 20 - Z-transform definition and RoC
Lecture 21 - Z-transform (Continued...)
Lecture 22 - Poles and zeros
Lecture 23 - Recursive implementation of FIR filters
Lecture 24 - Convergence criterion
Lecture 25 - Properties of the RoC
Lecture 26 - DTFT definition and absolute summability
Lecture 27 - Linearity
Lecture 28 - Delay
Lecture 29 - Exponential multiplication

Lecture 30 - Complex conjugation
Lecture 31 - Time reversal
Lecture 32 - Differentiation in the Z-domain
Lecture 33 - Convolution in the time domain
Lecture 34 - Relationship between x[n] and X(1)
Lecture 35 - Initial Value Theorem
Lecture 36 - Final Value Theorem
Lecture 37 - Multiplication in the time domain
Lecture 38 - Parseval's Theorem
Lecture 39 - Partial Fractions Method
Lecture 40 - Power series method
Lecture 41 - Contour Integral Method
Lecture 42 - Contour Integral Method (Continued...)
Lecture 43 - Inverse DTFT
Lecture 44 - DTFT of Sequences that are not absolutely summable
Lecture 45 - Response to cos(?_0 n+?)
Lecture 46 - Causality and Stability
Lecture 47 - Response to suddenly applied inputs
Lecture 48 - Introduction to frequency response
Lecture 49 - Magnitude response and its geometric interpretation
Lecture 50 - Magnitude Response (Continued...)
Lecture 51 - Response of a single complex zero/pole
Lecture 52 - Resonator and Improved Resonator
Lecture 53 - Notch filter
Lecture 54 - Moving Average Filter
Lecture 55 - Comb filter
Lecture 56 - Phase response of a single complex zero
Lecture 57 - Effect of crossing a unit circle zero, wrapped and unwrapped phase, resonator phase response
Lecture 58 - Allpass Filter
Lecture 59 - Group delay and its physical interpretation
Lecture 60 - Zero-phase filtering, effect on nonlinear phase on waveshape
Lecture 61 - Zero-Phase Filtering, Linear Phase - 1
Lecture 62 - Linear Phase - 2
Lecture 63 - Linear Phase - 3
Lecture 64 - Linear Phase - 3
Lecture 65 - Linear Phase - 3
Lecture 66 - Linear Phase - 4, Sampling - 1
Lecture 67 - Linear Phase - 4, Sampling - 1
Lecture 68 - Linear Phase - 4, Sampling - 1

Lecture 69 - Sampling - 2
Lecture 70 - Sampling - 3
Lecture 71 - Sampling - 4
Lecture 72 - Sampling - 4
Lecture 73 - Sampling - 4
Lecture 74 - The Discrete Fourier Transform - 1
Lecture 75 - The Discrete Fourier Transform - 1
Lecture 76 - The Discrete Fourier Transform - 2
Lecture 77 - The Discrete Fourier Transform - 3
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 Video Course - Electrical Engineering - NOC:Computational Electromagnetics

Subject Co-ordinator - Prof. Uday Khankhoje

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Chain rule of differentiation
Lecture 2 - Gradient, Divergence, and Curl operators
Lecture 3 - Common theorems in vector calculus
Lecture 4 - Corollaries of these theorems
Lecture 5 - Mathematical History
Lecture 6 - Different regimes of Maxwell's equations
Lecture 7 - Different ways of solving them
Lecture 8 - Maxwell's Equations
Lecture 9 - Boundary Conditions
Lecture 10 - Uniqueness Theorem
Lecture 11 - Equivalence Theorem
Lecture 12 - Simple Numerical Integration
Lecture 13 - Interpolating a Function
Lecture 14 - Gauss Quadrature
Lecture 15 - Line Charge Problem
Lecture 16 - Solving the Integral Equation
Lecture 17 - Basis Functions
Lecture 18 - Helmholtz Equation
Lecture 19 - Solving Helmholtz Equation
Lecture 20 - Huygen's principle and the Extinction theorem
Lecture 21 - Formulating the integral equations
Lecture 22 - Conclusions of surface integral equations
Lecture 23 - Motivations for Green's functions
Lecture 24 - A one-dimensional example
Lecture 25 - 1-D example
Lecture 26 - 2-D wave example
Lecture 27 - 2-D wave example
Lecture 28 - 2-D example
Lecture 29 - 2-D example

Lecture 30 - 3-D example
Lecture 31 - Motivation for MoM
Lecture 32 - Linear Vector Spaces
Lecture 33 - Formulating Method of Moments
Lecture 34 - Surface Integral Equations
Lecture 35 - Surface Integral Equations
Lecture 36 - Surface Integral Equations
Lecture 37 - Surface Integral Equations
Lecture 38 - Volume Integral Equations
Lecture 39 - Volume Integral Equations
Lecture 40 - Volume Integral Equations
Lecture 41 - Volume Integral Equations
Lecture 42 - Surface integral equations for PEC
Lecture 43 - Surface v/s volume integral equations
Lecture 44 - Definition of radar cross-section
Lecture 45 - Computational Considerations
Lecture 46 - History and Overview of the FEM
Lecture 47 - Basic framework of FEM
Lecture 48 - 1D Basis Functions
Lecture 49 - 2D Basis Functions
Lecture 50 - Weak form of 1D-FEM - Part 1
Lecture 51 - Weak form of 1D-FEM - Part 2
Lecture 52 - Generating System of Equations for 1D FEM
Lecture 53 - 1D wave equation
Lecture 54 - 1D Wave Equation
Lecture 55 - 1D Wave Equation
Lecture 56 - 1D Wave Equation
Lecture 57 - 2D FEM Shape Functions
Lecture 58 - Converting to Weak Form (2D FEM)
Lecture 59 - Radiation Boundary Condition
Lecture 60 - Total field formulation
Lecture 61 - Scattered field formulation
Lecture 62 - Comparing total and scattered field formulation
Lecture 63 - Matrix assembly - Part 1
Lecture 64 - Matrix assembly - Part 2
Lecture 65 - Computing Far Field
Lecture 66 - Numerical Aspects of 2D FEM
Lecture 67 - Summary of FEM Procedure
Lecture 68 - Introduction to FDTD

Lecture 69 - 2D FDTD Formulation
Lecture 70 - 2D FDTD Formulation
Lecture 71 - 2D FDTD Formulation
Lecture 72 - Stability Criteria - Part 1
Lecture 73 - Stability Criteria - Part 2
Lecture 74 - Stability Criteria - Higher Dimensions
Lecture 75 - Accuracy Considerations - 1D
Lecture 76 - Accuracy Considerations - Higher Dimensions
Lecture 77 - Dealing with non-dispersive dielectric media
Lecture 78 - Dealing with dispersive dielectric media
Lecture 79 - Debye Model - Part 1
Lecture 80 - Debye Model - Part 2
Lecture 81 - Absorbing Boundary Conditions - 1D
Lecture 82 - Absorbing Boundary Conditions - 2D
Lecture 83 - Implementing ABC in FDTD
Lecture 84 - Failure of ABC
Lecture 85 - Perfectly Matched Layers (PML) - Introduction
Lecture 86 - Implementing PML using Coordinate Stretching
Lecture 87 - PML - Phase Matching
Lecture 88 - PML - Tangential Boundary Conditions
Lecture 89 - Perfectly Matched Interface
Lecture 90 - PML theory - Summary
Lecture 91 - Implementing PML into FDTD - Part 1
Lecture 92 - Implementing PML into FDTD - Part 2
Lecture 93 - Sources in FDTD - Currents
Lecture 94 - Sources in FDTD - Part 2
Lecture 95 - Summary of FDTD
Lecture 96 - MEEP
Lecture 97 - Inverse Problems - Introduction
Lecture 98 - Inverse Problems - Mathematical Formulation
Lecture 99 - Inverse Problems - Challenges
Lecture 100 - Inverse Problems - Non-Linearity
Lecture 101 - Inverse Problems - Summary
Lecture 102 - Antennas - Potential formulation
Lecture 103 - Antennas - Hertz Dipole - Part 1
Lecture 104 - Antennas - Hertz Dipole - Part 2
Lecture 105 - Antennas - Radiation Patterns
Lecture 106 - Antennas - Motivation for CEM
Lecture 107 - Antennas - Pocklingtonâ s Integral Equation - Part 1

Lecture 108 - Antennas - Pocklingtonâ s Integral Equation - Part 2
Lecture 109 - Antennas - Source Modeling
Lecture 110 - Antennas - Circuit Model
Lecture 111 - Antennas - MoM details
Lecture 112 - Antennas - Mutual Coupling - Part 1
Lecture 113 - Antennas - Mutual Coupling - Part 2
Lecture 114 - Hybrid Methods - Motivation
Lecture 115 - Finite Element-Boundary Integral - Part 1
Lecture 116 - Finite Element-Boundary Integral - Part 2
Lecture 117 - Finite Element-Boundary Integral - Part 3

NPTEL Video Course - Electrical Engineering - NOC:Transmission Lines and Electromagnetic Waves

Subject Co-ordinator - Dr. Ananth Krishnan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Transmission lines
Lecture 2 - LosslessTransmission lines
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
Lecture 14 - Transmission Line Limitations and Maxwell's Equation
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
Lecture 19 - Electromagnetic Waves in a conductive Medium
Lecture 20 - Plane Waves
Lecture 21 - Plane Waves at normal incidence
Lecture 22 - Plane waves at Oblique Incidence - I
Lecture 23 - Plane waves at Oblique Incidence - II
Lecture 24 - Plane waves at Oblique Incidence - III
Lecture 25 - Octave simulation of perpendicular polarisation
Lecture 26 - Octave simulation of perpendicular polarisation (Continued...)
Lecture 27 - Dielectric-ideal conductor interface
Lecture 28 - Parallel plate waveguide
Lecture 29 - Rectangular Waveguide

Lecture 30 - Octave simulation of modes of a Rectangular Waveguide
Lecture 31 - Phase Velocity and Group velocity
Lecture 32 - Octave simulation of Field pattern of a parellel plate waveguide
Lecture 33 - Cavity resonatorand Real life applications of waveguides and cavity

NPTEL Video Course - Electrical Engineering - NOC:Digital IC Design

Subject Co-ordinator - Prof. Janakiraman

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction - Digital IC Design
Lecture 2 - PN Junction
Lecture 3 - MOS Capacitor Threshold Voltage
Lecture 4 - MOS Transistor Current Expression
Lecture 5 - Body Effect and I-V Plots
Lecture 6 - Short Channel Transistors - Channel Length Modulation
Lecture 7 - Velocity Saturation and Level-1 SPICE Model
Lecture 8 - Drain Induced Barrier Lowering
Lecture 9 - Sub-Threshold Leakage
Lecture 10 - Substrate and Gate Leakage
Lecture 11 - The PMOS Transistor
Lecture 12 - Transistor Capacitance - 1
Lecture 13 - Transistor Capacitance - 2
Lecture 14 - CMOS Inverter Construction
Lecture 15 - Voltage Transfer Characteristics
Lecture 16 - Load Line Analysis
Lecture 17 - Trip Point for Short Channel Device Inverter
Lecture 18 - Trip Point for Long Channel Device Inverter
Lecture 19 - Noise Margin Analysis - 1
Lecture 20 - Noise Margin Analysis - 2
Lecture 21 - Noise Margin Analysis - 3
Lecture 22 - Noise Margin Analysis-Long Channel Device Inverter - 1
Lecture 23 - Noise Margin Analysis-Long Channel Device Inverter - 2
Lecture 24 - Pass Transistors
Lecture 25 - NMOS Transistor ON Resistance and Fall Delay
Lecture 26 - Elmore Delay Model
Lecture 27 - Inverter: Transient Response
Lecture 28 - Inverter: Dynamic Power
Lecture 29 - Inverter: Short Circuit Power

Lecture 30 - Inverter: Leakage Power and Transistor Stacks
Lecture 31 - Stacking Effect and Sleep Transistors
Lecture 32 - Ring Oscillators and Process Variations
Lecture 33 - Implementing Any Boolean Logic Function
Lecture 34 - Implementing Any Boolean Logic Function: Examples. Gate sizing
Lecture 35 - Gate Sizing
Lecture 36 - Logic Gate Capacitance
Lecture 37 - Gate Delay
Lecture 38 - Parasitic Delay
Lecture 39 - Gate Delay with a Load Capacitance
Lecture 40 - Logical Effort
Lecture 41 - Gate Delay
Lecture 42 - Path Delay Calculation and Optimization Formulation
Lecture 43 - Path Delay Optimization: Intuition
Lecture 44 - Path Delay Optimization: Example
Lecture 45 - Buffer Insertion
Lecture 46 - Input Ordering and Asymmetric Gates
Lecture 47 - Skewed Gates
Lecture 48 - Special Functions
Lecture 49 - Pseudo NMOS Logic
Lecture 50 - Pseudo NMOS Inverter
Lecture 51 - Pseudo NMOS Logical Effort and CVSL
Lecture 52 - Dynamic Circuits and Input Monotonicity
Lecture 53 - Domino Logic and Weak Keepers
Lecture 54 - Transmission Gate Logic
Lecture 55 - Gate Sizing for Large Circuits
Lecture 56 - Ripple Adder Introduction
Lecture 57 - Full Adder Circuit Implementation
Lecture 58 - Full Adder Optimization
Lecture 59 - Carry Skip Adder
Lecture 60 - Carry Select Adder
Lecture 61 - Linear and Square Root Carry Select Adder
Lecture 62 - Two's Complement Arithmetic
Lecture 63 - Two's Complement Sign Extension
Lecture 64 - Array Multiplier
Lecture 65 - Array Multiplier - Timing Analysis
Lecture 66 - Carry Save Multiplier
Lecture 67 - Carry Save Multiplier - Signed Multiplication
Lecture 68 - Introduction to Pipelining

Lecture 69 - Time Borrowing
Lecture 70 - Master Slave Flip Flop
Lecture 71 - Flop Timing Parameters
Lecture 72 - Alternate Circuit Implementations
Lecture 73 - Clock Overlap
Lecture 74 - C2MOS Flop
Lecture 75 - Flop Characterization
Lecture 76 - Max and Min Delay of Flop Based Systems
Lecture 77 - Flop Min Delay Constraint
Lecture 78 - Latch - Max and Min Delay Constraints
Lecture 79 - Latch - Timing Analysis with Skew
Lecture 80 - Time Borrowing

NPTEL Video Course - Electrical Engineering - NOC:Power Management Integrated Circuits

Subject Co-ordinator - Prof. Qadeer Ahmad Khan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to PMIC - Part 1
Lecture 2 - Introduction to PMIC - Part 2
Lecture 3 - Linear versus Switching Regulators
Lecture 4 - Performance Parameters of Regulators
Lecture 5 - Local vs Remote Feedback, Point of Load Regulators
Lecture 6 - Kelvin Sensing, Droop Compensation
Lecture 7 - Current Regulator Applications, Introduction to Bandgap Voltage References, PTAT and CTAT voltage
Lecture 8 - Adding PTAT and CTAT Voltages
Lecture 9 - Bandgap Voltage Reference Circuit, Brokaw Bandgap Circuit
Lecture 10 - Sub-1-volt Bandgap Circuit
Lecture 11 - Generating Multiple Reference Voltages; Applications of Linear Regulators
Lecture 12 - Designing a Linear Regulator, Negative and Positive Feedback
Lecture 13 - First-Order Systems, Phase Margin
Lecture 14 - Closed-Loop Response of Second-Order Systems
Lecture 15 - Relationship between Damping Factor and Phase Margin, Frequency Compensation, MOS Parasitic Capa
Lecture 16 - Finding the Poles of the Error Amplifier - Part 1
Lecture 17 - Finding the Poles of the Error Amplifier - Part 2
Lecture 18 - Dominant Pole Frequency Compensation
Lecture 19 - Dominant Pole Compensation at No-Load
Lecture 20 - Dominant Pole Compensation using Miller Effect, RHP zero due to Miller Capacitor
Lecture 21 - Intuitive Method of Finding the Poles, Pole Splitting after Miller Compensation
Lecture 22 - Effect of RHP zero on Stability, Mitigating the Effect of RHP zero, LDO with NMOS Pass Element
Lecture 23 - Output Impedance of PMOS LDO
Lecture 24 - Line Regulation and PSRR of PMOS LDO
Lecture 25 - PSRR of PMOS versus PSRR of NMOS LDO
Lecture 26 - Sources of Error in Linear and Switching Regulators
Lecture 27 - Offset in Amplifiers; Real Life Analogy; Static Offset Cancellation
Lecture 28 - Dynamic Offset Cancellation Techniques (Chopping, Auto-zeroing)
Lecture 29 - Digital LDO, Technique to Avoid Limit Cycle Oscillations in Digital LDO

Lecture 30 - Hybrid LDO, Short-Circuit Protection
Lecture 31 - Hiccup Mode and Foldback Current Limit
Lecture 32 - Introduction to Switching Regulators
Lecture 33 - volt-second Balance, Non-Idealities in the Power Stage of a Buck Converter
Lecture 34 - Transformer Model of a Buck Converter, Conduction Efficiency, Efficiency of an LDO versus Effici
Lecture 35 - Synchronous versus Non-Synchronous Switching Regulators, PWM Control Techniques
Lecture 36 - Losses in Switching Regulators (Conduction Loss, Gate-Driver Switching Loss)
Lecture 37 - Dead-Time Switching Loss in DC-DC Converters
Lecture 38 - Hard Switching Loss in DC DC Converters
Lecture 39 - Magnetic Loss in DC-DC Converters, Relative Significance of Losses as a Function of the Load Cur
Lecture 40 - Output Voltage Ripple of a Buck Converter
Lecture 41 - Choosing the Inductor and Capacitor for a Buck Converter
Lecture 42 - CCM Vs DCM Operation in DC DC Converters
Lecture 43 - CCM DCM Boundary Condition, Voltage Conversion Ratio in DCM
Lecture 44 - Concept of Pulse Frequency Modulation PFM
Lecture 45 - Classification of Pulse Width Modulators
Lecture 46 - DC - DC Converter Control Techniques, Stability Analysis of Voltage Mode Buck Converter - Part 1
Lecture 47 - Stability Analysis of Voltage Mode Buck Converter - Part 2
Lecture 48 - Stability Analysis of Voltage Mode Buck Converter - Part 3
Lecture 49 - Dominant Pole Compensation (Type-I with Gm-C Architecture)
Lecture 50 - Dominant Pole Compensation (Type-I with Op Amp-RC Architecture)
Lecture 51 - Introduction to Type-II Compensation
Lecture 52 - Type-II Compensator using Gm-C Architecture - Part 1
Lecture 53 - Type-II Compensator using Gm-C Architecture - Part 2
Lecture 54 - Type-II Compensator using Gm-C Architecture - Part 3
Lecture 55 - Type-II Compensator using Op Amp-RC Architecture
Lecture 56 - Introduction to Type-III Compensator
Lecture 57 - Type-III Compensator using Op Amp-RC Architecture
Lecture 58 - Simulation of DC-DC Converter with Type-III Compensator
Lecture 59 - Type-III Compensator using Gm-C Architecture
Lecture 60 - Feed-Forward Line Compensation, Loop Gain Compensation by Modulating Gm
Lecture 61 - Designing a Buck Converter, Power Loss Budgeting
Lecture 62 - Sizing Power MOSFETs
Lecture 63 - Estimating Switching Losses and Choosing the Switching Frequency
Lecture 64 - Choosing Inductance and Capacitance Values
Lecture 65 - Choosing 'C' Depending on Factors that Limit the Load Transient Response
Lecture 66 - Inductor and Capacitor Characteristics, Reducing the Effect of Capacitor ESL
Lecture 67 - Gate Buffer and Non-Overlap Clock Generator in Gate-Driver Circuit
Lecture 68 - Pulse-Width Modulator- Trailing Edge, Leading Edge and Dual Edge; Triangle Wave Generator

Lecture 69 - Average Ramp Voltage of Single-Edge PW Modulator,Design Considerations of EA
Lecture 70 - Delays Associated with PW Modulator, PFM and PSM Operation, DCM Operation using NMOS
Lecture 71 - Designing a Zero-Cross Comparator, Inverter-Based Auto-Zeroed Comparator, Simulation Demo
Lecture 72 - Current Mode Control- Peak, Valley, Emulated; VMC versus CMC; Sub-Harmonic Oscillation
Lecture 73 - Ramp-Adaptive Slope Compensation to Avoid Current Loop Instability
Lecture 74 - Non-Linear Control of DC-DC Converters, Phase-Shift between i_L and v_C
Lecture 75 - Stabilising a Voltage-Mode Hysteretic Converter using R_esr, Relation between F_sw and the Hyste
Lecture 76 - Hysteretic Converter - Simulation Demo
Lecture 77 - Current-Mode Hysteretic Converter, Using R-C as Ripple Generator
Lecture 78 - Controlling the Switching Frequency of a Hysteretic Converter, Delay in the Hysteretic Comparato
Lecture 79 - Frequency and Voltage Regulation Loops in a Fixed-Frequency Hysteretic Converter
Lecture 80 - Resetting the Capacitor Voltage in a Hysteretic Converter, Constant ON-Time Control
Lecture 81 - Introduction to Boost Converter, RHP Zero in a Boost Converter
Lecture 82 - Introduction to Buck-Boost Converter
Lecture 83 - Tri-Mode Buck-Boost Converter (Buck, Buck-Boost and Boost)
Lecture 84 - Boundary Conditions for Mode Transition in a Tri-Mode Buck-Boost Converter
Lecture 85 - Generating Buck and Boost Duty Cycles in a Tri-Mode Buck-Boost Converter
Lecture 86 - Introduction to Switched-Capacitor DC-DC Converters,Switched-Capacitor DC-DC Converter with V_o
Lecture 87 - Applications of Switched-Capacitor DC-DC Converters in Open-Loop, Regulating the Output using Fe
Lecture 88 - H-Bridge Switched-Capacitor DC-DC Converter,SC DC-DC converter with Multiple Gain Settings
Lecture 89 - Current Sensing Techniques in DC-DC Converters
Lecture 90 - Analog Layout Techniques - Part 1
Lecture 91 - Analog Layout Techniques - Part 2
Lecture 92 - Digital Control of DC-DC Converters, ADC Architectures
Lecture 93 - Digital Pulse-Width Modulator Architectures, Adaptive Compensation
Lecture 94 - Limitations of Analog and Digital Controllers, Time-Based Controller for Buck Converter
Lecture 95 - Time-Based Controller for Buck Converter and for LDO, Issues with Time-Based Control
Lecture 96 - Multi-Phase DC-DC Converters
Lecture 97 - Dynamic Voltage and Frequency Scaling, Single Inductor Multiple Output (SIMO) DC-DC Converter
Lecture 98 - LCD/AMOLED Display Drivers - Part 1
Lecture 99 - LCD/AMOLED Display Drivers - Part 2
Lecture 100 - LCD/AMOLED Display Drivers - Part 3
Lecture 101 - LED Drivers for Camera Flash
Lecture 102 - Li-Ion Battery and its Charging Phases
Lecture 103 - Battery Charger IC

NPTEL Video Course - Electrical Engineering - NOC:DC Power Transmission Systems

Subject Co-ordinator - Prof. Krishna S

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Course contents
Lecture 2 - Introduction
Lecture 3 - Historical developments
Lecture 4 - Power semiconductor devices
Lecture 5 - General converter configuration
Lecture 6 - Choice of converter configuration
Lecture 7 - Choice of converter configuration
Lecture 8 - Converter configuration for pulse number equal to 6
Lecture 9 - Analysis of 6 pulse LCC neglecting inductance
Lecture 10 - Analysis of 6 pulse LCC neglecting inductance
Lecture 11 - Analysis of 6 pulse LCC neglecting inductance
Lecture 12 - Fourier series - Part 1
Lecture 13 - Fourier series - Part 2
Lecture 14 - Analysis of 6 pulse LCC neglecting inductance
Lecture 15 - Analysis of 6 pulse LCC neglecting inductance
Lecture 16 - Definitions
Lecture 17 - Commutation margin angle in a 6 pulse LCC neglecting inductance - Part 1
Lecture 18 - Commutation margin angle in a 6 pulse LCC neglecting inductance - Part 2
Lecture 19 - Instantaneous power on AC and DC sides in a 6 pulse LCC neglecting inductance
Lecture 20 - Average power on AC and DC sides in a 6 pulse LCC neglecting inductance
Lecture 21 - 6 pulse LCC with inductance
Lecture 22 - 2 and 3 valve conduction mode of 6 pulse LCC
Lecture 23 - 2 and 3 valve conduction mode of 6 pulse LCC
Lecture 24 - 2 and 3 valve conduction mode of 6 pulse LCC
Lecture 25 - 2 and 3 valve conduction mode of 6 pulse LCC
Lecture 26 - Extinction angle
Lecture 27 - Extinction angle
Lecture 28 - 3 and 4 valve conduction mode of 6 pulse LCC
Lecture 29 - Analysis of 3 and 4 valve conduction mode of 6 pulse LCC - Part 1

Lecture 30 - Analysis of 3 and 4 valve conduction mode of 6 pulse LCC - Part 2
Lecture 31 - Analysis of 3 and 4 valve conduction mode of 6 pulse LCC - Part 3
Lecture 32 - 3 valve conduction mode of 6 pulse LCC
Lecture 33 - Commutation margin angle
Lecture 34 - Normalization
Lecture 35 - Characteristics of 6 pulse LCC - Part 1
Lecture 36 - Characteristics of 6 pulse LCC - Part 2
Lecture 37 - Steady state analysis of a general LCC - Part 1
Lecture 38 - Steady state analysis of a general LCC - Part 2
Lecture 39 - Steady state analysis of a general LCC - Application to 6 pulse LCC
Lecture 40 - 6 pulse LCC with resistance included on the AC side
Lecture 41 - 6 pulse LCC with resistance, inductance and voltage source on the DC side - Part 1
Lecture 42 - 6 pulse LCC with resistance, inductance and voltage source on the DC side - Part 2
Lecture 43 - Power factor
Lecture 44 - Capacitor commutated converter - Part 1
Lecture 45 - Capacitor commutated converter - Part 2
Lecture 46 - 12 pulse LCC - Part 1
Lecture 47 - 12 pulse LCC - Part 2
Lecture 48 - Modes of operation of 12 pulse LCC
Lecture 49 - Purposes of transformer
Lecture 50 - Applications of DC transmission
Lecture 51 - Types of DC link
Lecture 52 - Types of DC link
Lecture 53 - DC link control
Lecture 54 - DC link control
Lecture 55 - Considerations that influence selection of control
Lecture 56 - Converter control characteristics
Lecture 57 - MTDC systens
Lecture 58 - Types of MTDC systems
Lecture 59 - Non-characteristic harmonics
Lecture 60 - Effect of firing angle errors
Lecture 61 - Problems with harmonics
Lecture 62 - Single tuned filter
Lecture 63 - Design of single tuned filter - Part 1
Lecture 64 - Design of single tuned filter - Part 2
Lecture 65 - Double tuned and damped filters
Lecture 66 - Reactive power requirement
Lecture 67 - Comparison of AC and DC transmission

NPTEL Video Course - Electrical Engineering - NOC:Optical Engineering

Subject Co-ordinator - Prof. Shanti Bhattacharya

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to Optical Engineering
Lecture 2 - Geometric Optics Basics
Lecture 3 - Refraction at a single surface
Lecture 4 - Lab 1 Introduction to OSLO
Lecture 5 - Stops and Rays
Lecture 6 - Aperture stop - Part 1
Lecture 7 - Aperture stop - Part 2
Lecture 8 - Lab 2 OSLO
Lecture 9 - Imaging equation for thick lens using ABCD matrix
Lecture 10 - Ray Tracing Matrix - Part 1
Lecture 11 - Ray Tracing Matrix - Part 2
Lecture 12 - Principal Planes
Lecture 13 - Lab 3 OSLO
Lecture 14 - Tracing rays through optical pupils - Part 1
Lecture 15 - Tracing rays through optical pupils - Part 2
Lecture 16 - Aberrations
Lecture 17 - Monochromatic Aberrations - Part 1
Lecture 18 - Monochromatic Aberrations - Part 2
Lecture 19 - Lab 4 - OSLO
Lecture 20 - Chromatic Aberrations and Aberration correction
Lecture 21 - Aberration correction
Lecture 22 - Revisiting Ray intercept curves
Lecture 23 - Lab 5 - OSLO
Lecture 24 - Interesting Geometric phenomena and applications
Lecture 25 - Gaussian beams introduction
Lecture 26 - Gaussian beams
Lecture 27 - Lab 6 - OSLO
Lecture 28 - ransformation of a Gaussian beam
Lecture 29 - Transformation of a Gaussian beam due to a lens and a mirror

Lecture 30 - Application of Gaussian beam equations
Lecture 31 - Interferometry basics
Lecture 32 - Interferometry basics - Part 1
Lecture 33 - Introduction to Python
Lecture 34 - Python - Part 2
Lecture 35 - Introduction to Matlab
Lecture 36 - Interferometry basics - Part 2
Lecture 37 - Python - Part 3
Lecture 38 - Matlab tutorial on interference
Lecture 39 - Applications of interference - Part 1
Lecture 40 - Holography
Lecture 41 - Applications of interference
Lecture 42 - Applications of Optical Engineering
Lecture 43 - Diffractive Optics
Lecture 44 - Diffraction Grating

NPTEL Video Course - Electrical Engineering - NOC:Nonlinear System Analysis

Subject Co-ordinator - Dr. Arun D. Mahindrakar, Prof. Ramkrishna Pasumarthy

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Examples of Nonlinear Physical Systems
Lecture 2 - Math Preliminaries - Part 1
Lecture 3 - Math Preliminaries - Part 2
Lecture 4 - Math Preliminaries - Part 3
Lecture 5 - Lipschitz Continuity and Contraction Mapping Theorem - Part 1
Lecture 6 - Lipschitz Continuity and Contraction Mapping Theorem - Part 2
Lecture 7 - Lipschitz Continuity and Contraction Mapping Theorem - Part 3
Lecture 8 - Existence and Uniqueness Theorem of ODE - Part 1
Lecture 9 - Existence and Uniqueness Theorem of ODE - Part 2
Lecture 10 - Existence and Uniqueness Theorem of ODE - Part 3
Lecture 11 - Existence and Uniqueness Theorem of ODE - Part 4
Lecture 12 - Equilibrium Points
Lecture 13 - Phase Portrait - Part 1
Lecture 14 - Phase Portrait - Part 2
Lecture 15 - Phase Portrait - Part 3
Lecture 16 - Phase portrait of Nonlinear Systems
Lecture 17 - Limit Cycles
Lecture 18 - Limit Cycles - Examples - Part 1
Lecture 19 - Limit Cycles - Examples - Part 2
Lecture 20 - Introduction to Bifurcation Theory - 1
Lecture 21 - Introduction to Bifurcation Theory - 2
Lecture 22 - Necessary and Sufficient Conditions for Local Bifurcation
Lecture 23 - Problems on Bifurcation Theory.
Lecture 24 - Stability Notions
Lecture 25 - Stability Notions
Lecture 26 - Stability Notions
Lecture 27 - Stability Notions
Lecture 28 - Stability Analysis and types of stability
Lecture 29 - Lypaunov Stability

Lecture 30 - Supplementary lecture
Lecture 31 - Center Manifold Theorem
Lecture 32 - Interconnection between non linearity and a linear system - Sector Nonlinearities And Aizermannâ
Lecture 33 - Counter example for Aizermannâ s conjecture
Lecture 34 - Passivity inspiration - passive circuits - dissipation equality
Lecture 35 - Dissipative Equality for circuit (Continued...)
Lecture 36 - PR condition for passivity of SISO system
Lecture 37 - Examples of PR transfer functions
Lecture 38 - Relation between storage function and Lyapunov function - PR Lemma
Lecture 39 - Proof of PR Lemma
Lecture 40 - Proof (Continued...) using spectral factorization theorem
Lecture 41 - PR definition for MIMO case
Lecture 42 - PSD Storage function in PR Lemma and how to make it PD (strictly PR)
Lecture 43 - KYP Theorem
Lecture 44 - Passivity preservation under interconnection
Lecture 45 - Aizermannâ s conjecture under passivity assumption is true
Lecture 46 - Sector Nonlinearities and need for generlaizing KYP Lemma
Lecture 47 - Need for Loop transformations
Lecture 48 - Loop Transformations - Part 1
Lecture 49 - Loop Transformations - Part 2
Lecture 50 - Circle criterion for PR
Lecture 51 - Examples based on circle criterion and stability under circle transformations

NPTEL Video Course - Electrical Engineering - NOC:Signals and Systems

Subject Co-ordinator - Prof. Kushal K. Shah

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Real and Complex Number
Lecture 2 - Sinusoid and Phasor
Lecture 3 - Limits and Continuity
Lecture 4 - Differentiation and Integration
Lecture 5 - Lâ Hospitalâ s Rule
Lecture 6 - LTI System Examples; Impedance
Lecture 7 - Dirac Delta function; Impulse
Lecture 8 - Continuous and Discrete Time Systems
Lecture 9 - Even Signal; Odd Signal
Lecture 10 - Orthogonality of Signals
Lecture 11 - Shifting and Scaling in Continuous Time - I
Lecture 12 - Shifting and Scaling in Continuous Time - II
Lecture 13 - Shifting and Scaling in Discrete Time
Lecture 14 - Signal and Noise
Lecture 15 - Signals in the Physical World
Lecture 16 - Signals and Sensory Perception
Lecture 17 - Frequency Domain Representation
Lecture 18 - Definition of Fourier Transform
Lecture 19 - Fourier Transform
Lecture 20 - Dirichlet Conditions
Lecture 21 - Inverse Fourier Transform
Lecture 22 - Fourier Transform
Lecture 23 - Frequency-Time Uncertainty Relation
Lecture 24 - Fourier Transform
Lecture 25 - Fourier Transform
Lecture 26 - Fourier Transform
Lecture 27 - Fourier Transform
Lecture 28 - Fourier Transform
Lecture 29 - Fourier Transform

Lecture 30 - Fourier Transform of Noise
Lecture 31 - Types of Noise
Lecture 32 - Overview of Systems and General Properties
Lecture 33 - Linearity and Time Invariance
Lecture 34 - LTI System Examples
Lecture 35 - Frequency Response of RLC circuits - I
Lecture 36 - Frequency Response of RLC circuits - II
Lecture 37 - LCCDE Representation of Continuous-Time LTI Systems
Lecture 38 - Frequency Domain Representation of LCCDE Systems
Lecture 39 - Time Domain Representation of LTI Systems
Lecture 40 - Continuous-Time Convolution Integral
Lecture 41 - Continuous-Time Convolution
Lecture 42 - Continuous-Time Convolution
Lecture 43 - Continuous-Time Convolution
Lecture 44 - LTI Systems
Lecture 45 - LTI Systems
Lecture 46 - LTI Systems
Lecture 47 - Fourier Transform in Complex Frequency Domain
Lecture 48 - Laplace Transform
Lecture 49 - Laplace Transform
Lecture 50 - Laplace Transform
Lecture 51 - Laplace Transform
Lecture 52 - Laplace Analysis of LTI Systems
Lecture 53 - Laplace Analysis of RLC Circuits - I
Lecture 54 - Laplace Transform
Lecture 55 - Laplace Transform
Lecture 56 - Laplace Transform
Lecture 57 - Laplace Analysis of LTI Systems
Lecture 58 - Laplace Analysis of LTI Systems
Lecture 59 - Laplace Analysis of First Order RLC Circuits
Lecture 60 - Laplace Analysis of Second Order RLC Circuits
Lecture 61 - Fourier Transform of Periodic Signals
Lecture 62 - Fourier Series Representation in Continuous-Time
Lecture 63 - Fourier Series Properties - I
Lecture 64 - Fourier Series Properties - II
Lecture 65 - LTI System Response for Periodic Input Signal
Lecture 66 - Fourier Series in Continuous-Time
Lecture 67 - Fourier Series in Continuous-Time
Lecture 68 - Discrete-Time Convolution Sum

Lecture 69 - Discrete-Time Convolution Sum Examples and Properties
Lecture 70 - LCCDE Representation of Discrete-Time LTI Systems
Lecture 71 - Impulse Train Sampling
Lecture 72 - Reconstruction of Continuous-Time Signal
Lecture 73 - Nyquist Sampling Theorem and Aliasing
Lecture 74 - Fourier Transform of Sampled Signals
Lecture 75 - DTFT
Lecture 76 - DTFT Properties I
Lecture 77 - DTFT Properties II
Lecture 78 - DTFT Properties III
Lecture 79 - DTFT
Lecture 80 - DTFT in Complex Frequency Domain
Lecture 81 - Z-Transform
Lecture 82 - Z-Transform Properties I
Lecture 83 - Z-Transform Properties II
Lecture 84 - Z-Transform Properties III
Lecture 85 - Z-Transform
Lecture 86 - Z-Transform
Lecture 87 - Block Diagram Representation

NPTEL Video Course - Electrical Engineering - NOC:Linear Dynamical Systems

Subject Co-ordinator - Prof. Tushar Jain

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Response and state-space solution of Linear systems
Lecture 2 - Solution of LTV systems
Lecture 3 - Solution of LTI systems
Lecture 4 - Equivalent State Equations
Lecture 5 - Realization of LTI and LTV Systems
Lecture 6 - Tutorial - 1
Lecture 7 - Introduction to Stability Analysis
Lecture 8 - Lyapunov Stability - Part I
Lecture 9 - Lyapunov Stability - Part II
Lecture 10 - Proof of lyapunov stability theorem
Lecture 11 - BIBO vs Lyapunov Stability
Lecture 12 - BIBO vs Lyapunov Stability
Lecture 13 - Tutorial - 2
Lecture 14 - Introduction to Controllability
Lecture 15 - Reachability and Controllability Gramians
Lecture 16 - Controllability Matrix
Lecture 17 - Discrete-time Reachability and Controllability Gramians
Lecture 18 - Tests for controllability - I
Lecture 19 - Tests for controllability - II
Lecture 20 - Tutorial - 3
Lecture 21 - Tests for controllability - III
Lecture 22 - Tests for controllability - IV
Lecture 23 - Controllable Decomposition - I
Lecture 24 - Stabilizable Systems
Lecture 25 - Tests for Stabilizability
Lecture 26 - Tutorial - 4
Lecture 27 - State Feeback - I
Lecture 28 - State Feeback - II
Lecture 29 - Lyapunov Method of State Feedback Design

Lecture 30 - Regulation and Tracking
Lecture 31 - Tutorial - 5
Lecture 32 - Robust Tracking and Disturbance Rejection
Lecture 33 - State Feedback design for Multi-input systems
Lecture 34 - Linear Quadratic Regulator
Lecture 35 - Tutorial - 6
Lecture 36 - Output feedback and observability
Lecture 37 - Duality and Observability tests
Lecture 38 - Decompostions and Detectability
Lecture 39 - Minimal Realisations
Lecture 40 - Observer Design and Output Feedback
Lecture 41 - Observer Design and Output Feedback
Lecture 42 - UIO
Lecture 43 - Tutorial - 7 and 8 (combined)

NPTEL Video Course - Electrical Engineering - NOC:A brief Introduction of Micro-Sensors

Subject Co-ordinator - Prof. Santanu Talukder

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to Microscale Sensors or MEMS
Lecture 2 - Scaling effect
Lecture 3 - Some Simple Mechanics
Lecture 4 - Basic Mechanics - Part 1
Lecture 5 - Basic Mechanics - Part 2
Lecture 6 - Basic Mechanics - Part 3
Lecture 7 - Electrostatics
Lecture 8 - Electrostatic force
Lecture 9 - Coupled electromechanics
Lecture 10 - Stiction
Lecture 11 - Si crystal structure
Lecture 12 - Si etching
Lecture 13 - KOH etching
Lecture 14 - TMAH etching
Lecture 15 - Deposition and Lithography
Lecture 16 - Lithography
Lecture 17 - Pressure sensor types, membrane, Piezoelectric sensing, capacitive sensing
Lecture 18 - Pressure Sensor - II
Lecture 19 - Pressure Sensor - III
Lecture 20 - Accelerometer - I
Lecture 21 - Accelerometer - II
Lecture 22 - Assignment 1
Lecture 23 - Assignment 2

NPTEL Video Course - Electrical Engineering - NOC:Fiber Optic Communication Technology

Subject Co-ordinator - Prof. Deepa Venkitesh

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to FOCT
Lecture 2 - Communication through the ages
Lecture 3 - Communication
Lecture 4 - Communication
Lecture 5 - Digital Communication for Optical Communication
Lecture 6 - Digital modulation
Lecture 7 - Digital modulation
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
Lecture 13 - External Quantum Efficiency
Lecture 14 - Modulation Bandwidth of LED
Lecture 15 - Optical and Electrical Bandwidth of LED
Lecture 16 - Emission Pattern of LED
Lecture 17 - Optical Sources
Lecture 18 - Laser Diodes
Lecture 19 - Laser Diodes
Lecture 20 - Laser Diodes
Lecture 21 - Assignment Discussion - Week 2
Lecture 22 - Laser Diodes
Lecture 23 - Laser Diodes
Lecture 24 - Laser rate equation
Lecture 25 - Laser rate equation
Lecture 26 - Laser power derivation
Lecture 27 - Modulation Response of Laser - 1
Lecture 28 - Modulation Response of Laser - 2
Lecture 29 - Modulation Response of Laser - 3

Lecture 30 - Setbacks of direct modulation of laser
Lecture 31 - Setbacks of direct modulation of laser
Lecture 32 - Assignment Discussion - Week 3
Lecture 33 - Recap of direction modulation consequences
Lecture 34 - Noise in Lasers
Lecture 35 - Relative Intensity Noise
Lecture 36 - Laser Phase Noise - 1
Lecture 37 - Laser Phase Noise - 2
Lecture 38 - Effect of Laser Phase Noise
Lecture 39 - Electro-optic phase modulation
Lecture 40 - Electro-optic intensity modulator
Lecture 41 - Biasing of MZM
Lecture 42 - Biasing of MZM
Lecture 43 - Line coding schemes and their bandwidth requirements
Lecture 44 - Assignment Discussion - Week 4
Lecture 45 - Introduction to optical Fiber
Lecture 46 - Attenuation in optical fibers
Lecture 47 - Fiber Modes
Lecture 48 - Modes of a step index fiber - 1
Lecture 49 - Modes of a step index fiber - 2
Lecture 50 - Modes of a step index fiber - 3
Lecture 51 - Modes of a step index fiber - 4
Lecture 52 - Modes of a step index fiber - 5
Lecture 53 - Modes and Cut-off conditions
Lecture 54 - Universal b-V curves
Lecture 55 - Modal Profiles in step index fiber
Lecture 56 - Mode Field Diameter
Lecture 57 - Dispersion- Intermodal dispersion derivation
Lecture 58 - Dispersion-Bit rate distance Product
Lecture 59 - Phase Velocity and Group Velocity - 1
Lecture 60 - Phase Velocity and Group Velocity - 2
Lecture 61 - Material dispersion
Lecture 62 - Waveguide dispersion
Lecture 63 - Total Dispersion in optical fiber
Lecture 64 - Polarization mode dispersion
Lecture 65 - Photodetectors concepts
Lecture 66 - p-n and p-i-n Photodetectors
Lecture 67 - Avalance Photodetector
Lecture 68 - Direct detection receiver and sources of noise

Lecture 69 - Quantifying noises in direct detection receivers
Lecture 70 - SNR and Operation Regimes
Lecture 71 - Noise Equivalent power and SNR in APDs
Lecture 72 - Coherent Receivers
Lecture 73 - SNR analysis of coherent receivers
Lecture 74 - Performance Evaluation - 1
Lecture 75 - Performance Evaluation - 2
Lecture 76 - Performance Metrics
Lecture 77 - Performance Metrics
Lecture 78 - Quantum limit of photodetection
Lecture 79 - Optical Amplifier
Lecture 80 - Erbium doped fiber amplifier - 1
Lecture 81 - Erbium doped fiber amplifier - 2
Lecture 82 - Erbium doped fiber amplifier - 3
Lecture 83 - Erbium doped fiber amplifier - 4
Lecture 84 - Link Design - Rise Time Budget
Lecture 85 - Link Design - Case Study
Lecture 86 - Link Design - Passive Optical Network and long haul link
Lecture 87 - Dispersion - Recap
Lecture 88 - Dispersion Compensation - Pulse Propagation with disperison
Lecture 89 - Pulse propagation - 2
Lecture 90 - Dispersion Compensation - Dispersion Transfer Function
Lecture 91 - Dispersion Compensation - Case Study
Lecture 92 - Dispersion COmpensation - WDM and DSP
Lecture 93 - Nonlinear Effects- Nonlinear refractive Index
Lecture 94 - Self Phase Modulation
Lecture 95 - Cross Phase Modulation
Lecture 96 - Scattering Processes in optical fibers
Lecture 97 - Stimulated Brillouin Scattering
Lecture 98 - Stimulated Raman Scattering
Lecture 99 - Components - Directional Couplers
Lecture 100 - Components - VOA, Polariser, Polarisation Controllers
Lecture 101 - Components - Isolator
Lecture 102 - Components - Circulator, Definitions
Lecture 103 - Components - Wavelength filters
Lecture 104 - Components - Arrayed Waveguide Gratings, WSS
Lecture 105 - Balanced Detection
Lecture 106 - Polarisation Diverse Coherent Receiver
Lecture 107 - Phase and Polarisation Diverse Coherent Reciever

Lecture 108 - Overview of impairments in coherent optical communication
Lecture 109 - Transceiver impairments - Generation and Compensation
Lecture 110 - Channel Impairments - Generation and Compensation
Lecture 111 - Demo video
Lecture 112 - Introduction to Optical Networks
Lecture 113 - Layers of Optical Network
Lecture 114 - SDH/SONET Layering, Frame Structure
Lecture 115 - Physical Networks Topologies
Lecture 116 - Topology specific Link Design
Lecture 117 - Network Protection
Lecture 118 - Access Networks- PON
Lecture 119 - Optical Interconnects, Data Centers
Lecture 120 - Optical communication for Wireless Fronthauling

NPTEL Video Course - Electrical Engineering - NOC:Image Signal Processing

Subject Co-ordinator - Prof. A. N. Rajagopalan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Course Introduction
Lecture 2 - Applications of Image processing
Lecture 3 - Applications of Image processing (Continued...)
Lecture 4 - Basics of Images
Lecture 5 - Shot Noise
Lecture 6 - Geometric Transformations
Lecture 7 - Geometric Transformations (Continued...)
Lecture 8 - Bilinear Interpolation
Lecture 9 - Geometric Transformations (Continued...)
Lecture 10 - Projective Transformation
Lecture 11 - Homography
Lecture 12 - Homography - Special cases
Lecture 13 - Computing Homography
Lecture 14 - RANSAC
Lecture 15 - Rotational Homography
Lecture 16 - Research Challenges
Lecture 17 - Real Aperture Camera
Lecture 18 - Real aperture camera - Introduction
Lecture 19 - Cricle of confusion
Lecture 20 - Depth of field, Linearity
Lecture 21 - Space-Invariance
Lecture 22 - 2D Convolution
Lecture 23 - 2D Convolution
Lecture 24 - Blur Models
Lecture 25 - Space-variant Blurring
Lecture 26 - Shape from X - Introduction
Lecture 27 - 2-View Stereo
Lecture 28 - Introduction to Shape from Focus
Lecture 29 - SFF Principle

Lecture 30 - Shape from focus - Gaussian fitting
Lecture 31 - Shape from focus - Focus operators
Lecture 32 - Shape from Focus - Examples
Lecture 33 - Shape from Focus - Tensor Voting
Lecture 34 - DFD Principle
Lecture 35 - Motion Blur
Lecture 36 - Image Transforms - Introduction
Lecture 37 - Image Transforms - Motivation
Lecture 38 - 1D Unitary Transforms - Introduction
Lecture 39 - Extending 1D Unitary Transform to 2D - Motivation
Lecture 40 - Extending 1D Unitary Transform to 2D - Example
Lecture 41 - Alternative Forms of 2D
Lecture 42 - Kronecker Product
Lecture 43 - Kronecker Product - (Example Revisited)
Lecture 44 - Extending 1D Unitary Transform to 2D - Summary
Lecture 45 - 1D DFT to 2D DFT
Lecture 46 - 2D DFT Visualization
Lecture 47 - 2D DFT - Computation
Lecture 48 - 1D DCT - Definition, Motivation
Lecture 49 - Relation to DFT
Lecture 50 - 2D DCT and Walsh-Haddamard Transform
Lecture 51 - Data Dependent Transforms, Karhunen Loeve Transform
Lecture 52 - Karhunen-Loeve Transform (KLT) - Concept
Lecture 53 - Karhunen-Loeve Transform (KLT) - Applications
Lecture 54 - Karhunen-Loeve Transform (KLT) - Applications
Lecture 55 - Singular Value Decomposition (SVD)
Lecture 56 - Applications of SVD
Lecture 57 - Change detection
Lecture 58 - Image Thresholding
Lecture 59 - Adaptive Local thresholding - Motivation
Lecture 60 - Chow-Kaneko Local thresholding
Lecture 61 - K-Means Method
Lecture 62 - ISODATA Method
Lecture 63 - Theory of Histogram Equalization and Modification
Lecture 64 - Histogram Equalization example
Lecture 65 - Image sequence and Single image filtering in Gaussian noise
Lecture 66 - Non-local Means Method
Lecture 67 - Non-local Means Filtering (Examples)
Lecture 68 - Impulse Noise Generator

Lecture 69 - Impulse noise filtering
Lecture 70 - Transform Domain Filtering
Lecture 71 - Illumination Handling
Lecture 72 - Applications of Restoration, and Image Deblurring
Lecture 73 - Haddamard's conditions and Least squares solution
Lecture 74 - Min-norm solution and Norm of Linear operator
Lecture 75 - Numerical stability analysis
Lecture 76 - Image Deblurring
Lecture 77 - Tikhonov-Miller Regularization
Lecture 78 - Conditional Mean as an Estimator
Lecture 79 - Linear Estimator
Lecture 80 - Wiener Filter
Lecture 81 - Fourier Wiener Filter
Lecture 82 - 1D Superresolution
Lecture 83 - Superresolution Examples

NPTEL Video Course - Electrical Engineering - NOC:Fundamentals of Electric Vehicles: Technology and Economics

Subject Co-ordinator - Prof. Ashok Jhunjhunwala, Prof. Prabhjot Kaur, Prof. Kaushal Kumar Jha, Prof. L Kannan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Overview of Electric Vehicles in India
Lecture 2 - Can India Drive its EV program Innovatively and Differently and scale? - Part 1
Lecture 3 - Can India Drive its EV program Innovatively and Differently and scale? - Part 2
Lecture 4 - A bit about batteries
Lecture 5 - Charging and Swapping Infrastructure
Lecture 6 - Where will we get Lithium for batteries?
Lecture 7 - EV Subsystems
Lecture 8 - Forces acting when a vehicle move
Lecture 9 - Aerodynamic drag, Rolling Resistance and Uphill Resistance
Lecture 10 - Power and Torque to accelerate
Lecture 11 - Putting it all together - 1
Lecture 12 - Putting it all together - 2
Lecture 13 - Concept of Drive Cycle - 1
Lecture 14 - Concept of Drive Cycle - 2
Lecture 15 - Drive Cycles and Energy used per km - Part 1
Lecture 16 - Drive Cycles and Energy used per km - Part 2
Lecture 17 - EV Subsystem
Lecture 18 - EV Subsystem
Lecture 19 - Introduction to Battery Parameters - Part 1
Lecture 20 - Introduction to Battery Parameters - Part 2
Lecture 21 - Why Lithium Ion Battery? - Part 1
Lecture 22 - Why Lithium Ion Battery? - Part 2
Lecture 23 - Batteries in Future
Lecture 24 - Li-Ion Battery Cells
Lecture 25 - SoH and SoC estimation and Self Discharge - Part 1
Lecture 26 - SoH and SoC estimation and Self Discharge - Part 2
Lecture 27 - Battery Pack Development - Part 1
Lecture 28 - Battery Pack Development - Part 2
Lecture 29 - Computation of Effective cost of battery - Part 1

Lecture 30 - Computation of Effective cost of battery - Part 2
Lecture 31 - Charging Batteries
Lecture 32 - Fundamentals of Battery Pack Design
Lecture 33 - Mechanical Design - Part 1
Lecture 34 - Mechanical Design - Part 2
Lecture 35 - Mechanical Design - Part 3
Lecture 36 - Mechanical Design - Part 4
Lecture 37 - Thermal Design - Part 1
Lecture 38 - Thermal Design - Part 2
Lecture 39 - Thermal Design - Part 3
Lecture 40 - Thermal Design - Part 4
Lecture 41 - Electrical Design - Part 1
Lecture 42 - Electrical Design - Part 2
Lecture 43 - Electrical Design - Part 3
Lecture 44 - BMS Design of Electic Vehicle - Part 1
Lecture 45 - BMS Design of Electic Vehicle - Part 2
Lecture 46 - BMS Design of Electic Vehicle - Part 3
Lecture 47 - EV Motors and Controllers - Understanding Flow - Part 1
Lecture 48 - EV Motors and Controllers - Understanding Flow - Part 2
Lecture 49 - Power and Efficiency
Lecture 50 - Torque Production - Part 1
Lecture 51 - Torque Production - Part 2
Lecture 52 - Torque Production - Part 3
Lecture 53 - Speed and Back EMF
Lecture 54 - The d-q Equivalent circuit - Part 1
Lecture 55 - The d-q Equivalent circuit - Part 2
Lecture 56 - Field-oriented Control
Lecture 57 - Three phase AC - Part 1
Lecture 58 - Three phase AC - Part 2
Lecture 59 - Thermal Design - Part 1
Lecture 60 - Thermal Design - Part 2
Lecture 61 - Engineering Considerations - Part 1
Lecture 62 - Engineering Considerations - Part 2
Lecture 63 - Future Frontiers
Lecture 64 - EV Chargers
Lecture 65 - EV Chargers
Lecture 66 - EV Chargers
Lecture 67 - Battery Swapping
Lecture 68 - Standardization and On board Chargers

Lecture 69 - Public Chargers - Part 1
Lecture 70 - Public Chargers - Part 2
Lecture 71 - Bulk Chargers/Swap Stations - Part 1
Lecture 72 - Bulk Chargers/Swap Stations - Part 2
Lecture 73 - Economics of Public Chargers in context
Lecture 74 - Analytics - Part 1
Lecture 75 - Analytics - Part 2
Lecture 76 - Course Summary

NPTEL Video Course - Electrical Engineering - NOC:Applied Linear Algebra

Subject Co-ordinator - Prof. Andrew Thangaraj

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to the Course
Lecture 2 - Vector Spaces
Lecture 3 - Linear Combinations and Span
Lecture 4 - Subspaces, Linear Dependence and Independence
Lecture 5 - Basis and Dimension
Lecture 6 - Sums, Direct Sums and Gaussian Elimination
Lecture 7 - Linear Maps and Matrices
Lecture 8 - Null space, Range, Fundamental theorem of linear maps
Lecture 9 - Column space, null space and rank of a matrix
Lecture 10 - Algebraic operations on linear maps
Lecture 11 - Invertible maps, Isomorphism, Operators
Lecture 12 - Solving Linear Equations
Lecture 13 - Elementary Row Operations
Lecture 14 - Translates of a subspace, Quotient Spaces
Lecture 15 - Row space and rank of a matrix
Lecture 16 - Determinants
Lecture 17 - Coordinates and linear maps under a change of basis
Lecture 18 - Simplifying matrices of linear maps by choice of basis
Lecture 19 - Polynomials and Roots
Lecture 20 - Invariant subspaces, Eigenvalues, Eigenvectors
Lecture 21 - More on Eigenvalues, Eigenvectors, Diagonalization
Lecture 22 - Eigenvalues, Eigenvectors and Upper Triangularization
Lecture 23 - Properties of Eigenvalues
Lecture 24 - Linear state space equations and system stability
Lecture 25 - Discrete-time Linear Systems and Discrete Fourier Transforms
Lecture 26 - Sequences and counting paths in graphs
Lecture 27 - PageRank Algorithm
Lecture 28 - Dot product and length in Cn, Inner product and norm in V over F
Lecture 29 - Orthonormal basis and Gram-Schmidt orthogonalisation

Lecture 30 - Linear Functionals, Orthogonal Complements
Lecture 31 - Orthogonal Projection
Lecture 32 - Projection and distance from a subspace
Lecture 33 - Linear equations, Least squares solutions and Linear regression
Lecture 34 - Minimum Mean Squared Error Estimation
Lecture 35 - Adjoint of a linear map
Lecture 36 - Properties of Adjoint of a Linear Map
Lecture 37 - Adjoint of an Operator and Operator-Adjoint Product
Lecture 38 - Self-adjoint Operator
Lecture 39 - Normal Operators
Lecture 40 - Complex Spectral Theorem
Lecture 41 - Real Spectral Theorem
Lecture 42 - Positive Operators
Lecture 43 - Quadratic Forms, Matrix Norms and Optimization
Lecture 44 - Isometries
Lecture 45 - Classification of Operators
Lecture 46 - Singular Values and Vectors of a Linear Map
Lecture 47 - Singular Value Decomposition
Lecture 48 - Polar decomposition and some applications of SVD

NPTEL Video Course - Electrical Engineering - NOC:Basic Electrical Circuits

Subject Co-ordinator - Dr. Nagendra Krishnapura

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Preliminaries
Lecture 2 - Current
Lecture 3 - Voltage
Lecture 4 - Electrical elements and circuits
Lecture 5 - Kirchhoff's current law (KCL)
Lecture 6 - Kirchhoff's voltage law (KVL)
Lecture 7 - Voltage source
Lecture 8 - Current source
Lecture 9 - Resistor
Lecture 10 - Capacitor
Lecture 11 - Inductor
Lecture 12 - Mutual inductor
Lecture 13 - Linearity of elements
Lecture 14 - Series connection-Voltage sources in series
Lecture 15 - Series connection of R, L, C, current source
Lecture 16 - Elements in parallel
Lecture 17 - Current source in series with an element; Voltage source in parallel with an element
Lecture 18 - Extreme cases
Lecture 19 - Summary
Lecture 20 - Voltage controlled voltage source (VCVS)
Lecture 21 - Voltage controlled current source (VCCS)
Lecture 22 - Current controlled voltage source (CCVS)
Lecture 23 - Current controlled current source (CCCS)
Lecture 24 - Realizing a resistance using a VCCS or CCCS
Lecture 25 - Scaling an element's value using controlled sources
Lecture 26 - Example calculation
Lecture 27 - Power and energy absorbed by electrical elements
Lecture 28 - Power and energy in a resistor
Lecture 29 - Power and energy in a capacitor

Lecture 30 - Power and energy in an inductor
Lecture 31 - Power and energy in a voltage source
Lecture 32 - Power and energy in a current source
Lecture 33 - Goals of circuit analysis
Lecture 34 - Number of independent KCL equations
Lecture 35 - Number of independent KVL equations and branch relationships
Lecture 36 - Analysis of circuits with a single independent source
Lecture 37 - Analysis of circuits with multiple independent sources using superposition
Lecture 38 - Superposition
Lecture 39 - What is nodal analysis
Lecture 40 - Setting up nodal analysis equations
Lecture 41 - Structure of the conductance matrix
Lecture 42 - How do elements circuit appear in the nodal analysis formulation
Lecture 43 - Completely solving the circuit starting from nodal analysis
Lecture 44 - Nodal analysis example
Lecture 45 - Matrix inversion basics
Lecture 46 - Nodal analysis with independent voltage sources
Lecture 47 - Supernode for nodal analysis with independent voltage sources
Lecture 48 - Nodal analysis with VCCS
Lecture 49 - Nodal analysis with VCVS
Lecture 50 - Nodal analysis with CCVS
Lecture 51 - Nodal analysis with CCCS
Lecture 52 - Nodal analysis summary
Lecture 53 - Planar circuits
Lecture 54 - Mesh currents and their relationship to branch currents
Lecture 55 - Mesh analysis
Lecture 56 - Mesh analysis with independent current sources-Supermesh
Lecture 57 - Mesh analysis with current controlled voltage sources
Lecture 58 - Mesh analysis with current controlled current sources
Lecture 59 - Mesh analysis using voltage controlled sources
Lecture 60 - Nodal analysis versus Mesh analysis
Lecture 61 - Superposition theorem
Lecture 62 - Pushing a voltage source through a node
Lecture 63 - Splitting a current source
Lecture 64 - Substitution theorem
Lecture 65 - Substitution theorem
Lecture 66 - Substituting a voltage or current source with a resistor
Lecture 67 - Extensions to Superposition and Substitution theorem
Lecture 68 - Thevenin's theorem

Lecture 69 - Worked out example
Lecture 70 - Norton's theorem
Lecture 71 - Worked out example
Lecture 72 - Maximum power transfer theorem
Lecture 73 - Preliminaries
Lecture 74 - Two port parameters
Lecture 75 - y parameters
Lecture 76 - y parameters
Lecture 77 - z parameters
Lecture 78 - z parameters
Lecture 79 - h parameters
Lecture 80 - h parameters
Lecture 81 - g parameters
Lecture 82 - g parameters
Lecture 83 - Calculations with a two-port element
Lecture 84 - Calculations with a two-port element
Lecture 85 - Degenerate cases
Lecture 86 - Relationships between different two-port parameters
Lecture 87 - Equivalent circuit representation of two-ports
Lecture 88 - Reciprocity
Lecture 89 - Proof of reciprocity of resistive two-ports
Lecture 90 - Proof for 4-terminal two-ports
Lecture 91 - Reciprocity in terms of different two-port parameters
Lecture 92 - Reciprocity in circuits containing controlled sources
Lecture 93 - Examples
Lecture 94 - Feedback amplifier using an opamp
Lecture 95 - Ideal opamp
Lecture 96 - Negative feedback around the opamp
Lecture 97 - Finding opamp sign for negative feedback
Lecture 98 - Example
Lecture 99 - Analysis of circuits with opamps
Lecture 100 - More on opamps
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
Lecture 111 - First order circuit with a constant input
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
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
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
Lecture 127 - First order RC response to a sinusoidal input-via the complex exponential
Lecture 128 - Summary
Lecture 129 - Three methods of calculating the sinusoidal steady state response
Lecture 130 - Calculating the total response including initial conditions
Lecture 131 - Why are sinusoids used in measurement?
Lecture 132 - Second order system natural response
Lecture 133 - Second order system as a cascade of two first order systems
Lecture 134 - Second order system natural response-critically damped and underdamped
Lecture 135 - Generalized form of a second order system
Lecture 136 - Numerical example
Lecture 137 - Series and parallel RLC circuits
Lecture 138 - Forced response of a second order system
Lecture 139 - Steady state response calculation and Phasors
Lecture 140 - Phasors (Continued...)
Lecture 141 - Magnitude and Phase plots
Lecture 142 - Magnitude and phase plotes of a second order system
Lecture 143 - Maximum power transfer and Conjugate matching

NPTEL Video Course - Electrical Engineering - NOC:Optical Fiber Sensors

Subject Co-ordinator - Prof. Balaji Srinivasan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to optical sensors
Lecture 2 - Different types of optical sensors
Lecture 3 - Overview of distributed sensors
Lecture 4 - Optical sensors system
Lecture 5 - Optical sources
Lecture 6 - Optical receivers - 1
Lecture 7 - Optical receivers - 2
Lecture 8 - Optical receivers - 3
Lecture 9 - Optical receiver design
Lecture 10 - Noise Analysis
Lecture 11 - Sensor Performance characteristics
Lecture 12 - Noise Mitigation Techniques
Lecture 13 - Lock in detection
Lecture 14 - Amplitude modulated sensors - 1
Lecture 15 - Gas absoprtion spectroscopy
Lecture 16 - Amplitude modulated sensors - 2
Lecture 17 - Amplitude modulated sensors - 3
Lecture 18 - Amplitude modulated sensors - 4
Lecture 19 - Problem Discussion
Lecture 20 - Pulse-oximeter
Lecture 21 - Phase modulated sensors - 1
Lecture 22 - Phase modulated sensors - 2
Lecture 23 - Phase modulated Sensors - 3
Lecture 24 - Phase modulated sensors - 4
Lecture 25 - Phase modulated sensors - 5
Lecture 26 - Phase modulated sensors - 6
Lecture 27 - Phase modulated sensors - 7
Lecture 28 - Phase modulated sensors - 8
Lecture 29 - Phase modulated sensors - 9

Lecture 30 - Phase modulated sensors - 10
Lecture 31 - Phase modulated Sensors - 11
Lecture 32 - Wavelength modulated sensors - 1
Lecture 33 - Wavelength modulated sensors - 2
Lecture 34 - Wavelength modulated sensors - 3
Lecture 35 - Wavelength modulated sensors - 4
Lecture 36 - Wavelength modulated sensors - 5
Lecture 37 - Wavelength modulated sensors - 6
Lecture 38 - Wavelength modulated sensors - 7
Lecture 39 - Wavelength modulated sensors - 8
Lecture 40 - Polarization modulated sensors - 1
Lecture 41 - Polarization modulated sensors - 2
Lecture 42 - Polarization modulated sensors - 3

NPTEL Video Course - Electrical Engineering - NOC:Introduction to Time - Varying Electrical Networks

Subject Co-ordinator - Prof. Shanthi Pavan

Co-ordinating Institute - IIT - Madras

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

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
Lecture 39 - Analysis of an example LPTV network - Part 1
Lecture 40 - Analysis of an example LPTV network - Part 2
Lecture 41 - LPTV network analysis, RC filter, time-varying
Lecture 42 - Impedance and admittance in LTI and LPTV networks
Lecture 43 - Thevenin and Norton's Theorems for LPTV networks
Lecture 44 - The N-path principle
Lecture 45 - N-path example
Lecture 46 - Time-domain intuition of the N-path principle
Lecture 47 - N-path example: Time-Interleaved ADCs
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
Lecture 62 - Applications of inter-reciprocity: analysis of chopped amplifiers
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
Lecture 66 - Time-domain implications of inter-reciprocity and the adjoint network
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
Lecture 70 - LPTV networks with sampled outputs: The equivalent LTI filter
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-
Lecture 74 - Finding the equivalent LTI filter of a sampled LPTV system with offset sampling
Lecture 75 - LPTV networks driven by modulated inputs
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 Video Course - Electrical Engineering - NOC:Digital System Design

Subject Co-ordinator - Prof. Neeraj Goel

Co-ordinating Institute - IIT - Ropar

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

Lecture 1 - Introduction
Lecture 2 - Analog vs Digital
Lecture 3 - Binary number system - 1
Lecture 4 - Binary number system - 2
Lecture 5 - Negative number representation - 1
Lecture 6 - Negative number representation - 2
Lecture 7 - Other number systems
Lecture 8 - Floating point numbers - 1
Lecture 9 - Floating point numbers - 2
Lecture 10 - Floating point numbers - 3
Lecture 11 - Floating point numbers - 4
Lecture 12 - Floating point numbers - 5
Lecture 13 - Boolean functions
Lecture 14 - Boolean Algebra
Lecture 15 - SOP and POS Representation
Lecture 16 - Algebraic simplifications
Lecture 17 - Canonical form
Lecture 18 - Boolean minimization using K-Maps
Lecture 19 - More Logic gates
Lecture 20 - Hardware description language:Verilog
Lecture 21 - Verilog simulation demo
Lecture 22 - K-maps
Lecture 23 - QM-method
Lecture 24 - Area delay model
Lecture 25 - Multi-level logic
Lecture 26 - Multiplexer
Lecture 27 - Four state logic
Lecture 28 - Decoders - 1
Lecture 29 - Decoders - 2

Lecture 30 - Encoders
Lecture 31 - Programmable hardware
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
Lecture 39 - Iterative circuits - 2
Lecture 40 - Introduction to sequential circuits
Lecture 41 - Latches
Lecture 42 - D-Flip-flops
Lecture 43 - More Flip-flops
Lecture 44 - Counters
Lecture 45 - Verilog-Behavior model - 1
Lecture 46 - Verilog-Behavior model - 2
Lecture 47 - Registers - 1
Lecture 48 - Registers - 2
Lecture 49 - Memory
Lecture 50 - Sequential circuit analysis
Lecture 51 - Derivation state graph
Lecture 52 - Sequence detector: Example 1
Lecture 53 - Sequence detector: Example 2
Lecture 54 - State machine reduction
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
Lecture 65 - FPGA
Lecture 66 - Xilinx CLB
Lecture 67 - FPGA - Design flow
Lecture 68 - FPGA design demo

Lecture 69 - Introduction to ASIC design flow - Part 1
Lecture 70 - Introduction to ASIC design flow - Part 2
Lecture 71 - Future directions

NPTEL Video Course - Electrical Engineering - NOC:Stochastic Modeling and the Theory of Queues

Subject Co-ordinator - Prof. Krishna Jagannathan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Review of Probability Theory: Random Variable
Lecture 2 - Sequence of Random Variables
Lecture 3 - Laws of Large Numbers and Central Limit Theorem
Lecture 4 - What is a stochastic process?
Lecture 5 - Counting Process
Lecture 6 - Poisson Process - Introduction
Lecture 7 - Poisson Process - Memorylessness
Lecture 8 - Poisson Process - Increment properties
Lecture 9 - Distribution of arrival epoch Sn and N(t) for a Poisson Process
Lecture 10 - Alternate definitions of a Poisson Process
Lecture 11 - Merging of Poisson Processes - Part 1
Lecture 12 - Merging of Poisson Processes - Part 2
Lecture 13 - Splitting of Poisson Process - Part 1
Lecture 14 - Splitting of Poisson Process - Part 2
Lecture 15 - Example: Poisson Splitting
Lecture 16 - Conditional arrival density and order statistics - Part 1
Lecture 17 - Conditional arrival density and order statistics - Part 2
Lecture 18 - Non Homogeneous Poisson Process
Lecture 19 - Introduction to Queueing (with examples)
Lecture 20 - Examples: Non homogeneous Poisson process
Lecture 21 - Examples: Competing Poisson processes
Lecture 22 - Introduction to Renewal Processes
Lecture 23 - Strong law for renewal processes
Lecture 24 - Strong law for renewal processes - Proof
Lecture 25 - Residual life, age and duration (Time average) - Part 1
Lecture 26 - Residual life, age and duration (Time average) - Part 2
Lecture 27 - Renewal Reward Theorem (Time average) - Part 1
Lecture 28 - Renewal Reward Theorem (Time average) - Part 2
Lecture 29 - Stopping time

Lecture 30 - Wald's Equality
Lecture 31 - Wald's Equality (Continued...)
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 Video Course - Electrical Engineering - NOC:Integrated Photonics Devices and Circuits

Subject Co-ordinator - Prof. Bijoy Krishna Das

Co-ordinating Institute - IIT - Madras

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

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 Interferomete
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
Lecture 32 - Tunable Devices and Reconfigurable Circuits: Post Fabrication Phase Error Corrections
Lecture 33 - Tunable Devices and Reconfigurable Circuits: Thermo-Optic Switching and Tuning
Lecture 34 - Tunable Devices and Reconfigurable Circuits: Programmable Silicon Photonics
Lecture 35 - Electro-Optic Modulators for Integrated Photonics: Basic Design and Working Principle
Lecture 36 - Electro-Optic Modulators for Integrated Photonics: Various Physical Mechanisms
Lecture 37 - Electro-Optic Modulators for Integrated Photonics: FCCE Based Silicon Photonics Modulator
Lecture 38 - Light Sources and Photodetectors for Integrated Photonics: Integrated Photonic light Sources - P
Lecture 39 - Light Sources and Photodetectors for Integrated Photonics: Integrated Photonic light Sources - P
Lecture 40 - Light Sources and Photodetectors for Integrated Photonics: Photodetectors for Silicon Photonics

NPTEL Video Course - Electrical Engineering - NOC:Introduction to Semiconductor Devices

Subject Co-ordinator - Prof. Naresh Kumar Emani

Co-ordinating Institute - IIT - Hyderabad

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

Lecture 1 - Types of Semiconductors
Lecture 2 - Classical Vs Quantum Mechanics
Lecture 3 - Electrons in infinite and finite 1D potential well
Lecture 4 - 3D potential well model of atom and Bohr's model
Lecture 5 - Covalent bonds and inter-atomic interactions in Silicon
Lecture 6 - Energy band formation
Lecture 7 - Electron hole pair generation
Lecture 8 - Direct and Indirect bandgap semiconductors
Lecture 9 - Energy levels in infinite and finite potential wells (short demo)
Lecture 10 - Effective mass in Semiconductors
Lecture 11 - Intrinsic carrier density
Lecture 12 - Doping and extrinsic semiconductors
Lecture 13 - Fermi level in extrinsic semiconductors
Lecture 14 - Temperature dependence of Fermi level
Lecture 15 - Temperature dependence of Fermi level
Lecture 16 - Charge neutrality relationship
Lecture 17 - Drift current and energy band representation of kinetic energy of carriers
Lecture 18 - Semiconductor bands in a electric field
Lecture 19 - Diffusion current
Lecture 20 - Non-uniform doping
Lecture 21 - Equilibrium Vs Nonequilibrium carrier response
Lecture 22 - Minority carrier diffusion equation (MCDE) - Example problems
Lecture 23 - Quasi Fermi level in nonequilibrium conditions
Lecture 24 - Quasi Fermi level and minority carrier diffusion length
Lecture 25 - Semiconductor device fabrication
Lecture 26 - PN Junctions - An introduction
Lecture 27 - PN Junction electrostatics
Lecture 28 - Energy band diagram of PN junction
Lecture 29 - Depletion width and peak electric field

Lecture 30 - PN junction electrostatics - examples
Lecture 31 - Demo of PN Junction Lab on Nanohub
Lecture 32 - Forward and reverse biased PN junctions
Lecture 33 - Minority carrier injection in PN junctions
Lecture 34 - Current in forward biased PN junction
Lecture 35 - Current in reverse biased PN junction
Lecture 36 - Depletion capacitance in PN junction
Lecture 37 - Non-idealities in PN junction diode
Lecture 38 - Nanohub Demo - PN Junction with applied bias
Lecture 39 - Schottky barrier in metal-semiconductor junction
Lecture 40 - Current flow across a Schottky barrier
Lecture 41 - Ohmic vs rectifying contacts
Lecture 42 - An Ideal MOS Capacitor
Lecture 43 - Operating regimes of a MOSCAP
Lecture 44 - Simplified band diagrams of accumulation and depletion in MOSCAP
Lecture 45 - Inversion in a MOSCAP
Lecture 46 - NMOSCAP in accumulation mode
Lecture 47 - NMOSCAP in depletion mode
Lecture 48 - NMOSCAP in inversion mode
Lecture 49 - Exact solution vs delta-depletion approximation
Lecture 50 - Threshold voltage in a MOSCAP
Lecture 51 - Nanohub Demo - MOSCAP tool
Lecture 52 - Non-ideal MOS Capacitor
Lecture 53 - MOSCAP Capacitance-Voltage (CV) Characteristics
Lecture 54 - Example problems with MOSCAPs
Lecture 55 - Impact of doping, oxide thickness and temperature on CV
Lecture 56 - Nanohub Demo - MOS CV
Lecture 57 - Introduction to MOSFET
Lecture 58 - Operating modes of a MOSFET
Lecture 59 - IV Characteristics of a long channel MOSFET
Lecture 60 - Example problems with MOSFETs
Lecture 61 - MOSFET device metrics
Lecture 62 - CMOS Technology
Lecture 63 - MOSFET Scaling and technology nodes
Lecture 64 - Limits of scaling
Lecture 65 - Current characteristics of a short channel MOSFET
Lecture 66 - Threshold voltage characteristics of short channel MOSFET
Lecture 67 - MOSFETs in the 21st century
Lecture 68 - Optical absorption and bandgap

Lecture 69 - Introduction to solar cells
Lecture 70 - Efficiency of a solar cell
Lecture 71 - Types of photodetectors
Lecture 72 - PIN and avalanche Photodectectors
Lecture 73 - Photodetector metrics
Lecture 74 - Radiative absoption and emission processes
Lecture 75 - Materials for optoelectronic devices
Lecture 76 - Operation of a light emitting diode (LED)
Lecture 77 - LED emission spectrum
Lecture 78 - Stimulated emission and lasing

NPTEL Video Course - Electrical Engineering - NOC:Electric Vehicles and Renewable Energy

Subject Co-ordinator - Prof. Ashok Jhunjhunwala, Prof. Prabhjot Kaur, Prof. Kaushal Kumar Jha, Prof. L Kannan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Electric Vehicle Introduction
Lecture 2 - The drive Torque, Power, Speed and Energy
Lecture 3 - Energy Source
Lecture 4 - Vehicle Auxillary, Petrol pumps and Charging stations
Lecture 5 - Introduction to Electric Vehicles in India
Lecture 6 - Can India Drive its EV program Innovatively and Differently and scale
Lecture 7 - Battery Cost reduction strategy
Lecture 8 - A bit about Batteries, Charging and Swapping Infrastructure
Lecture 9 - Where will we get Lithium for batteries and EV Subsystems
Lecture 10 - Forces acting when a vehicle move
Lecture 11 - Aerodynamic drag, Rolling Resistance and Uphill Resistance
Lecture 12 - Power and torque to accelerate
Lecture 13 - Putting it all together - 1
Lecture 14 - Putting it all together - 2
Lecture 15 - Concept of drive cycle - 1
Lecture 16 - Concept of drive cycle - 2
Lecture 17 - Drive Cycles and Energy used per km - Part 1
Lecture 18 - Drive Cycles and Energy used per km - Part 2
Lecture 19 - EV Subsystem: Design of EV Drive Train - Part 1
Lecture 20 - EV Subsystem: Design of EV Drive Train - Part 2
Lecture 21 - Introduction to Battery Parameters - Part 1
Lecture 22 - Introduction to Battery Parameters - Part 2
Lecture 23 - Why Lithium Ion Battery? - Part 1
Lecture 24 - Why Lithium Ion Battery? - Part 2
Lecture 25 - Batteries in Future
Lecture 26 - Li-Ion Battery Cells
Lecture 27 - SoH and SoC estimation and Self Discharge - Part 1
Lecture 28 - SoH and SoC estimation and Self Discharge - Part 2
Lecture 29 - Battery Pack Development - Part 1

Lecture 30 - Battery Pack Development - Part 2
Lecture 31 - Computation of Effective cost of battery - Part 1
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 Video Course - Electrical Engineering - Phase-locked loops

Subject Co-ordinator - Dr. Saurabh Saxena

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Course Introduction and Motivation - Part I
Lecture 2 - Course Introduction and Motivation - Part II
Lecture 3 - Basic Operation of a Phase Locked Loop
Lecture 4 - Simple Implementation of a Phase Locked Loop
Lecture 5 - Input Output Characteristics of Basic PLL Blocks
Lecture 6 - Time Domain Analysis of a Simple PLL
Lecture 7 - Time Domain Versus Small Signal Analysis of a Simple PLL
Lecture 8 - Type and Order of PLL
Lecture 9 - Small Signal Analysis of Type-I/II/III PLLs for Phase Step, Frequency Step and Frequency Ramp
Lecture 10 - Frequency Acquisition Range for PLLs
Lecture 11 - Frequency Acquisition in Type-I PLLs
Lecture 12 - Frequency Acquisition Limits in Type-I PLLs
Lecture 13 - Frequency Acquisition in Type II PLLs
Lecture 14 - Frequency Acquisition Ranges in Type II PLLs with Ideal and Non Ideal Integrator
Lecture 15 - Frequency Domain Insight in Frequency Acquisition for Type II PLLs
Lecture 16 - Introduction to Clock Multipliers
Lecture 17 - Analog Phase Error Detectors - Part I
Lecture 18 - Analog Phase Error Detectors - Part II
Lecture 19 - Digital Phase Error Detectors - Part I
Lecture 20 - Digital Phase Error Detectors - Part II
Lecture 21 - Range Extension for Phase Error Detectors
Lecture 22 - Phase Frequency Detector
Lecture 23 - Digital Frequency Detector
Lecture 24 - Charge Pump PLL
Lecture 25 - Small Signal and Stability Analysis of Type II Order 2 Charge Pump PLL
Lecture 26 - Problems in Charge Pump PLL - Dead Zone in PFD
Lecture 27 - Problems in Charge Pump PLL - Reference Spur
Lecture 28 - Design Procedure for Type-II Order 3 Charge Pump PLL
Lecture 29 - Design Procedure for Charge Pump Clock Multiplier

Lecture 30 - Sources of Non-Linearities in CP-PLL - Part I
Lecture 31 - Sources of Non-Linearities in CP-PLL - Part II
Lecture 32 - Noise Analysis in CP-PLL - Part I
Lecture 33 - Noise Analysis in CP PLL - Part II
Lecture 34 - Noise Analysis in CP-PLL - Part III
Lecture 35 - Noise Simulations for CP-PLL Blocks
Lecture 36 - Introduction to Oscillators
Lecture 37 - Low Swing Ring Oscillator - Part I
Lecture 38 - Low-Swing Ring Oscillator - Part II
Lecture 39 - Large-Swing Ring Oscillator - Part I
Lecture 40 - Large-Swing Ring Oscillator - Part II
Lecture 41 - Large-Swing Ring Oscillator - Part III
Lecture 42 - Large-Swing Ring Oscillator - Part IV
Lecture 43 - Large-Swing Ring Oscillator - Part V
Lecture 44 - Supply Regulated VCO - Part I
Lecture 45 - Supply Regulated VCO - Part II
Lecture 46 - Supply Regulated VCO - Part III
Lecture 47 - Phase Noise in Ring Oscillators
Lecture 48 - Circuit level Design of PFD - Part I
Lecture 49 - Circuit level Design of PFD - Part II
Lecture 50 - Circuit level Design of PFD - Part III
Lecture 51 - Circuit level Design of Charge Pump - Part I
Lecture 52 - Circuit-level Design of Charge Pump - Part II
Lecture 53 - Circuit-level Design of Charge Pump - Part III
Lecture 54 - Circuit-level Design of Charge Pump - Part IV
Lecture 55 - Circuit-level Design of Charge Pump - Part V
Lecture 56 - Circuit-level Design of Charge Pump - Part VI
Lecture 57 - Circuit-level Design of Clock Frequency Divider
Lecture 58 - Techniques for Wide Frequency Range Clock Multiplier
Lecture 59 - Introduction to Digital PLL
Lecture 60 - Design of Time-to-Digital Converter
Lecture 61 - Small Signal Analysis of Digital PLL
Lecture 62 - Noise Analysis in Digital PLL
Lecture 63 - Analog/Digital Hybrid PLL - Part I
Lecture 64 - Analog/Digital Hybrid PLL - Part II
Lecture 65 - Course Summary

NPTEL Video Course - Electrical Engineering - NOC:Fundamentals of Nano and Quantum Photonics

Subject Co-ordinator - Prof. Naresh Kumar Emani

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Review of Maxwell's Equations
Lecture 2 - Wave Equation
Lecture 3 - Dispersion Relation
Lecture 4 - Propagating and Evanescent Waves
Lecture 5 - Diffraction Limit and Spatial Frequencies
Lecture 6 - Plane Waves
Lecture 7 - Optical Response of Materials
Lecture 8 - Lorentz Model
Lecture 9 - Properties of Lorentz Oscillator Model
Lecture 10 - Drude-Lorentz Model for Metals
Lecture 11 - Kramers-Kronig Relation
Lecture 12 - Engineering Optical Response of Materials
Lecture 13 - Low dimensional systems
Lecture 14 - Absorption in Semiconductors
Lecture 15 - Optical gain in semiconductors
Lecture 16 - Absorption in low-dimensional semiconductors
Lecture 17 - Selection rules for optical processes
Lecture 18 - Scattering of EM radiation
Lecture 19 - LSPR: Quasi-static approximation
Lecture 20 - Size dependence of Plasmon Resonance
Lecture 21 - Tuning Plasmonic Resonances
Lecture 22 - Surface Plasmon Polariton(SPP)
Lecture 23 - Understanding SPP Dispersion Diagram
Lecture 24 - Exciting Surface Plasmon Polaritons
Lecture 25 - Analytical Calculation of Scattering Coefficients - IPython code overview
Lecture 26 - EM Waves in Multilayer Stack - T Matrix formulation
Lecture 27 - Photonic Bandgap in 1D
Lecture 28 - EM Waves in 1D Photonic Crystal
Lecture 29 - Diffracton Grating

Lecture 30 - Applications of Photonic Crystals
Lecture 31 - PhC in 1D - T-matrix examples
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 Video Course - Electrical Engineering - NOC:Analog Electronic Circuits (IITM)

Subject Co-ordinator - Prof. Shanthi Pavan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction Linear and Nonlinear Network
Lecture 2 - Small Signal Analysis of Nonlinear Networks
Lecture 3 - Small Signal Analysis
Lecture 4 - Incremental Model for Common Two Terminal Element Passive Two Terminal Elements
Lecture 5 - Linear and Nonlinear Two Ports and the Incremental Y Matrix
Lecture 6 - Graphical Representation of the Y Matrix
Lecture 7 - Nonlinear Two Ports With Incremental Gain
Lecture 8 - IV Charateristic of a Nonlinear 2 port with Incremental Gain
Lecture 9 - The MOSFET and its Characterisitics
Lecture 10 - Deriving the Common V Source Amplifier - Part 1
Lecture 11 - The Common Source Amplifier
Lecture 12 - Large Signal Behaviour of the Common Source Amplifier
Lecture 13 - The Common Source Amplifier Swing Limits
Lecture 14 - Introduction to Robust Biasing
Lecture 15 - Robust Biasing Part 1 Common Source Amplifier with DC Drain Feedback
Lecture 16 - Robust Biasing with the Current Mirror and Drain Gate Resistor
Lecture 17 - Robust Baising With Source Feedback - Part 1
Lecture 18 - Robust Biasing with Source Feedback - Part 2
Lecture 19 - Robust Biasing with Source Degeneration
Lecture 20 - Introduction to Negative Feedback
Lecture 21 - The Ideal Operational Amplifier
Lecture 22 - Negative Feedback (Continued...)
Lecture 23 - Robust Baising with Drain Measurement and Source Feedback
Lecture 24 - Robust biasing with source measurement and gate feedback
Lecture 25 - The Incremental Voltage Controlled Voltage Source The Common drain Amplifier Incremental Picture
Lecture 26 - Baising of the Common Drain Amplifier and Signal Swings
Lecture 27 - The VCVS Continued, the Incremental
Lecture 28 - Introducing the Current Controlled Voltage Source
Lecture 29 - The Incremental Current Controlled Voltage Source Transimpedance Amplifier

Lecture 30 - The Transimpedance amplifier (Continued...)
Lecture 31 - The Incremental current controlled current source, the common gate amplifier
Lecture 32 - Summary of controlled Sources and finite output Impedance of the Transistor
Lecture 33 - Effect of Finite Output Resistance on the Basic Building Blocks - Part 1
Lecture 34 - Effect of Finite Output Resistance on the Basic Building Blocks - Part 2
Lecture 35 - Effect of Finite Output Resistance on the Basic Building Blocks - Part 3
Lecture 36 - Finite output Effect in current Mirrors the Cascode Current Mirror
Lecture 37 - Comparison of Current Mirrors The High Swing Cascode
Lecture 38 - Precision High Swing Cascode
Lecture 39 - The PMOS transistor
Lecture 40 - Small Signal Model and Bias Stabilization
Lecture 41 - Basic Building Blocks with PMOS Devices
Lecture 42 - Fixed Transconductance Bias Circuits from First Principles
Lecture 43 - Limitation of a Resistive Load
Lecture 44 - The Active Load
Lecture 45 - The Active Load (Continued...)
Lecture 46 - The CMOS Inverter
Lecture 47 - The CMOS Inverter (Continued...)
Lecture 48 - The Differential Amplifier
Lecture 49 - Half - Circuit Analysis
Lecture 50 - The Different Amplifier with Active Load - Part 1
Lecture 51 - The Different Amplifier with Active Load - Part 2
Lecture 52 - Large Signal Behaviour of the Different Pair
Lecture 53 - The two Stage Opamp and Single Supply Operation
Lecture 54 - The two Stage Opamp (Continued...)
Lecture 55 - The Two Stage Opamp (Continued...)
Lecture 56 - Swing Limits of the Two Stage OTA
Lecture 57 - The Two-Stage Opamp
Lecture 58 - The Bandgap Reference Principle
Lecture 59 - The Bandgap Reference - Part 1
Lecture 60 - The Bandgap Reference - Part 2
Lecture 61 - Memory Effects in MOS Transistors
Lecture 62 - The Common Source Amplifier with Parasitic Capacitances
Lecture 63 - The Common Source Amplifier with Parasitic Capacitances
Lecture 64 - Frequency Response of the Common Drain Amplifier
Lecture 65 - Frequency Response of the Common Gate Amplifier
Lecture 66 - Stability of Negative Feedback System The First Order Forward Amplifier
Lecture 67 - Stabilty of Second Order Feedback System
Lecture 68 - Stability of Third Order Negative Feedback System

Lecture 69 - Dominant Pole Compensation - Part 1
Lecture 70 - Dominant Pole Cpmpensation - Part 2
Lecture 71 - Phase Margin
Lecture 72 - Example Phase Margin Caculations
Lecture 73 - Dominant Pole Compensation Summary
Lecture 74 - Phase Margin Example
Lecture 75 - The 2 Stage Miller Compensated Amplifier
Lecture 76 - 2 Stage Operational Amplifier and Miller Compensation (Continued...)
Lecture 77 - Intuition Behind the Dominant and Second Poles in a Miller Compensated OTA
Lecture 78 - 2 Stage Operational Amplifier and Miller Compensation Cancelling the RHP Zero
Lecture 79 - Miller Compensation OTA Schematic
Lecture 80 - Bipolar Junction Transistor Circuits-Device Equations and Small Signal Model
Lecture 81 - BJT Biasing and Basic Building Blocks
Lecture 82 - Bipolar Junction Transistor Circuits Swing Limits and Two Stage Opamp
Lecture 83 - Input Stage of the 741 Opamp
Lecture 84 - Basic Analysis of the 741

NPTEL Video Course - Electrical Engineering - NOC:Modern Computer Vision

Subject Co-ordinator - Prof. A. N. Rajagopalan

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Course introduction - 1
Lecture 2 - Course introduction - 2
Lecture 3 - Introduction to Deep Learning - 1
Lecture 4 - Introduction to Deep Learning - 2
Lecture 5 - Introduction to Deep Learning - 3
Lecture 6 - Introduction to Neuron - 1
Lecture 7 - Introduction to Neuron - 2
Lecture 8 - Introduction to Neuron - 3
Lecture 9 - Multilayer Perceptron
Lecture 10 - Regression and classification losses
Lecture 11 - Training a neural network
Lecture 12 - Gradient descent
Lecture 13 - Activation function
Lecture 14 - Backpropagation in MLP - 1
Lecture 15 - Backpropagation in MLP - 2
Lecture 16 - Optimization and Regularization - 1
Lecture 17 - Optimization and Regularization - 2
Lecture 18 - Regularization
Lecture 19 - Dropout
Lecture 20 - Pre-processing
Lecture 21 - Convolutional Neural Networks - 1
Lecture 22 - Convolutional Neural Networks - 2
Lecture 23 - Convolutional Neural Networks - 3
Lecture 24 - CNN Properties
Lecture 25 - Alexnet
Lecture 26 - CNN Architectures - 1
Lecture 27 - CNN Architectures - 2
Lecture 28 - CNN Architectures - 3
Lecture 29 - Introduction to RNN - 1

Lecture 30 - Introduction to RNN - 2
Lecture 31 - Encoder-Decoder models in RNN
Lecture 32 - LSTM
Lecture 33 - Low-level vision - 1
Lecture 34 - Low-level vision - 2
Lecture 35 - Low-level vision - 3
Lecture 36 - Spatial Domain Filtering
Lecture 37 - Frequency Domain Filtering
Lecture 38 - Edge Detection - 1
Lecture 39 - Edge Detection - 2
Lecture 40 - DeepNets for Edge Detection
Lecture 41 - Line detection
Lecture 42 - Feature detectors
Lecture 43 - Harris Corner Detector - 1
Lecture 44 - Harris Corner Detector - 2
Lecture 45 - Harris Corner Detector - 3
Lecture 46 - Blob detection - 1
Lecture 47 - Blob detection - 2
Lecture 48 - Blob detection - 3
Lecture 49 - SIFT - 1
Lecture 50 - SIFT - 2
Lecture 51 - Feature descriptors - 1
Lecture 52 - Feature descriptors - 2
Lecture 53 - SURF - 1
Lecture 54 - SURF - 2
Lecture 55 - Single-View Geometry - 1
Lecture 56 - Single-View Geometry - 2
Lecture 57 - 2D Geometric transformations - 1
Lecture 58 - 2D Geometric transformations - 2
Lecture 59 - Camera intrinsics and extrinsics - 1
Lecture 60 - Camera intrinsics and extrinsics - 2
Lecture 61 - Two-view stereo - 1
Lecture 62 - Two-view stereo - 2
Lecture 63 - Two-view stereo - 3
Lecture 64 - Algebraic representation of epipolar geometry - 1
Lecture 65 - Algebraic representation of epipolar geometry - 2
Lecture 66 - Fundamental matrix computation - 1
Lecture 67 - Fundamental matrix computation - 2
Lecture 68 - Structure from Motion - 1

Lecture 69 - Structure from Motion - 2
Lecture 70 - Structure from Motion - 3
Lecture 71 - Batch processing in SFM
Lecture 72 - Multi-view SFM
Lecture 73 - Factorization methods in SFM
Lecture 74 - Bundle adjustment
Lecture 75 - Dense 3D reconstruction
Lecture 76 - Some results in Stereo and SFM
Lecture 77 - Deepnets for stereo and SFM - 1
Lecture 78 - Deepnets for stereo and SFM - 2
Lecture 79 - Mid-level vision - 1
Lecture 80 - Mid-level vision - 2
Lecture 81 - Lucas-Kanade method for OF
Lecture 82 - Handling large motion in optical flow
Lecture 83 - Image segmentation
Lecture 84 - GMM for clustering
Lecture 85 - Deepnets for Segmentation and OF -1
Lecture 86 - Deepnets for Segmentation and OF -2
Lecture 87 - Deepnets for Segmentation and OF -3
Lecture 88 - Deepnets for Object Detection - 1
Lecture 89 - Deepnets for Object Detection - 2
Lecture 90 - Vision and Language

NPTEL Video Course - Electrical Engineering - NOC:Optical Wireless Communications for Beyond 5G Networks and

Subject Co-ordinator - Prof. Anand Srivastava

Co-ordinating Institute - IIT - Madras

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

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)
Lecture 32 - Higher order CSK
Lecture 33 - NOMA
Lecture 34 - NOMA VLC
Lecture 35 - MIMO
Lecture 36 - VLC based MIMO NOMA
Lecture 37 - Power allocation in VLC based MIMO NOMA
Lecture 38 - Hybrid Network LiFi and WiFi Coexistance
Lecture 39 - Vehicle to Vehicle communication using Visible light
Lecture 40 - Anand Singh Part - 1
Lecture 41 - Anand Singh Part - 2
Lecture 42 - Dilnasin lecture - 1
Lecture 43 - Saswati Paramita
Lecture 44 - Dilnashin Tutorial - 2
Lecture 45 - Guriendar Prof Anand 001
Lecture 46 - Rehana Prof Anand

NPTEL Video Course - Electrical Engineering - NOC:VLSI Design Flow: RTL to GDS

Subject Co-ordinator - Prof. Sneh Saurabh

Co-ordinating Institute - IIIT - Delhi

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

Lecture 1 - Basic Concepts of Integrated Circuit - I
Lecture 2 - Basic Concepts of Integrated Circuit - II
Lecture 3 - Overview of VLSI Design Flow - I
Lecture 4 - Overview of VLSI Design Flow - II
Lecture 5 - Tutorial 1
Lecture 6 - Overview of VLSI Design Flow - III
Lecture 7 - Overview of VLSI Design Flow - IV
Lecture 8 - Overview of VLSI Design Flow - V
Lecture 9 - Overview of VLSI Design Flow - VI
Lecture 10 - Introduction to TCL
Lecture 11 - Hardware Modeling: Introduction to Verilog - I
Lecture 12 - Hardware Modeling: Introduction to Verilog - II
Lecture 13 - Functional Verification using Simulation
Lecture 14 - High-level synthesis using Bambu - Tutorial 3
Lecture 15 - RTL Synthesis - Part I
Lecture 16 - RTL Synthesis - Part II
Lecture 17 - Logic Optimization - Part I
Lecture 18 - Simulation-based Verification using Icarus
Lecture 19 - Logic Optimization - Part II
Lecture 20 - Logic Optimization - Part III
Lecture 21 - Formal Verification - I
Lecture 22 - Logic Synthesis using Yosys
Lecture 23 - Formal Verification - II
Lecture 24 - Formal Verification - III
Lecture 25 - Formal Verification - IV
Lecture 26 - Technology Library
Lecture 27 - Logic Optimization using Yosys
Lecture 28 - Static Timing Analysis - I
Lecture 29 - Static Timing Analysis - II

Lecture 30 - Static Timing Analysis - III
Lecture 31 - Static Timing Analysis using OpenSTA
Lecture 32 - Constraints - I
Lecture 33 - Constraints - II
Lecture 34 - Technology Mapping
Lecture 35 - Timing-driven Optimization
Lecture 36 - Technology Library and Constraints
Lecture 37 - Power Analysis
Lecture 38 - Power Optimization
Lecture 39 - Basic Concepts of DFT
Lecture 40 - Scan Design Flow
Lecture 41 - Power Analysis using OpenSTA
Lecture 42 - Automatic Test Pattern Generation (ATPG)
Lecture 43 - Built-in Self Test (BIST)
Lecture 44 - Basic Concepts for Physical Design - I
Lecture 45 - Basic Concepts for Physical Design - II
Lecture 46 - Installation of OpenRoad
Lecture 47 - Chip Planning - I
Lecture 48 - Chip Planning - II
Lecture 49 - Placement
Lecture 50 - Chip Planning and Placement
Lecture 51 - Clock Tree Synthesis (CTS)
Lecture 52 - Routing
Lecture 53 - Post-layout Verification and Signoff
Lecture 54 - Clock Tree Synthesis (CTS) and Routing

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

Subject Co-ordinator - Dr.Vivek Bohara

Co-ordinating Institute - IIIT - Delhi

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

Lecture 1 - Introduction to the Course
Lecture 2 - Basics of Wireless Communication Systems
Lecture 3 - Path-Loss Models for a Wireless Channel
Lecture 4 - Log-Normal Shadowing
Lecture 5 - Small-Scale Fading
Lecture 6 - Statistical Multipath Channel Models
Lecture 7 - MATLAB programming for Path Loss Models
Lecture 8 - Statistical Multipath Channel Models - Part 1
Lecture 9 - Statistical Multipath Channel Models - Part 2
Lecture 10 - Digital Modulation and Detection (Binary Modulations) - Part 1
Lecture 11 - Digital Modulation and Detection (Binary Modulations) - Part 2
Lecture 12 - Digital Modulation and Detection (Binary Modulations) - Part 3
Lecture 13 - MATLAB programming for Wireless Fading Channels
Lecture 14 - Digital Modulation and Detection (Binary Modulations) - Part 1
Lecture 15 - Digital Modulation and Detection (Binary Modulations) - Part 2
Lecture 16 - Digital Modulation and Detection (M-ary Modulation) - Part 1
Lecture 17 - Digital Modulation and Detection (M-ary Modulation) - Part 2
Lecture 18 - Digital Modulation and Detection (M-ary Modulation) - Part 3
Lecture 19 - MATLAB programming for Modulation Schemes
Lecture 20 - Digital Modulation and Detection (GMSK)
Lecture 21 - Performance of Digital Modulation over Wireless Channels
Lecture 22 - Performance of Digital Modulation over Wireless Channels
Lecture 23 - MATLAB programamming: Error performance in AWGN channel
Lecture 24 - Receiver Diversity Techniques - Part 1
Lecture 25 - Receiver Diversity Techniques - Part 2
Lecture 26 - Receiver Diversity Techniques - Part 3
Lecture 27 - Error performance in Fading Channel Part 1
Lecture 28 - Error performance in Fading Channel Part 2
Lecture 29 - Multi-Carrier Modulation and OFDM - Part 1

Lecture 30 - Multi-Carrier Modulation and OFDM - Part 2
Lecture 31 - Multi-Carrier Modulation and OFDM - Part 3
Lecture 32 - Multi-Carrier Modulation and OFDM - Part 4
Lecture 33 - Numerical on OFDM
Lecture 34 - Programming for OFDM
Lecture 35 - OFDM System with Cyclic Prefix
Lecture 36 - OFDM Signal Transmission and OFDM System Design
Lecture 37 - Advantages and Drawbacks of OFDM System
Lecture 38 - OFDM Standards
Lecture 39 - Multiple Access Schemes
Lecture 40 - Technologies for Wireless Cellular Standards

NPTEL Video Course - Electrical Engineering - NOC:Sensor Technologies: Physics, Fabrication, and Circuits

Subject Co-ordinator - Prof.Mitradip Bhattacharjee

Co-ordinating Institute - IISER - Bhopal

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

Lecture 1 - Sensors and Transducers - Basics
Lecture 2 - Introduction to Sensors
Lecture 3 - Materials for sensors
Lecture 4 - Multidisciplinary Aspects of Sensors
Lecture 5 - Introduction to Sensor Parameters
Lecture 6 - Sensor Parameters - II
Lecture 7 - Sensor Parameters - III
Lecture 8 - Sensor Parameters - IV
Lecture 9 - Sensor Parameters - V
Lecture 10 - Numerical Examples
Lecture 11 - Introduction: Physics of Sensors
Lecture 12 - Capacitive Sensor Architecture
Lecture 13 - Different Types of Capacitive Sensors
Lecture 14 - Thermal Sensors Basics
Lecture 15 - Dynamic Condition of Thermal Sensors
Lecture 16 - Classification of Thermal Sensors
Lecture 17 - Chemical Sensor Basics
Lecture 18 - Electrochemical Sensors
Lecture 19 - Impedimetric Sensors
Lecture 20 - Numerical Examples
Lecture 21 - Physics of Optical Sensors
Lecture 22 - Physics of Magnetic Sensors
Lecture 23 - Physics of Acoustic Sensors
Lecture 24 - Physics of Microfluidic Sensors
Lecture 25 - Various Sensor Geometries and Examples
Lecture 26 - Microfabrication Technologies
Lecture 27 - Deposition Techniques
Lecture 28 - Physical Vapor Deposition
Lecture 29 - Chemical Vapor Deposition

Lecture 30 - Patterning Techniques
Lecture 31 - Lithography Techniques
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 Video Course - Electrical Engineering - NOC:Advanced topics in Wireless Communication (Hindi)

Subject Co-ordinator - Prof. Vivek Ashok Bohara

Co-ordinating Institute - IIIT - Delhi

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

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
Lecture 32 - MIMO Zero-Forcing Receiver
Lecture 33 - MIMO MMSE Receiver
Lecture 34 - Introduction to MIMO SVD
Lecture 35 - Diagonalization of MIMO channel
Lecture 36 - Optimal Capacity of MIMO channel and MIMO Beamforming
Lecture 37 - Tutorial 5 - Random Access Technoques: ALOHA and CSMA
Lecture 38 - MIMO V-BLAST Receivers
Lecture 39 - Introduction to Adaptive Modulation and Coding
Lecture 40 - Modulation and Coding with Variable MQAM
Lecture 41 - Conventional Multiple Access Schemes
Lecture 42 - Next generation Multiple Access Schemes and Multi-User Channels
Lecture 43 - Overview of Cellular and Wi-Fi Standards
Lecture 44 - Evolution of Cellular and Wi-Fi Standards
Lecture 45 - Tutorial 6 - MIMO SVD Example
Lecture 46 - Tutorial 7 - Rate Splitting Multiple Access

NPTEL Video Course - Electrical Engineering - NOC:State Space Approach to Control System Analysis and Design

Subject Co-ordinator - Prof A P Tiwari

Co-ordinating Institute - IIT - Mandi

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

Lecture 1 - Introduction
Lecture 2 - Standard State-space Representation of Physical Systems
Lecture 3 - Mathematical Modeling from First Principles
Lecture 4 - Mathematical Modeling from First Principles
Lecture 5 - State-space Representation of Transfer Functions
Lecture 6 - State-space Representation of Transfer Functions (Continued...)
Lecture 7 - Equivalent Dynamical Equations
Lecture 8 - Transformation of State Equations into Canonical forms
Lecture 9 - Solution of State Equations
Lecture 10 - Solution of State Equations: Methods to determine the STM
Lecture 11 - Simulation: An Overview
Lecture 12 - Numerical Solution of State Equations
Lecture 13 - Controllability
Lecture 14 - Controllability
Lecture 15 - Controllability
Lecture 16 - Observability
Lecture 17 - Lypunov's Stability - 1
Lecture 18 - Lypunov's Stability - 2
Lecture 19 - Lypunov's Stability - 3
Lecture 20 - Pole Placement Design-I: Concept of State feedback
Lecture 21 - Pole Placement Design-II: Properties of State Feedback
Lecture 22 - Pole Placement Design-III: Pole placement formulae, Selection of Closed loop pole locations
Lecture 23 - Linear Quadratic Optimal Control - Part 1
Lecture 24 - Linear Quadratic Optimal Control - Part 2
Lecture 25 - Linear Observers-Full Order Observer
Lecture 26 - Linear Observers-Reduced Order Observer
Lecture 27 - Separation Principle
Lecture 28 - Multirate Sampling Controllers-Relationship between System state, multirate output samples and i
Lecture 29 - Multirate Output Controller (MROC)

Lecture 30 - Fast Output Sampling (FOS) Controller
Lecture 31 - Periodic Output Feedback (POF) Controller
Lecture 32 - Continuous-Time Kalman Filter
Lecture 33 - Discrete-Time Kalman Filter
Lecture 34 - Case Study of Nuclear Reactor: Nonlinear Model Development
Lecture 35 - Case Study of Nuclear Reactor: Model Linearization
Lecture 36 - Case Study of Nuclear Reactor: Output Feedback Control Design
Lecture 37 - Case Study of Nuclear Reactor: Periodic Output Feedback Design
Lecture 38 - Case Study of Nuclear Reactor: Fast Output Sampling based Control Design
Lecture 39 - Case Study of Nuclear Reactor: Application of Kalman Filtering to Response Improvement of Vanadi

NPTEL Video Course - Electrical Engineering - NOC:Optimization Theory and Algorithms

Subject Co-ordinator - Prof. Uday K Khankhoje

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction to the course - 1 - Prerequisites, key elements
Lecture 2 - Introduction to the course - 2 - Types of problems
Lecture 3 - Introduction to the course - 3 - An optimization example to live longer
Lecture 4 - Summary of background material - Linear Algebra - I
Lecture 5 - Summary of background material - Linear Algebra - II
Lecture 6 - Summary of background material - Analysis - I
Lecture 7 - Summary of background material - Analysis - II
Lecture 8 - Summary of background material - Analysis - III
Lecture 9 - Summary of background material - Calculus - I
Lecture 10 - Summary of background material - Calculus - II
Lecture 11 - Summary of background material - Calculus - III
Lecture 12 - Example of Multivariate Differentiation
Lecture 13 - Gradient of Quadratic form and product rule
Lecture 14 - Directional derivative, hessian, and mean value theorem
Lecture 15 - Unconstrained optimization - 1 - Roadmap of the course and Taylorâ s theorem
Lecture 16 - Unconstrained optimization - 2 - Identifying a local minima - 1st and 2nd order conditions
Lecture 17 - Unconstrained optimization - 3 - Proof of 1st Order Condition
Lecture 18 - Unconstrained optimization - 4 - overview of algorithms and choosing a descent direction
Lecture 19 - Unconstrained optimization - 5 - properties of descent directions steepest descent direction
Lecture 20 - Unconstrained optimization - 6 - properties of descent directions newton direction
Lecture 21 - Unconstrained optimization - 7 - Trust Region Methods
Lecture 22 - A MATLAB session
Lecture 23 - Introduction to Line Search
Lecture 24 - Wolfe Conditions
Lecture 25 - Strong Wolfe Conditions
Lecture 26 - Backtracking Line Search
Lecture 27 - Line Search - Analysis
Lecture 28 - Line Search - Convergence and Rate - 1
Lecture 29 - Line Search - Convergence and Rate - 2

Lecture 30 - Convergence analysis of a descent algorithm - 1
Lecture 31 - Convergence analysis of a descent algorithm - 2
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 Video Course - Electrical Engineering - NOC:Power Electronics with Wide Band Gap Devices

Subject Co-ordinator - Prof. Moumita Das

Co-ordinating Institute - IIT - Mandi

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

Lecture 1 - Introduction Wide Bandgap Devices
Lecture 2 - Characterization Of Wide Bandgap Devices
Lecture 3 - Static Characterization Of Power Devices
Lecture 4 - Junction Capacitance Characterization Of Power Devices
Lecture 5 - Fundamentals Of Dynamic Characterization
Lecture 6 - Fundamentals Of Dynamic Characterization (Continued...)
Lecture 7 - Gate Drive For Dynamic Characterization
Lecture 8 - Gate Drive For Dynamic Characterization (Continued...)
Lecture 9 - Gate Drive For Dynamic Characterization (Continued...)
Lecture 10 - Gate Driver Protection
Lecture 11 - Dpt-Protection
Lecture 12 - Protection-Dpt
Lecture 13 - Cross Talk Consideration
Lecture 14 - Cross Talk Consideration (Continued...)
Lecture 15 - Layout Design And Parasitic Management
Lecture 16 - Layout Design And Parasitic Management (Continued...)
Lecture 17 - Layout
Lecture 18 - Heat Sink
Lecture 19 - Heat Sink (Continued...)
Lecture 20 - Electromagnetic Interference (EMI) - Part 1
Lecture 21 - Electromagnetic Interference (EMI) - Part 2
Lecture 22 - Electromagnetic Interference (EMI) - Part 3
Lecture 23 - Electromagnetic Interference (EMI) - Passive Filter
Lecture 24 - Electromagnetic Interference (EMI) - Active Filter
Lecture 25 - Getting Started With Ltspice
Lecture 26 - Getting Started With Ltspice - Part 1
Lecture 27 - Getting Started With Ltspice - Part 2
Lecture 28 - EMI Simulation with LTspice - Part 1
Lecture 29 - EMI Simulation with LTspice - Part 2

Lecture 30 - Power Density - Part 1
Lecture 31 - Power Density - Part 2
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 Video Course - Electrical Engineering - NOC:Enabling Technologies for 6G Communications Networks (Hindi

Subject Co-ordinator - Prof. Vivek Ashok Bohara

Co-ordinating Institute - IIIT - Delhi

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

Lecture 1 - Introduction to 6G Communications Network
Lecture 2 - Fundamentals of Communication System
Lecture 3 - Revision of Multipath Fading Channels
Lecture 4 - Evolution of Cellular Standards - Part 1
Lecture 5 - Evolution of Cellular Standards - Part 2
Lecture 6 - Introduction to Diversity Techniques
Lecture 7 - Alamouti's Space Time Code
Lecture 8 - MIMO System
Lecture 9 - Single User MIMO and Multi User MIMO
Lecture 10 - Massive MIMO
Lecture 11 - Significance of the Shannon's Channel Capacity Theorem
Lecture 12 - Turbo Codes
Lecture 13 - LDPC Codes
Lecture 14 - Tutorial: Orbital Angular momentum
Lecture 15 - LDPC Decoding
Lecture 16 - Multiple Access Schemes
Lecture 17 - Non-Terrestrial Networks (NTN)
Lecture 18 - Advanced Networks Topologies for 6G

NPTEL Video Course - Electrical Engineering - NOC:Optimal Control

Subject Co-ordinator - Prof. Barjeev Tyagi

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Introduction and Performance Index
Lecture 2 - Basic Concepts of Calculus of Variation
Lecture 3 - The Basic Variational Problem
Lecture 4 - Fixed End Point Problem
Lecture 5 - Free End Point Problem
Lecture 6 - Free End Point Problem (Continued...)
Lecture 7 - Free End Point Problem (Continued...)
Lecture 8 - Free End Point Problem (Continued...)
Lecture 9 - Optimum of Functions with Conditions
Lecture 10 - Optimum of Functions with Conditions (Lagrange Multiplier Method)
Lecture 11 - Optimum of Functional with Conditions
Lecture 12 - Variational Approach to Optimal Control Systems
Lecture 13 - Variational Approach to Optimal Control Systems (Continued...)
Lecture 14 - Linear Quadratic Optimal Control Systems
Lecture 15 - Linear Quadratic Optimal Control Systems (Continued...)
Lecture 16 - Linear Quadratic Optimal Control Systems (Continued...)
Lecture 17 - Linear Quadratic Optimal Control Systems (Continued...)
Lecture 18 - Linear Quadratic Optimal Control Systems (Continued...)
Lecture 19 - Linear Quadratic Optimal Control Systems (Optimal Value of Performance Index)
Lecture 20 - Infinite Horizon Regulator Problem
Lecture 21 - Infinite Horizon Regulator Problem (Continued...)
Lecture 22 - Analytical Solution of MDRE - State Transition Matrix Approach
Lecture 23 - Analytical Solution of MDRE - Similarity Transformation Approach
Lecture 24 - Analytical Solution of MDRE - Similarity Transformation Approach (Continued...)
Lecture 25 - Frequency Domain Interpretation of LQR - Linear Time Invariant System
Lecture 26 - Frequency Domain Interpretation of LQR - Linear Time Invariant System (Continued...)
Lecture 27 - LQR with a Specified Degree of Stability
Lecture 28 - Inverse Matrix Riccati Equation
Lecture 29 - Linear Quadratic Tracking System

Lecture 30 - Discrete-Time Optimal Control Systems
Lecture 31 - Discrete-Time Optimal Control Systems (Continued...)
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 Video Course - Electronics and Communication Engineering - NOC:Basics of Software Defined Radios and Pr

Subject Co-ordinator - Dr. Meenakshi Rawat

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Foundation for software defined radio
Lecture 2 - Components of a software defined radio
Lecture 3 - Software defined radio architectures - Part I
Lecture 4 - Software defined radio architectures - Part II
Lecture 5 - Software defined radio architectures - Part III
Lecture 6 - Software defined radio architectures - Part IV
Lecture 7 - Distortion Parameters - Part I
Lecture 8 - Distortion Parameters - Part II
Lecture 9 - Distortion Parameters
Lecture 10 - Distortion Parameters
Lecture 11 - Power Amplifiers
Lecture 12 - Power Amplifiers
Lecture 13 - Case study-I
Lecture 14 - Case study-II
Lecture 15 - Behavioral models for representing nonlinear distortions
Lecture 16 - Linearization Techniques for nonlinear distortion
Lecture 17 - Predistortion Techniques for nonlinearity distortion in SDR
Lecture 18 - Basic Digital Predistortion Techniques for nonlinear distortion in SDR
Lecture 19 - State-of-the-art Digital Predistortion Techniques for Nonlinear Distortion in SDR
Lecture 20 - Digital Predistortion Techniques for Linear as well as Nonlinear Distortion in SDR

NPTEL Video Course - Electrical Engineering - NOC:Electrical Distribution System Analysis

Subject Co-ordinator - Prof. N P Padhy, Late Prof. G. B. Kumbhar

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Introduction to Electrical Distribution System
Lecture 2 - Components of Distribution System Substation and Busbar Layouts
Lecture 3 - Components of Distribution System and Feeder Configurations
Lecture 4 - Nature of Loads in a Distribution System
Lecture 5 - Load Allocation in a Distribution System
Lecture 6 - K Factors and Their Applications
Lecture 7 - Analysis of Uniformly Distributed Loads
Lecture 8 - Lumping Loads in Geometric Configurations: Rectangular
Lecture 9 - Lumping Loads in Geometric Configurations: Triangular
Lecture 10 - Impedance of Distribution Lines and Feeders - Part I
Lecture 11 - Series Impedance of Distribution Lines and Feeders - Part II
Lecture 12 - Models of Distribution Lines and Cables
Lecture 13 - Modelling of Single-Phase and Three-Phase Transformers
Lecture 14 - Modelling of Three-Phase Transformers - Part I
Lecture 15 - Modelling of Three-Phase Transformers - Part II
Lecture 16 - Modelling of Three-Phase Transformers - Part III
Lecture 17 - Modelling of Three-Phase Transformers - Part IV
Lecture 18 - Modelling of Step Voltage Regulators - Part I
Lecture 19 - Modelling of Step Voltage Regulators - Part II
Lecture 20 - Modelling of Step Voltage Regulators - Part III
Lecture 21 - Modelling of Step Voltage Regulators - Part IV
Lecture 22 - Load Models in Distribution System - Part I
Lecture 23 - Load Models in Distribution System - Part II
Lecture 24 - Modelling of Distributed Generation
Lecture 25 - Applications and Modeling of Capacitor Banks
Lecture 26 - Summary of Modelling of Distribution System Components
Lecture 27 - Backward/Forward Sweep Load Flow Analysis - Part I
Lecture 28 - Backward/Forward Sweep Load Flow Analysis - Part II
Lecture 29 - Direct Approach Based Load Flow Analysis - Part I

Lecture 30 - Direct Approach Based Load Flow Analysis - Part II
Lecture 31 - Direct Approach Based Load Flow Analysis - Part III
Lecture 32 - Direct Approach Based Load Flow Analysis: Weakly Meshed System
Lecture 33 - Gauss Implicit Z-matrix Method
Lecture 34 - Sequence Component Based Short Circuit Analysis
Lecture 35 - Thevenin's Equivalent and Phase Variable Based Short Circuit Analysis
Lecture 36 - Direct Approach for Short-Circuit Analysis: Introduction and LG Fault
Lecture 37 - Direct Approach for Short-Circuit Analysis: LLG and LLLG Fault
Lecture 38 - Direct Approach for Short-Circuit Analysis: LL Fault and Examples
Lecture 39 - Direct Approach for Short-Circuit Analysis: Weakly Meshed System
Lecture 40 - Applications of Distribution System Analysis
Lecture 41 - Distributed Generation Integration Issues in Distribution System
Lecture 42 - Distribution System Protection Issues
Lecture 43 - Power Quality, Reliability and Availability
Lecture 44 - Design and Operation - Part I
Lecture 45 - Design and Operation - Part II
Lecture 46 - Definition and objective of Volt-var control (VVC)
Lecture 47 - Traditional approaches of VVC
Lecture 48 - Distribution Automation
Lecture 49 - SCADA-Based VVC and Integrated VVC
Lecture 50 - Advanced technologies for VVC - Part I
Lecture 51 - Advanced technologies for VVC - Part II
Lecture 52 - System Planning - Part I
Lecture 53 - System Planning - Part II
Lecture 54 - Electricity Forecasting
Lecture 55 - Case study: IIT Roorkee distribution system
Lecture 56 - Optimization techniques
Lecture 57 - Optimal location and sizing battery energy storage system (BESS)
Lecture 58 - Practical Insights into Electrical Distribution Systems
Lecture 59 - Field Deployment of BESS
Lecture 60 - Emerging Technologies and Future Trends

NPTEL Video Course - Electrical Engineering - NOC:Introduction to Smart Grid

Subject Co-ordinator - Prof. Premalata Jena, Prof. N.P. Padhy

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Introduction to Smart Grid - I
Lecture 2 - Introduction to Smart Grid - II
Lecture 3 - Architecture of smart grid system
Lecture 4 - Standards for smart grid system
Lecture 5 - Elements and Technologies of smart grid system - I
Lecture 6 - Elements and Technologies of smart grid system - II
Lecture 7 - Distributed Generation Resources - I
Lecture 8 - Distributed Generation Resources - II
Lecture 9 - Distributed Generation Resources - III
Lecture 10 - Distributed Generation Resources - IV
Lecture 11 - Wide Area Monitoring System - I
Lecture 12 - Wide Area Monitoring System - II
Lecture 13 - Phasor Estimation - I
Lecture 14 - Phasor Estimation - II
Lecture 15 - Digital Relays for Smart Grid Protection
Lecture 16 - Islanding Detection Techniques - I
Lecture 17 - Islanding Detection Techniques - II
Lecture 18 - Islanding Detection Techniques - III
Lecture 19 - Smart Grid Protection - I
Lecture 20 - Smart Grid Protection - II
Lecture 21 - Smart Grid Protection - III
Lecture 22 - Smart Grid Protection - IV
Lecture 23 - Modelling of Storage Devices
Lecture 24 - Modelling of DC Smart Grid Components
Lecture 25 - Operation and Control of AC Microgrid - I
Lecture 26 - Operation and Control of AC Microgrid - Il
Lecture 27 - Operation and Control of DC Microgrid - I
Lecture 28 - Operation and Control of DC Microgrid - II
Lecture 29 - Operation and Control of AC-DC hybrid Microgrid - I

Lecture 30 - Operation and Control of AC-DC hybrid Microgrid - II
Lecture 31 - Simulation and Case Study of AC Microgrid
Lecture 32 - Simulation and Case Study of DC Microgrid
Lecture 33 - Simulation and Case Study of AC-DC Hybrid Microgrid
Lecture 34 - Demand Side Management in Smart Grid
Lecture 35 - Demand Response Analysis of Smart Grid
Lecture 36 - Energy Management
Lecture 37 - Design of Smart Grid and Practical Smart Grid Case Study - I
Lecture 38 - Design of Smart Grid and Practical Smart Grid Case Study - II
Lecture 39 - System Analysis of AC/DC Smart Grid
Lecture 40 - Conclusions

NPTEL Video Course - Electrical Engineering - NOC:Facts Devices

Subject Co-ordinator - Prof. Avik Bhattacharya

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Introduction - I
Lecture 2 - Introduction - II
Lecture 3 - Switch Realization
Lecture 4 - PWM - I
Lecture 5 - PWM - II
Lecture 6 - Closed Loop Control
Lecture 7 - Multi Level Inverter - I
Lecture 8 - Multi Level Inverter - II
Lecture 9 - Multi Level Inverter - III
Lecture 10 - Shunt Compensator Analysis
Lecture 11 - Shunt Compensator TCR and TSC - I
Lecture 12 - Shunt Compensator TCR and TSC - II
Lecture 13 - Static Var Compensator - I
Lecture 14 - Static Var Compensator - II
Lecture 15 - STATCOM - I
Lecture 16 - STATCOM - II
Lecture 17 - STATCOM/SVC Comparisons
Lecture 18 - External Control Design of Static Var Compensator
Lecture 19 - DSTATCOM
Lecture 20 - Design of DSTATCOM
Lecture 21 - Series Compensator - I
Lecture 22 - Series Compensator - II
Lecture 23 - GCSC and SSSC
Lecture 24 - SSSC - II
Lecture 25 - SSSC - III and TSSC
Lecture 26 - TSSC - II and TCSC
Lecture 27 - TCSC Characteristics and Control
Lecture 28 - Voltage and Phase Angle Regulation
Lecture 29 - Voltage and Phase Angle Regulator Device - I

Lecture 30 - Voltage and Phase Angle Regulator Device - II
Lecture 31 - UPQC Introduction and Classification
Lecture 32 - UPQC Classification - I
Lecture 33 - Operation and Control of UPQC - II
Lecture 34 - Operation and Control of UPQC - III
Lecture 35 - UPFC
Lecture 36 - Control Structure of UPFC
Lecture 37 - Comparison of UPFC with PAR and Series Compensators
Lecture 38 - Interline Power Flow Controller (IPFC) - I
Lecture 39 - Interline Power Flow Controller (IPFC) - II
Lecture 40 - Practical Application and Conclusion

NPTEL Video Course - Electrical Engineering - NOC:Advanced Linear Continuous Control Systems: Applications wi

Subject Co-ordinator - Prof. Yogesh Vijay Hote

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Introduction to State Space
Lecture 2 - State Space Representation
Lecture 3 - State Space Representation
Lecture 4 - State Space Representation
Lecture 5 - State Space Representation
Lecture 6 - State Space Representation
Lecture 7 - State Space Representation
Lecture 8 - State Space Representation
Lecture 9 - State Space Representation
Lecture 10 - State Space Representation
Lecture 11 - Modelling of Mechanical Systems in State Space
Lecture 12 - Modelling of DC Servo Motor - Part I
Lecture 13 - Modelling of DC Servo Motor - Part II
Lecture 14 - Determination of Transfer Function from State Space Model - Part I
Lecture 15 - Determination of Transfer Function from State Space Model - Part II
Lecture 16 - Stability Analysis in State Space
Lecture 17 - Stability Analysis in State Space - Part II
Lecture 18 - Stability Analysis in State Space
Lecture 19 - Stability Analysis in State Space
Lecture 20 - Stability Analysis in State Space
Lecture 21 - Concept of Diagonalization
Lecture 22 - Solution of State Equation
Lecture 23 - Solution of State Equation (Forced System)
Lecture 24 - Steady State Error for State Space System
Lecture 25 - State Transition Matrix - Part I
Lecture 26 - State Transition Matrix - Part II
Lecture 27 - State Transition Matrix using Cayley-Hamilton Theorem - Part III
Lecture 28 - MATLAB Programming with State Space
Lecture 29 - Controllability in State Space - Part I

Lecture 30 - Controllability in State Space - Part II
Lecture 31 - Observability in State Space - Part I
Lecture 32 - Observability in State Space - Part II
Lecture 33 - Pole Placement by State Feedback - Part I
Lecture 34 - Pole Placement by State Feedback - Part II
Lecture 35 - Pole Placement by State Feedback - Part III
Lecture 36 - Tracking Problem in State Feedback Design - Part I
Lecture 37 - Tracking Problem in State Feedback Design - Part II
Lecture 38 - State Observer Design - Part I
Lecture 39 - State Observer Design - Part II
Lecture 40 - State Observer Design - Part III

NPTEL Video Course - Electrical Engineering - NOC:Computer Aided Power System Analysis

Subject Co-ordinator - Prof. Biswarup Das

Co-ordinating Institute - IIT - Roorkee

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

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
Lecture 32 - Introduction to Contingency Analysis
Lecture 33 - Linear Sensitivity Factor
Lecture 34 - Linear Sensitivity Factors (Continued...)
Lecture 35 - Line outage sensitivity factor
Lecture 36 - Line outage sensitivity factor (Continued...)
Lecture 37 - Line outage sensitivity factor (Continued...)
Lecture 38 - State Estimation Technique
Lecture 39 - Weighted Least Square (WLS) Method
Lecture 40 - WLS (Continued...)
Lecture 41 - WLS Examples
Lecture 42 - Error Analysis
Lecture 43 - Error Analysis (Continued...)
Lecture 44 - Bad Data Detection
Lecture 45 - Power system state estimation
Lecture 46 - Power system state estimation (Continued...)
Lecture 47 - Power system state estimation (Continued...)
Lecture 48 - Power system state estimation (Continued...)
Lecture 49 - Fault Analysis
Lecture 50 - Fault Analysis (Continued...)
Lecture 51 - Fault Analysis (Continued...)
Lecture 52 - Fault Analysis (Continued...)
Lecture 53 - Fault Analysis (Continued...)
Lecture 54 - Fault Analysis (Continued...)
Lecture 55 - Fault Analysis (Continued...)
Lecture 56 - Fault Analysis (Continued...)
Lecture 57 - Fault Analysis (Continued...)
Lecture 58 - Fault Analysis (Continued...)
Lecture 59 - Fault Analysis (Continued...)
Lecture 60 - Fault Analysis (Continued...)

NPTEL Video Course - Electrical Engineering - NOC:Advance Power Electronics and Control

Subject Co-ordinator - Prof. Avik Bhattacharya

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Introduction
Lecture 2 - Basic Concept of Switches
Lecture 3 - Device Physics - I
Lecture 4 - Device Physics - II
Lecture 5 - Device Physics - III
Lecture 6 - Device Physics - IV
Lecture 7 - Application and Analysis of Switches - I
Lecture 8 - Application and Analysis of Switches - II
Lecture 9 - Single Phase Converter
Lecture 10 - Single Phase Converters - II
Lecture 11 - Single Phase Converters - III
Lecture 12 - Three Phase Converters - I
Lecture 13 - Three Phase Converters - II
Lecture 14 - Multipulse Converters II
Lecture 15 - Effect of Source Inductance and PWM Rectifiers
Lecture 16 - PWM Rectifiers - II
Lecture 17 - PWM Rectifiers - III and Power Factor Improvement Techniques
Lecture 18 - PWM Rectifiers - IV and Power Factor Improvement Techniques - II
Lecture 19 - Power Factor Improvement Techniques III and Non Isolated DC- DC Converters
Lecture 20 - Non Isolated DC- DC Converters - II
Lecture 21 - Non Isolated and Isolated DC- DC Converters and Choppers
Lecture 22 - Isolated DC-DC Converters and Choppers
Lecture 23 - Isolated DC-DC Converters - II
Lecture 24 - Isolated DC-DC Converters - III
Lecture 25 - Isolated DC-DC Converters - IV and VSI and CSI
Lecture 26 - VSI and CSI
Lecture 27 - VSI and CSI II and MLI
Lecture 28 - PWM Techniques II and MLI
Lecture 29 - MLI II and ZSI

Lecture 30 - ZSI II and Space Vector Modulation (SVM)
Lecture 31 - SVM II and AC to AC Converters
Lecture 32 - SVM III and AC to AC Converters
Lecture 33 - Cycloconverters and Matrix Converters
Lecture 34 - Matrix Converter - II
Lecture 35 - Matrix Converter - III and Power Quality Mitigation Devices
Lecture 36 - Power Quality Mitigation Devices - II
Lecture 37 - Linear and Non Linear Control in Power Electronics - I
Lecture 38 - Linear and Non Linear Control in Power Electronics - II
Lecture 39 - Non-Linear Control in Power Electronics
Lecture 40 - Application and Conclusion

NPTEL Video Course - Electrical Engineering - NOC:CMOS Digital VLSI Design

Subject Co-ordinator - Prof. Sudeb Dasgupta

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - MOS Transistor Basics - I
Lecture 2 - MOS Transistor Basics - II
Lecture 3 - MOS Transistor Basics - III
Lecture 4 - MOS Parasitics and SPICE Model
Lecture 5 - CMOS Inverter Basics - I
Lecture 6 - CMOS Inverter Basics - II
Lecture 7 - CMOS Inverter Basics - III
Lecture 8 - Power Analysis - I
Lecture 9 - Power Analysis - II
Lecture 10 - SPICE Simulation - I
Lecture 11 - SPICE Simulation - II
Lecture 12 - Combinational Logic Design - I
Lecture 13 - Combinational Logic Design - II
Lecture 14 - Combinational Logic Design - III
Lecture 15 - Combinational Logic Design - IV
Lecture 16 - Combinational Logic Design - V
Lecture 17 - Combinational Logic Design - VI
Lecture 18 - Combinational Logic Design - VII
Lecture 19 - Combinational Logic Design - VIII
Lecture 20 - Combinational Logic Design - IX
Lecture 21 - Combinational Logic Design - X
Lecture 22 - Logical Efforts - I
Lecture 23 - Logical Efforts - II
Lecture 24 - Logical Efforts - III
Lecture 25 - Sequential Logic Design - I
Lecture 26 - Sequential Logic Design - II
Lecture 27 - Sequential Logic Design - III
Lecture 28 - Sequential Logic Design - IV
Lecture 29 - Sequential Logic Design - V

Lecture 30 - Sequential Logic Design - VI
Lecture 31 - Sequential Logic Design - VII
Lecture 32 - Sequential Logic Design - VIII
Lecture 33 - Clocking Strategies for Sequential Design - I
Lecture 34 - Clocking Strategies for Sequential Design - II
Lecture 35 - Clocking Strategies for Sequential Design - III
Lecture 36 - Clocking Strategies for Sequential Design - IV
Lecture 37 - Sequential Logic Design - IX
Lecture 38 - Clocking Strategies for Sequential Design - V
Lecture 39 - Concept of Memory and its Designing - I
Lecture 40 - Concept of Memory and its Designing - II

NPTEL Video Course - Electrical Engineering - NOC:Microelectronics: Devices to Circuits

Subject Co-ordinator - Prof. Sudeb Dasgupta

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Bipolar Junction Transistor
Lecture 2 - Bipolar Junction Transistor
Lecture 3 - Bipolar Junction Transistor
Lecture 4 - BJT Operation in active mode Circuit symbol and conventions - I
Lecture 5 - BJT Operation in active mode Circuit symbol and conventions - II
Lecture 6 - BJT as an amplifier small circuit model - I
Lecture 7 - BJT as an amplifier small circuit model - II
Lecture 8 - BJT Small Signal Circuit Model - I
Lecture 9 - BJT Small Signal Circuit Model - II
Lecture 10 - BJT as a switch and Ebers Moll Model
Lecture 11 - Simple BJT Inverter and second order effects
Lecture 12 - BJT Second order effects - I
Lecture 13 - BJT Second order effects - II
Lecture 14 - MOS Transistor basics - I
Lecture 15 - MOS Transistor basics - II
Lecture 16 - MOS Transistor basics - III
Lecture 17 - MOS Parasitic and SPICE Model
Lecture 18 - CMOS Inverter Basics - I
Lecture 19 - CMOS Inverter Basics - II
Lecture 20 - CMOS Inverter Basics - III
Lecture 21 - Power Analysis - I
Lecture 22 - Logical Efforts - I
Lecture 23 - Fabrication-Process - I
Lecture 24 - Fabrication-Process - II
Lecture 25 - Biasing of Amplifier and its behaviour as an Analog switch - I
Lecture 26 - Biasing of Amplifier and its behaviour as an Analog switch - II
Lecture 27 - Biasing of Amplifier and its behaviour as an Analog switch - III
Lecture 28 - CMOS CS/CG/CD Amplifier Configuration
Lecture 29 - CMOS CG/CD Amplifier Configuration

Lecture 30 - Internal CAP Models and high frequency Modelling - I
Lecture 31 - Internal CAP Models and high frequency Modelling - II
Lecture 32 - JFET, Structure and Operation
Lecture 33 - Multistage and Differential Amplifier - I
Lecture 34 - Multistage and Differential Amplifier - II
Lecture 35 - MOS Differential Amplifier - I
Lecture 36 - MOS Differential Amplifier - II
Lecture 37 - Small signal operation and Differential Amplifiers - I
Lecture 38 - Small signal operation and Differential Amplifiers - II
Lecture 39 - Multistage Amplifier with SPICE Simulation
Lecture 40 - S-Domain Analysis, Transfer Function, Poles and Zeros - I
Lecture 41 - S-Domain Analysis, Transfer Function, Poles and Zeros - II
Lecture 42 - High Frequency response of CS and CE Amplifier
Lecture 43 - High Frequency response of CC and SF Configuration
Lecture 44 - Frequency response of Differential Amplifier
Lecture 45 - General Feedback Structure and properties of negative Feedback
Lecture 46 - Basic Feedback Topologies
Lecture 47 - Design of feedback amplifier for all configuration
Lecture 48 - Stability and amplifier poles
Lecture 49 - Bode plots and Frequency Plot
Lecture 50 - Ideal Operational Amplifier and its terminal
Lecture 51 - Op-amp as a Integrator and Differentiator
Lecture 52 - Large Signal Operation of Op-amp and second order effects
Lecture 53 - Combinational logic design - I
Lecture 54 - Combinational logic design - II
Lecture 55 - Combinational logic design - III
Lecture 56 - Combinational logic design - IV
Lecture 57 - Sequential logic design - I
Lecture 58 - Clocking strategies For Sequential design - I
Lecture 59 - Clocking strategies For Sequential design - II
Lecture 60 - Memory Design

NPTEL Video Course - Electrical Engineering - NOC:DC Microgrid

Subject Co-ordinator - Prof. Avik Bhattacharya

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Overview of Microgrids
Lecture 2 - Concept of Microgrids
Lecture 3 - Microgrid and distributed generation
Lecture 4 - Microgrid vs Conventional Power System
Lecture 5 - AC and DC Microgrid with Distributed Energy Resources (AC Microgrid Part)
Lecture 6 - AC and DC Microgrid with Distributed Energy Resources (AC Microgrid Part) (Continued...)
Lecture 7 - Power Electronics for Microgrid
Lecture 8 - Power Electronic Converters in Microgrid Applications
Lecture 9 - Power Electronic Converters in Microgrid Applications (Power Electronic for Interfacing)
Lecture 10 - Power Electronic Converters in Microgrid Applications (Converter Modulation Techniques)
Lecture 11 - Modeling of converters in microgrid power system (AC/DC and DC/AC Converters Modeling)
Lecture 12 - Modeling of Power Converters in Microgrid Power System (DC/DC Converter Modeling and Control)
Lecture 13 - Modeling of Renewable Energy Resources (Modeling of Wind Energy System)
Lecture 14 - Modeling of Renewable Energy Resources (Modeling of Photovoltaic System)
Lecture 15 - Modeling of Energy Storage System
Lecture 16 - Microgrid Dynamics and Modeling
Lecture 17 - Microgrid Dynamics and Modeling (Continued...)
Lecture 18 - Microgrid Operation Modes and Standards - Part I
Lecture 19 - Microgrid Operation Modes and Standards - Part II
Lecture 20 - Microgrid Control Architectures
Lecture 21 - Microgrid Control Architectures (Continued...)
Lecture 22 - Intelligent Microgrid Operation and Control
Lecture 23 - Intelligent Microgrid Operation and Control (Continued...)
Lecture 24 - Intelligent Microgrid Operation and Control (Continued...)
Lecture 25 - Energy Management in Microgrid System (Continued...)
Lecture 26 - DC Microgrid System Architecture and AC Interface
Lecture 27 - DC Microgrid System Architecture and AC Interface (Continued...)
Lecture 28 - DC Microgrid System Architecture and AC Interface (Continued...)
Lecture 29 - DC Microgrid Dynamics and Modeling

Lecture 30 - DC Microgrid Dynamics and Modeling (Continued...)
Lecture 31 - Control of DC Microgrid System
Lecture 32 - Control of DC Microgrid System (Continued...)
Lecture 33 - Applications of DC Microgrids
Lecture 34 - Stability in Microgrid
Lecture 35 - Stability Analysis of DC Microgrid
Lecture 36 - Stability Analysis of DC Microgrid (Continued...)
Lecture 37 - DC Microgrid stabilization strategies (Passive damping method)
Lecture 38 - DC Microgrid Stabilization Strategies (Impedance/Admittance stability criteria)
Lecture 39 - DC microgrid stabilization using nonlinear Techniques
Lecture 40 - General Summary of DC Microgrids

NPTEL Video Course - Electrical Engineering - NOC:Power Quality Improvement Technique

Subject Co-ordinator - Prof. Avik Bhattacharya

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Introduction
Lecture 2 - Overview - I
Lecture 3 - Overview - II
Lecture 4 - Overview - III
Lecture 5 - Source of Poor Power Quality - I
Lecture 6 - Source of Poor Power Quality - II
Lecture 7 - AC Power Quality Standard
Lecture 8 - Improvement of Power Factor by Capacitor
Lecture 9 - Passive Filter - I
Lecture 10 - Passive Filter - II
Lecture 11 - Passive Filter Design - I
Lecture 12 - Passive Filter Design - II
Lecture 13 - PWM Rectifier - I
Lecture 14 - PWM Rectifier - II
Lecture 15 - PWM Rectifier - III
Lecture 16 - Three phase converters - I
Lecture 17 - Three Phase Converters - II and multi pulse Converters
Lecture 18 - Three Phase Converters - III and multi-pulse Converters
Lecture 19 - VSI and CSI
Lecture 20 - Multilevel Inverter - I
Lecture 21 - Multilevel Inverter - II
Lecture 22 - Multilevel Inverter - III
Lecture 23 - PWM for Voltage Source Inverter - I
Lecture 24 - PWM for Voltage Source Inverter - II
Lecture 25 - PWM for Voltage Source inverter - III
Lecture 26 - PWM for Voltage Source Inverter - IV
Lecture 27 - Operation and Control of Grid-Connected VSC
Lecture 28 - Grid Connected VSC with inner Current Control
Lecture 29 - Shunt Active Power Filter - I

Lecture 30 - Shunt Active Power Filter - II
Lecture 31 - Shunt Active Power Filter - III
Lecture 32 - Shunt Active Power Filter - IV
Lecture 33 - Hybrid Active Power Filter - I
Lecture 34 - Hybrid Active power Filter - II
Lecture 35 - Hybrid Shunt Active Power Filter
Lecture 36 - UPQC Introduction and classification
Lecture 37 - UPQC Classification
Lecture 38 - Operation and Control of UPQC
Lecture 39 - Control of UPQC
Lecture 40 - Conclusion

NPTEL Video Course - Electrical Engineering - NOC:Power System Protection and Switchgear

Subject Co-ordinator - Prof. Bhaveshkumar R. Bhalja

Co-ordinating Institute - IIT - Roorkee

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

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
Lecture 32 - Protection against Transients and Surges along with System Response to Severe Upsets - I
Lecture 33 - Protection against Transients and Surges along with System Response to Severe Upsets - II
Lecture 34 - Arc Interruption Theory in Circuit Breaker - I
Lecture 35 - Arc Interruption Theory in Circuit Breaker - II
Lecture 36 - Arc Interruption Theory in Circuit Breaker - III
Lecture 37 - Arc Interruption Theory in Circuit Breaker - IV
Lecture 38 - Types of Circuit Breakers
Lecture 39 - Testing, Commissioning and Maintenance of Relays - I
Lecture 40 - Testing, Commissioning and Maintenance of Relays - II

NPTEL Video Course - Electrical Engineering - NOC:RF Transceiver of Design

Subject Co-ordinator - Prof. Darshak Bhatt

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Basic of Wireless Communication - I
Lecture 2 - Basic of Wireless Communication - II
Lecture 3 - Basic of Wireless Communication - III
Lecture 4 - Basic of Wireless Communication - IV
Lecture 5 - Basic of Wireless Communication - V
Lecture 6 - Basic of Wireless Communication - VI
Lecture 7 - Noise in RF Systems - I
Lecture 8 - Noise in RF Systems - II
Lecture 9 - Noise in RF Systems - III
Lecture 10 - Noise in RF Systems - IV
Lecture 11 - Non-Linearity in RF Systems - I
Lecture 12 - Non-Linearity in RF Systems - II
Lecture 13 - Non-Linearity in RF Systems - III
Lecture 14 - Transceiver Architecture - I
Lecture 15 - Transceiver Architecture - II
Lecture 16 - Transceiver Architecture - III
Lecture 17 - Transceiver Architecture - IV
Lecture 18 - Transceiver Architecture - V
Lecture 19 - Transceiver Architecture - VI
Lecture 20 - Transceiver Architecture - VII
Lecture 21 - Active Devices - I
Lecture 22 - Active Devices - II
Lecture 23 - Active Devices - III
Lecture 24 - Active Devices - IV
Lecture 25 - Passive Components and Impedance Matching - I
Lecture 26 - Passive Components and Impedance Matching - II
Lecture 27 - Passive Components and Impedance Matching - III
Lecture 28 - Passive Components and Impedance Matching - IV
Lecture 29 - Passive Components and Impedance Matching - V

Lecture 30 - Passive Components and Impedance Matching - VI
Lecture 31 - Passive Components and Impedance Matching - VII
Lecture 32 - Stability and Amplifier Design - I
Lecture 33 - Stability and Amplifier Design - II
Lecture 34 - Stability and Amplifier Design - III
Lecture 35 - Stability and Amplifier Design - IV
Lecture 36 - Low Noise Amplifier Design - I
Lecture 37 - Low Noise Amplifier Design - II
Lecture 38 - Low Noise Amplifier Design - III
Lecture 39 - Low Noise Amplifier Design - IV
Lecture 40 - Low Noise Amplifier Design - V
Lecture 41 - Low Noise Amplifier Design - VI
Lecture 42 - Mixer Design - I
Lecture 43 - Mixer Design - II
Lecture 44 - Mixer Design - III
Lecture 45 - Mixer Design - IV
Lecture 46 - Mixer Design - V
Lecture 47 - Mixer Design - VI
Lecture 48 - Mixer Design - VII
Lecture 49 - Mixer Design - VIII
Lecture 50 - Mixer Design - IX
Lecture 51 - Oscillator Design - I
Lecture 52 - Oscillator Design - II
Lecture 53 - Oscillator Design - III
Lecture 54 - Oscillator Design - IV
Lecture 55 - Power Amplifier Design - I
Lecture 56 - Power Amplifier Design - II
Lecture 57 - Power Amplifier Design - III
Lecture 58 - Basics of Phase Locked Loop - I
Lecture 59 - Basics of Phase Locked Loop - II
Lecture 60 - System Level Considerations
Lecture 61 - RF Testing and Measurement Techniques

NPTEL Video Course - Electrical Engineering - NOC:VLSI Physical Design with Timing Analysis

Subject Co-ordinator - Prof. Bishnu Prasad Das

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Introduction to VLSI Design
Lecture 2 - Introduction to VLSI Physical Design
Lecture 3 - Complexity Analysis for Algorithms
Lecture 4 - Graphs for Physical Design
Lecture 5 - Graph searching Algorithms
Lecture 6 - Spanning Tree and Shortest Path Algorithms
Lecture 7 - Overview of Timing Analysis
Lecture 8 - Timing Arcs and Unateness
Lecture 9 - Delay Parameters of a Combinational Circuit
Lecture 10 - Delay Parameters of a Sequential Circuit
Lecture 11 - Timing Analysis in a Sequential Circuit
Lecture 12 - STA in Sequential Circuit with Clock Skew - I
Lecture 13 - STA in Sequential Circuit with Clock Skew - II
Lecture 14 - STA in Sequential Circuit with Clock Jitter
Lecture 15 - STA considering OCV and CRPR (Setup check)
Lecture 16 - STA considering OCV and CRPR (Hold check)
Lecture 17 - STA for Combinational Circuits - I
Lecture 18 - STA for Combinational Circuits - II
Lecture 19 - Introduction to Partitioning - I
Lecture 20 - Introduction to Partitioning - II
Lecture 21 - Partitioning Algorithms
Lecture 22 - Kernighan-Lin (KL) Algorithm
Lecture 23 - Fidduccia-Mattheyeses (FM) Algorithm
Lecture 24 - Introduction to Floorplanning
Lecture 25 - Floorplanning Representations
Lecture 26 - Floorplanning Algorithms - 1
Lecture 27 - Floorplanning Algorithms - 2
Lecture 28 - Pin Assignment and Power - Ground Routing
Lecture 29 - Introduction to Placement

Lecture 30 - Wirelength estimation techniques
Lecture 31 - Min-cut placement
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 Video Course - Electrical Engineering - NOC:Modeling, Analysis and Estimation of Three Phase Unbalancec

Subject Co-ordinator - Prof. Biswarup Das

Co-ordinating Institute - IIT - Roorkee

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

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 Video Course - Electrical Engineering - NOC:Semiconductor Devices for Next Generation Field Effect Tran

Subject Co-ordinator - Prof. Sudeb Dasgupta

Co-ordinating Institute - IIT - Roorkee

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

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 Video Course - Electrical Engineering - NOC:Intelligent Control of Robotic Systems

Subject Co-ordinator - Prof. M. Felix Orlando

Co-ordinating Institute - IIT - Roorkee

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

Lecture 1 - Robotics: Primer-Robot Anatomy and Terminology
Lecture 2 - Robotics: Primer-Kinematics and Dynamics
Lecture 3 - Back Stepping Control
Lecture 4 - Feedback Linearization
Lecture 5 - Lyapunov Stability
Lecture 6 - Introduction to Fuzzy Logic
Lecture 7 - Fuzzy Relations and Rule Base
Lecture 8 - Fuzzy Logic Control - I
Lecture 9 - Fuzzy Logic Control - II
Lecture 10 - T-S Fuzzy
Lecture 11 - Neural Network based Robot Control
Lecture 12 - Neural Adaptive Control of Robotics Systems
Lecture 13 - Neural Network based Feedback Linearization
Lecture 14 - Robust RBFN
Lecture 15 - NN based Hybrid Force/Position Control of Robot Manipulator
Lecture 16 - Introduction to Reinforcement Learning
Lecture 17 - Introduction to Search Methods
Lecture 18 - Introduction to Path Planning
Lecture 19 - Sampling based Path Planning Methods
Lecture 20 - Path Planning of Robotic Needle

NPTEL Video Course - Electrical Engineering - An Introduction to Electronics Systems Packaging

Subject Co-ordinator - Prof. G.V. Mahesh

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction and Objectives of the course
Lecture 2 - Definition of a system and history of semiconductors
Lecture 3 - Products and levels of packaging
Lecture 4 - Packaging aspects of handheld products; Case studies in applications
Lecture 5 - Case Study (continued); Definition of PWB, summary and Questions for review
Lecture 6 - Basics of Semiconductor and Process flowchart; Video on â Sand-to-Siliconâ •
Lecture 7 - Wafer fabrication, inspection and testing
Lecture 8 - Wafer packaging; Packaging evolution; Chip connection choices
Lecture 9 - Wire bonding, TAB and flipchip-1
Lecture 10 - Wire bonding, TAB and flipchip-2; Tutorials
Lecture 11 - Why packaging? & Single chip packages or modules (SCM)
Lecture 12 - Commonly used packages and advanced packages; Materials in packages
Lecture 13 - Advances packages (continued); Thermal mismatch in packages; Current trends in packaging
Lecture 14 - Multichip modules (MCM)-types; System-in-package (SIP); Packaging roadmaps; Hybrid circuits; Qui
Lecture 15 - Electrical Issues â   I; Resistive Parasitic
Lecture 16 - Electrical Issues â   II; Capacitive and Inductive Parasitic
Lecture 17 - Electrical Issues â   III; Layout guidelines and the Reflection problem
Lecture 18 - Electrical Issues â   IV; Interconnection
Lecture 19 - Quick Tutorial on packages; Benefits from CAD; Introduction to DFM, DFR & DFT
Lecture 20 - Components of a CAD package and its highlights
Lecture 21 - Design Flow considerations; Beginning a circuit design with schematic work and component layout
Lecture 22 - Demo and examples of layout and routing; Technology file generation from CAD; DFM check list and
Lecture 23 - Review of CAD output files for PCB fabrication; Photo plotting and mask generation
Lecture 24 - Process flow-chart; Vias; PWB substrates
Lecture 25 - Substrates continued; Video highlights; Surface preparation
Lecture 26 - Photoresist and application methods; UV exposure and developing; Printing technologies for PWBs
Lecture 27 - PWB etching; Resist stripping; Screen-printing technology
Lecture 28 - Through-hole manufacture process steps; Panel and pattern plating methods
Lecture 29 - Video highlights on manufacturing; Solder mask for PWBs; Multilayer PWBs; Introduction to microv

Lecture 30 - Microvia technology and Sequential build-up technology process flow for high-density interconnec
Lecture 31 - Conventional Vs HDI technologies; Flexible circuits; Tutorial session
Lecture 32 - SMD benefits; Design issues; Introduction to soldering
Lecture 33 - Reflow and Wave Soldering methods to attach SMDs
Lecture 34 - Solders; Wetting of solders; Flux and its properties; Defects in wave soldering
Lecture 35 - Vapour phase soldering, BGA soldering and Desoldering/Repair; SMT failures
Lecture 36 - SMT failure library and Tin Whiskers
Lecture 37 - Tin-lead and lead-free solders; Phase diagrams; Thermal profiles for reflow soldering; Lead-free
Lecture 38 - Lead-free solder considerations; Green electronics; RoHS compliance and e-waste recycling issues
Lecture 39 - Thermal Design considerations in systems packaging
Lecture 40 - Introduction to embedded passives; Need for embedded passives; Design Library; Embedded resistor
Lecture 41 - Embedded capacitors; Processes for embedding capacitors; Case study examples; Summary of materia
Lecture 42 - Chapter-wise summary

NPTEL Video Course - Electrical Engineering - Power Electronics and Distributed Generation

Subject Co-ordinator - Dr. Vinod John

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Course introduction and overview
Lecture 2 - Distributed generation technologies
Lecture 3 - Distributed storage technologies
Lecture 4 - Distribution system protection
Lecture 5 - Circuit breaker coordination
Lecture 6 - Symmetrical component analysis and sequence excitation
Lecture 7 - Modeling of distribution system components
Lecture 8 - Protection components
Lecture 9 - Impact of distributed generation of distribution protection
Lecture 10 - Consumption and distribution grounding
Lecture 11 - Islanding of distribution systems
Lecture 12 - Modeling of islanded distribution systems
Lecture 13 - Distribution system problems and examples
Lecture 14 - Distribution system problems and examples continued
Lecture 15 - Anti-islanding methods
Lecture 16 - Solid state circuit switching
Lecture 17 - Relaying for distributed generation
Lecture 18 - Feeder voltage regulation
Lecture 19 - Grounding, distribution protection coordination problems and examples
Lecture 20 - Ring and network distribution
Lecture 21 - Economic evaluation of DG systems
Lecture 22 - Design for effective initial cost
Lecture 23 - Single phase inverters
Lecture 24 - DC bus design in voltage source inverter
Lecture 25 - Electrolytic capacitor reliability and lifetime
Lecture 26 - Inverter switching and average model
Lecture 27 - Common mode and differential mode model of inverters
Lecture 28 - Two leg single phase inverter
Lecture 29 - Distribution system problems, and examples

Lecture 30 - DG evaluation problems and examples
Lecture 31 - Switch selection in two level voltage source inverters and loss evaluation
Lecture 32 - Thermal model, management and cycling failure of IGBT modules
Lecture 33 - Semiconductor switch design reliability considerations
Lecture 34 - AC filters for grid connected inverters
Lecture 35 - AC inductor design and need for LCL filter
Lecture 36 - LCL filter design
Lecture 37 - Examples in power electronic design for DG systems
Lecture 38 - Examples in power electronic design for DG systems continued
Lecture 39 - Higher order passive damping design for LCL filters
Lecture 40 - Balance of hardware component for inverters in DG systems

NPTEL Video Course - Electrical Engineering - Pulse width Modulation for Power Electronic Converters

Subject Co-ordinator - Dr. G. Narayanan

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Electronic switches
Lecture 2 - DC - DC converters
Lecture 3 - DC - AC converters
Lecture 4 - Multilevel converters - I
Lecture 5 - Multilevel converters - II
Lecture 6 - Applications of voltage source converter - I
Lecture 7 - Applications of voltage source converter - II
Lecture 8 - Applications of voltage source converter - III
Lecture 9 - Purpose of PWM - I
Lecture 10 - Purpose of PWM - II
Lecture 11 - Low switching frequency PWM - I
Lecture 12 - Low switching frequency PWM - II
Lecture 13 - Selective harmonic elimination
Lecture 14 - Off-line optimized pulsewidth modulation
Lecture 15 - Sine-triangle pulsewidth modulation
Lecture 16 - Harmonic injection pulsewidth modulation
Lecture 17 - Bus-clamping pulsewidth modulation
Lecture 18 - Triangle-comparison based PWM for three-phase inverter
Lecture 19 - Concept of space vector
Lecture 20 - Conventional space vector PWM
Lecture 21 - Space vector based bus-clamping PWM
Lecture 22 - Space vector based advanced bus-clamping PWM
Lecture 23 - Harmonic analysis of PWM techniques
Lecture 24 - Analysis of RMS line current ripple using the notion of stator flux ripple
Lecture 25 - Evaluation of RMS line current ripple using the notion of stator flux ripple
Lecture 26 - Analysis and design of PWM techniques from line current ripple perspective
Lecture 27 - Instantaneous and average dc link current in a voltage source inverter
Lecture 28 - DC link current and DC capacitor current in a voltage source inverter
Lecture 29 - Analysis of torque ripple in induction motor drives - I

Lecture 30 - Analysis of torque ripple in induction motor drives - II
Lecture 31 - Evaluation of conduction loss in three-phase inverter
Lecture 32 - Evaluation of switching loss in three-phase inverter
Lecture 33 - Design of PWM for reduced switching loss in three-phase inverter
Lecture 34 - Effect of dead-time on inverter output voltage for continuous PWM schemes
Lecture 35 - Effect of dead-time on inverter output voltage for bus-clamping PWM schemes
Lecture 36 - Analysis of overmodulation in sine-triangle PWM from space vector perspective
Lecture 37 - Overmodulation in space vector modulated inverter
Lecture 38 - PWM for three-level neutral-point-clamped inverter - I
Lecture 39 - PWM for three-level neutral-point-clamped inverter - II
Lecture 40 - PWM for three-level neutral-point-clamped inverter - III

NPTEL Video Course - Electrical Engineering - Switched Mode Power Conversion

Subject Co-ordinator - Prof. L. Umanand, Prof. V. Ramanarayanan

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction to DC-DC converter
Lecture 2 - Diode
Lecture 3 - Controlled Switches
Lecture 4 - Prior Art
Lecture 5 - Inductor
Lecture 6 - Transformer
Lecture 7 - Capacitor
Lecture 8 - Issues related to switches
Lecture 9 - Energy storage - Capacitor
Lecture 10 - Energy storage - Inductor
Lecture 11 - Primitive Converter
Lecture 12 - Non-Isolated converter - I
Lecture 13 - Non-Isolated converter - II
Lecture 14 - Isolated Converters - I
Lecture 15 - Isolated Converters - II
Lecture 16 - Conduction Mode
Lecture 17 - Problem set - I
Lecture 18 - Problem set - II
Lecture 19 - Modeling DC-DC converters
Lecture 20 - State space representation - I
Lecture 21 - State Space representation - II
Lecture 22 - Circuit Averaging - I
Lecture 23 - Circuit Averaging - II
Lecture 24 - State Space Model of Boost Converter
Lecture 25 - DC-DC converter controller
Lecture 26 - Controller Structure
Lecture 27 - PID Controller - I
Lecture 28 - PID Controller - II
Lecture 29 - PID Controller - III

Lecture 30 - Implementation of PID controller
Lecture 31 - Pulse Width Modulator
Lecture 32 - Controller Design - I
Lecture 33 - Controller Design - II
Lecture 34 - Controllers and Sensing Circuit
Lecture 35 - Regulation of Multiple outputs - I
Lecture 36 - Regulation of Multiple outputs - II
Lecture 37 - Current Control
Lecture 38 - Unity Power Factor Converter
Lecture 39 - Magnetic Design
Lecture 40 - DC-DC Converter Design

NPTEL Video Course - Electrical Engineering - Basic Electrical Technology

Subject Co-ordinator - Prof. L. Umanand

Co-ordinating Institute - IISc - Bangalore

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

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
Lecture 32 - Three Phase System - Part 4
Lecture 33 - Three Phase Transformer - Part 1
Lecture 34 - Three Phase Transformer - Part 2
Lecture 35 - Induction Motor - Part 1
Lecture 36 - Induction Motor - Part 2
Lecture 37 - Induction Motor - Part 3
Lecture 38 - Induction Motor - Part 4
Lecture 39 - Synchronous Machine

NPTEL Video Course - Electrical Engineering - Industrial Drives - Power Electronics

Subject Co-ordinator - Prof. K. Gopakumar

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Electric Drive
Lecture 2 - Controlled Rectifier - Part-1
Lecture 3 - Controlled Rectifier - Part-2 (Three phase)
Lecture 4 - Controlled Rectifier - Part-3 (Three phase)
Lecture 5 - Controlled Rectifier - Part-4 (Three Phase)
Lecture 6 - Controlled Rectifier - Part-5 (Three Phase)
Lecture 7 - Power Electronics Improvements
Lecture 8 - Four Quadrant Dc to Dc Converter
Lecture 9 - Sine Triangle PWM Control of Converter
Lecture 10 - Front-end Ac-Dc Converter with harmonic control
Lecture 11 - Ac to Dc Converter Close Loop Control Schematic
Lecture 12 - Ac-Dc Converter Close loop Control Block Diagram
Lecture 13 - Design of the Converter Controller & AC to DC
Lecture 14 - Front-End Ac to Dc Converter-Design
Lecture 15 - Front-End Ac to Dc Converter - Simulation study
Lecture 16 - Dc Motor Speed Control - Introduction
Lecture 17 - Dc Motor Speed Control - Block Diagram
Lecture 18 - Dc Motor Speed Control Current Control & S C L
Lecture 19 - Dc-Motor Speed Control Controller Design - Part-1
Lecture 20 - Dc Motor Speed Control Controller Design - Part-2
Lecture 21 - Dc Motor Speed Control Controller Design - Part-3
Lecture 22 - Basics of DC to AC Converter - Part-1
Lecture 23 - Basics of DC to AC Converter - Part-2
Lecture 24 - Inverter Sine Triangle PWM
Lecture 25 - Inverter - Current Hysteresis Controlled PWM
Lecture 26 - C H controlled & Basics of space vector PWM
Lecture 27 - Space Vector PWM - Part-2
Lecture 28 - Space Vector PWM - Part-3
Lecture 29 - Space Vector PWM Signal Generation

Lecture 30 - Speed Control of Induction Motor - Part-1
Lecture 31 - Speed Control of Induction Motor - Part-2
Lecture 32 - High dynamic performance of I M Drive
Lecture 33 - Dynamic Model of Induction Motor - Part-1
Lecture 34 - Dynamic Model of Induction Motor - Part-2
Lecture 35 - Vector Control of Induction Motor
Lecture 36 - Effect of Switching Time lag in Inverter
Lecture 37 - Power Switch Protection - Snubbers

NPTEL Video Course - Electrical Engineering - NOC:Design for Internet of Things

Subject Co-ordinator - Prof. T.V. Prabhakar

Co-ordinating Institute - IISc - Bangalore

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

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 Video Course - Electrical Engineering - NOC:Advances in UHV Transmission and Distribution

Subject Co-ordinator - Prof Subba Reddy B

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Advantages of HVAC/DC Transmission, Introduction to Grid Management
Lecture 2 - Transmission system development, Important components of transmission system
Lecture 3 - Insulation coordination, over voltage in power systems
Lecture 4 - Design/selection of insulators, Importance of grading/cc rings
Lecture 5 - Non ceramic insulators performance-service experience
Lecture 6 - Failure of apparatus in the field, importance of reliability and testing
Lecture 7 - Pollution flashover phenomena, modeling etc
Lecture 8 - Planning of High Voltage laboratories
Lecture 9 - Importance of High Voltage testing and techniques employed
Lecture 10 - Basic philosophy of HV testing, tests for various HV apparatus
Lecture 11 - HV testing techniques for various apparatus
Lecture 12 - HV testing on Composite Insulators
Lecture 13 - Surface degradation studies on composite insulators
Lecture 14 - Surface morphological techniques for composite insulators
Lecture 15 - Conductors used for EHV/UHV transmission
Lecture 16 - Corona nad interference on transmission lines
Lecture 17 - Introduction of HTLS conductors and their advantages
Lecture 18 - Mechanical considerations for HV conductors
Lecture 19 - Introduction to Towers and importance of foundations
Lecture 20 - Selection/Design of clearances for HV towers
Lecture 21 - Design Optimization for UHV towers
Lecture 22 - Introduction to 1100kV HVDC
Lecture 23 - Introduction to HV Substations
Lecture 24 - Types of Substations, comparison
Lecture 25 - Insulation coordination, Components in a typical substation
Lecture 26 - Preventive maintenance of Substation
Lecture 27 - Electric and magnetic fields, mitigations techniques
Lecture 28 - Importance of Grounding, reducing Earthing resistance
Lecture 29 - Introduction to the use of Fiber optic cables, OPGW

Lecture 30 - Introduction to communication and SCADA
Lecture 31 - Precautions and safety measures in substation
Lecture 32 - Electrical hazards, minimum clearances in substation
Lecture 33 - Importance of Generation of HVDC in the laboratory
Lecture 34 - Importance of Generation of HVAC, Impulse Voltage and Currents in the laboratory
Lecture 35 - Measurements of High Voltages
Lecture 36 - Measurements of High Voltages (Continued...)
Lecture 37 - Introduction to digital recorders, measurement
Lecture 38 - Upgradation/uprating of transmission lines- advantages
Lecture 39 - Upgradation/uprating of transmission lines- advantages (Continued...)
Lecture 40 - Summary of the course

NPTEL Video Course - Electrical Engineering - NOC:Mathematical Methods and Techniques in Signal Processing

Subject Co-ordinator - Prof. Shayan Srinivasa Garani

Co-ordinating Institute - IISc - Bangalore

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

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
Lecture 32 - Sampling theorem
Lecture 33 - Basics of multirate systems
Lecture 34 - Frequency representation of expanders and decimators
Lecture 35 - Decimation and interpolation filters
Lecture 36 - Fractional sampling rate alterations
Lecture 37 - Digital filter banks
Lecture 38 - DFT as filter bank
Lecture 39 - Noble Identities
Lecture 40 - Polyphase representation
Lecture 41 - Efficient architectures for interpolation and decimation filters
Lecture 42 - Problems on simplifying multirate systems using noble identities
Lecture 43 - Problem on designing synthesis bank filters
Lecture 44 - Efficient architecture for fractional decimator
Lecture 45 - Multistage filter design
Lecture 46 - Two-channel filter banks
Lecture 47 - Amplitude and phase distortion in signals
Lecture 48 - Polyphase representation of 2-channel filter banks, signal flow graphs and perfect reconstructio
Lecture 49 - M-channel filter banks
Lecture 50 - Polyphase representation of M-channel filter bank
Lecture 51 - Perfect reconstruction of signals
Lecture 52 - Nyquist and half band filters
Lecture 53 - Special filter banks for perfect reconstruction
Lecture 54 - Introduction to wavelets
Lecture 55 - Multiresolution analysis and properties
Lecture 56 - The Haar wavelet
Lecture 57 - Structure of subspaces in MRA
Lecture 58 - Haar decomposition - 1
Lecture 59 - Haar decomposition - 2
Lecture 60 - Wavelet Reconstruction
Lecture 61 - Haar wavelet and link to filter banks
Lecture 62 - Demo on wavelet decomposition
Lecture 63 - Problem on circular convolution
Lecture 64 - Time frequency localization
Lecture 65 - Basic analysis
Lecture 66 - Basic Analysis
Lecture 67 - Fourier series and notions of convergence
Lecture 68 - Convergence of Fourier series at a point of continuity

Lecture 69 - Convergence of Fourier series for piecewise differentiable periodic functions
Lecture 70 - Uniform convergence of Fourier series of piecewise smooth periodic function
Lecture 71 - Convergence in norm of Fourier series
Lecture 72 - Convergence of Fourier series for all square integrable periodic functions
Lecture 73 - Problem on limits of integration of periodic functions
Lecture 74 - Matrix Calculus
Lecture 75 - KL transform
Lecture 76 - Applications of KL transform
Lecture 77 - Demo on KL Transform
Lecture 78 - Live Session
Lecture 79 - Live Session 2

NPTEL Video Course - Electrical Engineering - NOC:Electronics Enclosures Thermal Issues

Subject Co-ordinator - Prof. N. V Chalapathi Rao

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Electronic Equipment Thermal issues
Lecture 2 - Practical Examples - 1
Lecture 3 - Practical Examples - 2
Lecture 4 - CEDT worked examples - 1
Lecture 5 - CEDT worked examples - 2
Lecture 6 - Text book theory
Lecture 7 - Sample heat sinks
Lecture 8 - Published correlations - 1
Lecture 9 - Published correlations - 2
Lecture 10 - Parallel combined effects
Lecture 11 - Mounting of packages
Lecture 12 - Combined Rth of devices
Lecture 13 - Schonholzer moduls
Lecture 14 - 1972 model paper
Lecture 15 - Jensen model
Lecture 16 - Thermal management - 1
Lecture 17 - Thermal management - 2
Lecture 18 - Round up of full model
Lecture 19 - Fan cooling
Lecture 20 - Thermo-electric cooling
Lecture 21 - On-the-net DIY work
Lecture 22 - Practical video
Lecture 23 - Lecture 23
Lecture 24 - Lecture 24
Lecture 25 - Lecture 25
Lecture 26 - Lecture 26
Lecture 27 - Real packages
Lecture 28 - Prior art
Lecture 29 - OTS standard profiles

Lecture 30 - CAD detailed design of profiles
Lecture 31 - Round up
Lecture 32 - 4X Peltier Cooler
Lecture 33 - Manufacturing Video
Lecture 34 - Peltier heat sink

NPTEL Video Course - Electrical Engineering - NOC:Integrated Circuits, MOSFETs, Op-Amps and their Applicatio

Subject Co-ordinator - Prof. Hardik Jeetendra Pandya

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction to Integrated Circuits (IC) Technology
Lecture 2 - Introduction to fabrication of IC
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
Lecture 22 - Applications of Operational Amplifier
Lecture 23 - Applications of Operational Amplifier
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
Lecture 32 - Construction and Operation of UJT Relaxation Oscillators
Lecture 33 - Introduction to Noise and its Types
Lecture 34 - Analysis of Data Sheets of an Op-Amp
Lecture 35 - Analysis of Data Sheets of an Op-Amp (Continued...)
Lecture 36 - Analysis of Data Sheets of an Op-Amp (Continued...)
Lecture 37 - Experiment - Introduction to Laboratory Equipment
Lecture 38 - Experiment - Measurement of Active and Passive elements using Multimeter
Lecture 39 - Experiment - Working with Laboratory Equipment
Lecture 40 - Experiment - Working with Laboratory Equipment
Lecture 41 - Experiment - Op-Amp Characteristics
Lecture 42 - Experiment - Op-Amp Characteristics
Lecture 43 - Experiment - Op-Amp Characteristics
Lecture 44 - Experiment - Op-Amp as Inverting Amplifier
Lecture 45 - Experiment - Op-Amp as Non-Inverting Amplifier
Lecture 46 - Experiment - To study input and output voltage range of an Op-Amp
Lecture 47 - Experiment - Differential amplifier using op-amp
Lecture 48 - Experiment - To study the gain of instrumentation amplifier
Lecture 49 - Experiment - Summing amplifier using op-amp
Lecture 50 - Experiment - To study op-amp based comparator
Lecture 51 - Experiment - To study op-amp based integrator and differentiator
Lecture 52 - Experiment - Study of passive low pass filter
Lecture 53 - Experiment - Op-amp based active low pass filter
Lecture 54 - Experiment - Passive and active high pass filter
Lecture 55 - Experiment - Introduction to experimental set-up of band pass filter
Lecture 56 - Experiment - Passive and active band pass filter
Lecture 57 - Experiment - Introduction to experimental set-up for band reject filter
Lecture 58 - Experiment - Active band reject filter
Lecture 59 - Experiment - Peak detector circuit using Op-Amp

NPTEL Video Course - Electrical Engineering - NOC:Semiconductor Devices and Circuits

Subject Co-ordinator - Prof. Sanjiv Sambandan

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Quantum Mechanics
Lecture 2 - Quantum Mechanics
Lecture 3 - Quantum Mechanics
Lecture 4 - Solids
Lecture 5 - Solids
Lecture 6 - Solids
Lecture 7 - Solids
Lecture 8 - Solids
Lecture 9 - Density of States
Lecture 10 - Density of States (Continued...), Fermi Function
Lecture 11 - Fermi Function - Carrier Concentration
Lecture 12 - Doping
Lecture 13 - Doping (Continued...)
Lecture 14 - Recombination and Generation
Lecture 15 - Recombination and Generation (Continued...)
Lecture 16 - Recombination and Generation (Continued...), Charge Transport
Lecture 17 - Charge Transport (Continued...)
Lecture 18 - Continuity Equation
Lecture 19 - Junctions
Lecture 20 - Metal Semiconductor Junctions
Lecture 21 - Schottky Contact
Lecture 22 - Schottky Contact
Lecture 23 - Schottky Contact
Lecture 24 - Schottky Contact
Lecture 25 - PN Junctions
Lecture 26 - PN Junctions
Lecture 27 - PN Junctions
Lecture 28 - PN Junctions
Lecture 29 - Bipolar Junction Transistors (BJT)

Lecture 30 - BJT
Lecture 31 - BJT
Lecture 32 - Metal Oxide Semiconductor Capacitor (MOSCAP)
Lecture 33 - MOSCAP (Continued...)
Lecture 34 - MOSCAP
Lecture 35 - MOSCAP
Lecture 36 - MOSFET
Lecture 37 - MOSFET
Lecture 38 - MOSFET
Lecture 39 - MOSFET
Lecture 40 - Subthreshold swing, Additional concepts
Lecture 41 - Trapped charge, Body-bias
Lecture 42 - Scaling of MOSFETs
Lecture 43 - Scaling of MOSFETs (Continued...), Leakage currents in MOSFETs
Lecture 44 - MOSFET characterization
Lecture 45 - MOSFET characterization
Lecture 46 - MOSFET as a switch
Lecture 47 - MOSFET as a switch (Continued...)
Lecture 48 - Amplifiers using MOSFET
Lecture 49 - Amplifiers using MOSFET (Continued...)
Lecture 50 - Circuits
Lecture 51 - Introduction
Lecture 52 - Thin Film Transistors
Lecture 53 - Tutorials Session - 1
Lecture 54 - Tutorials Session - 2
Lecture 55 - Tutorials Session - 3

NPTEL Video Course - Electrical Engineering - NOC:Fabrication Techniques for MEMs-based Sensors: Clinical Per

Subject Co-ordinator - Prof. Hardik Jeetendra Pandya

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction to Microengineering Devices
Lecture 2 - Introduction to Microengineering Devices (Continued...)
Lecture 3 - Introduction to Microengineering Devices (Continued...)
Lecture 4 - Silicon, silicon di-oxide and photolithography
Lecture 5 - Silicon, silicon di-oxide and photolithography (Continued...)
Lecture 6 - Physical Vapour Deposition
Lecture 7 - Physical Vapour Deposition (Continued...)
Lecture 8 - Photolithography
Lecture 9 - Mask Aligner
Lecture 10 - Mask Aligner (Continued...)
Lecture 11 - Micromachining
Lecture 12 - Micromachining
Lecture 13 - Micromachining
Lecture 14 - Micromachining
Lecture 15 - Chemical Vapour Deposition
Lecture 16 - Typical Microfabricated Devices for Biomedical Applications
Lecture 17 - Cancer Diagnostic Tool
Lecture 18 - Process flow for Fabrication of Micro Heater
Lecture 19 - Process flow for Fabrication of Interdigited Electrodes
Lecture 20 - Process flow for Fabrication of Interdigited Electrodes (Continued...)
Lecture 21 - Process flow for Fabrication of ETM phenotyping
Lecture 22 - Process flow for Fabrication of Piezo canteliver
Lecture 23
Lecture 24
Lecture 25
Lecture 26
Lecture 27 - Microchip for Rapid Drug Screening
Lecture 28 - Microchip for Rapid Drug Screening (Continued...)
Lecture 29 - A Microfluidic chip for rapid bacterial antibiotic Susceptibility testing

Lecture 30 - Smart Catheter
Lecture 31 - Smart Catheter
Lecture 32 - Smart Catheter
Lecture 33 - Tissue and Cell Culture Techniques
Lecture 34 - Clean Room
Lecture 35 - GLP
Lecture 36 - Introduction to Equipments
Lecture 37 - Gowning Procedure for using Biological Lab Setup
Lecture 38 - Introduction to Equipments
Lecture 39 - Introduction to Equipments
Lecture 40 - Introduction to Equipments
Lecture 41 - Function generator, Multimeter, Sampling, LabVIEW, NI-CDAQ
Lecture 42 - Introduction to Equipments
Lecture 43 - Introduction to Equipments
Lecture 44 - Introduction to Equipments
Lecture 45 - Introduction to Equipments
Lecture 46 - Introduction to Equipments
Lecture 47 - Introduction to Equipments
Lecture 48 - Introduction to Equipments
Lecture 49 - Introduction to Equipments
Lecture 50 - Introduction to Equipments
Lecture 51 - PDMS Moulding
Lecture 52 - 3D Printing
Lecture 53 - Introduction to Fabricated Sensors
Lecture 54 - Simulation
Lecture 55 - Simulation

NPTEL Video Course - Electrical Engineering - NOC:Op-Amp Practical Applications: Design, Simulation and Imple

Subject Co-ordinator - Prof. Hardik Jeetendra Pandya

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction/Summary on Op-amps
Lecture 2 - Introduction/Summary on Op-amps (Continued...)
Lecture 3 - Introduction/Summary on Op-amps (Continued...)
Lecture 4 - Effect of Loading and Input Impedance - Part 1
Lecture 5 - Effect of Loading and Input Impedance - Part 2
Lecture 6 - Effect of Loading and Input Impedance - Part 3
Lecture 7 - Effect of Loading and Input Impedance - Part 4
Lecture 8 - Introduction to an Analog Circuit Development Board (TI ASLK Pro)
Lecture 9 - Op-amp Applications
Lecture 10 - Op-amp Applications
Lecture 11 - Op-amp Applications
Lecture 12 - Op-amp Circuits using Diodes
Lecture 13 - Understanding the Range of Feedback Amplifiers
Lecture 14 - Op-amps as Phase Shift Oscillator
Lecture 15 - Op-amp as Wein Bridge Oscillator
Lecture 16 - Op-amp as Hartley Oscillator
Lecture 17 - Op-amp as Colpitts Oscillator
Lecture 18 - Op-amps as Comparator
Lecture 19 - Op-amp with Positive Feedback
Lecture 20 - Op-amp with Positive Feedback
Lecture 21 - Op-amp with Positive Feedback
Lecture 22 - Op-amp with Positive Feedback
Lecture 23 - Op-amp based Voltage Controlled Current Source
Lecture 24 - Measure of Unknown Resistance by Constant Current Drive Circuit Implemented using Op-amp
Lecture 25 - Design and Development of Temperature Controlled Circuit using Op-amp as ON-OFF, Proportional ar
Lecture 26 - Implemetation of Error Detector Cirucit and Signal Conditioning Circuit for Temperature Control
Lecture 27 - Implementation of Plant/Heating Circuit and ON-OFF Controller
Lecture 28 - Implementation of P and PI Controllers
Lecture 29 - Experiment on Controlling the Temperature on the Plant using different Controllers

Lecture 30 - Experiment
Lecture 31 - Introduction to ECG Experiment
Lecture 32 - Desing and Implementation of ECG Preprocessing Stage - Part 1
Lecture 33 - Desing and Implementation of ECG Preprocessing Stage - Part 2
Lecture 34 - Desing and Implementation of ECG Preprocessing Stage - Part 3
Lecture 35 - Desing and Implementation of ECG Preprocessing Stage - Part 4
Lecture 36 - Desing and Implementation of Peak Detetor and Thresholding Circuit for ECG Signal Conditioning
Lecture 37 - Live Demonstration on ECG Signal Acquistion, Conditioning and Measurement of BPM
Lecture 38 - Understanding Analog Multipliers using Development Board
Lecture 39 - Application
Lecture 40 - Introdution to Data-Acquisition
Lecture 41 - Analog to Digital Conversion Circuits and Experiment on 2-bit Flash Type ADC
Lecture 42 - Digital to Analog Conversion Circuits and Experiment on 4-bit R-2R DAC
Lecture 43 - DAC Basics using Development Board - Introduction
Lecture 44 - Understanding DAC 7821 Datasheet
Lecture 45 - Basic DAC Experiment on Variable Gain Amplifier
Lecture 46 - Understanding DAC
Lecture 47 - Introduction to CDAQ (Compact DAQ)
Lecture 48 - Software-in-Loop based Temperature Controller using CDAQ and LabVIEW

NPTEL Video Course - Electrical Engineering - NOC:Physical Modelling for Electronics Enclosures using Rapid p

Subject Co-ordinator - Prof. N. V Chalapathi Rao

Co-ordinating Institute - IISc - Bangalore

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

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...)
Lecture 32 - Fastening detail
Lecture 33 - Flat objects
Lecture 34 - Modularity
Lecture 35 - Creative design work
Lecture 36 - Creative designs
Lecture 37 - Using flat features
Lecture 38 - Organic shapes
Lecture 39 - Simulation for alternate use

NPTEL Video Course - Electrical Engineering - NOC:Recent Advances in Transmission Insulators

Subject Co-ordinator - Prof Subba Reddy B

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction to Transmission and distribution Insulators
Lecture 2 - Manufacturing process for Ceramic/glass Insulators
Lecture 3 - Manufacturing process for Polymeric Insulators
Lecture 4 - Design Considerations of Transmission Insulators
Lecture 5 - Field experience of Ceramic/Glass and Polymeric Insulators
Lecture 6 - Comparison of Transmission Insulators
Lecture 7 - Environmental issues with transmission Insulators
Lecture 8 - Reliability and Philosophy of Testing
Lecture 9 - Testing of Ceramic, Glass and Composite Insulators
Lecture 10 - Cleaning methods adopted for Insulators
Lecture 11 - Cleaning methods adopted for Insulators (Continued...)
Lecture 12 - Coating techniques for Insulators
Lecture 13 - Introduction to Hybrid Insulators

NPTEL Video Course - Electrical Engineering - NOC:Fundamentals of Semiconductor Devices

Subject Co-ordinator - Prof. Digbijoy N. Nath

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction to semiconductors
Lecture 2 - Introduction to energy bands
Lecture 3 - Fundamentals of band structure
Lecture 4 - Band structure (Continued...) and Fermi-Dirac distribution
Lecture 5 - Density of states
Lecture 6 - Doping and intrinsic carrier concentration
Lecture 7 - Equilibrium carrier concentration
Lecture 8 - Temperature-dependence of carrier concentration
Lecture 9 - High doping effects and incomplete ionization
Lecture 10 - Carrier scattering and mobility
Lecture 11 - Low-field and high-field transport, introduction to diffusion
Lecture 12 - Drift-diffusion and trap statistics
Lecture 13 - Current continuity equation
Lecture 14 - Continuity equation (Continued...) and introduction to p-n junction
Lecture 15 - p-n junction under equilibrium
Lecture 16 - p-n junction under equilibrium (Continued...)
Lecture 17 - p-n junction under bias
Lecture 18 - p-n junction under bias (Continued...)
Lecture 19 - p-n junction
Lecture 20 - Application of p-n junctions
Lecture 21 - Breakdown of junction and C-V profiling
Lecture 22 - Introduction to Schottky junction
Lecture 23 - Schottky junction under equilibrium
Lecture 24 - Schottky junction under bias
Lecture 25 - Introduction to transistors
Lecture 26 - Basics of BJT
Lecture 27 - Working of BJT
Lecture 28 - Working of BJT (Continued...)
Lecture 29 - Delays in BJT

Lecture 30 - MOS
Lecture 31 - MOS
Lecture 32 - Ideal MOS system
Lecture 33 - MOS C-V in more details
Lecture 34 - MOSFET - An introduction
Lecture 35 - Gradual Channel Approximation
Lecture 36 - Substrate bias effect and subthreshold conduction in MOSFET
Lecture 37 - Short Channel Effects in MOSFET
Lecture 38 - Introduction to compound semiconductors
Lecture 39 - Basics of heterojunctions
Lecture 40 - Band diagram of heterojunctions
Lecture 41 - Heterojunctions (Continued....)
Lecture 42 - Heterojunction transistors
Lecture 43 - III-nitrides
Lecture 44 - Solar cell basics
Lecture 45 - Solar cell (Continued...)
Lecture 46 - Solar cell
Lecture 47 - Basics of photodetectors
Lecture 48 - Photodetectors
Lecture 49 - Junction photodetectors
Lecture 50 - Basics of recombination
Lecture 51 - Basics of LED
Lecture 52 - LED
Lecture 53 - Visible LED
Lecture 54 - Transistors for power electronics
Lecture 55 - Transistors for power electronics (Continued...) and for RF electronics
Lecture 56 - Transistors for RF (Continued...) and transistors for Memory
Lecture 57 - Basics of microelectronic fabrication
Lecture 58 - Microelectronic fabrication (Continued...)
Lecture 59 - Summary

NPTEL Video Course - Electrical Engineering - NOC:Advanced IOT Applications

Subject Co-ordinator - Prof. T V Prabhakar

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Overview of localization using IoT sensors
Lecture 2 - Outdoor localization without GPS - I
Lecture 3 - Outdoor localization without GPS - II
Lecture 4 - Outdoor localization using elevation - pressure mapping
Lecture 5 - Localization using IMU sensors - I
Lecture 6 - Localization using IMU sensors - II
Lecture 7 - Localization using IMU sensors - III
Lecture 8 - RFID based localization - I
Lecture 9 - RFID based localization - II
Lecture 10 - Simulation of simple algorithms for object detection
Lecture 11 - Building smart vehicle for collision avoidance
Lecture 12 - Basic computer vision algorithms - Part 1
Lecture 13 - Basic computer vision algorithms - Part 2
Lecture 14 - Code walkthrough of computer vision algorithm
Lecture 15 - Introduction to LiDAR
Lecture 16 - Range estimation and Obstacle avoidance
Lecture 17 - Introduction to vehicle platooning
Lecture 18 - Building blocks for autonomous vehicles - 1
Lecture 19 - Building blocks for autonomous vehicles - 2
Lecture 20 - On Board Diagnostics and protocols
Lecture 21 - Diagnostic services and fuel-injection ratio control unit
Lecture 22 - Real time event processing and Anomaly detection
Lecture 23 - OBD-II and stream processing demonstration
Lecture 24 - Speech recognition - Part 1
Lecture 25 - Speech recognition - Part 2
Lecture 26 - Speech recognition - Part 3
Lecture 27 - Speech recognition - Part 4
Lecture 28 - Device Security - Part 1
Lecture 29 - Device Security - Part 2

Lecture 30 - Device Security - Part 3
Lecture 31 - Need for air quality monitoring
Lecture 32 - Air quality
Lecture 33 - Introduction to air quality sensors
Lecture 34 - Calibration techniques for IoT air quality sensors
Lecture 35 - Sensor types
Lecture 36 - Air quality
Lecture 37 - Air quality
Lecture 38 - Air quality
Lecture 39 - Air quality
Lecture 40 - Introduction to First Responder networks
Lecture 41 - First Responders - Applications - Part 1
Lecture 42 - First Responders - Applications - Part 2
Lecture 43 - Cargo monitoring for tamper detection - Part 1
Lecture 44 - Cargo monitoring for tamper detection - Part 2

NPTEL Video Course - Electrical Engineering - NOC:Electronic Systems for Cancer Diagnosis

Subject Co-ordinator - Prof. Hardik Jeetendra Pandya

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Tissue and Cell Culture Techniques
Lecture 2 - Tissue and Cell Culture Techniques
Lecture 3 - Tissue and Cell Culture Techniques
Lecture 4 - Cleanroom Equipments
Lecture 5 - Cleanroom Equipments (Continued...)
Lecture 6 - Introduction to photolithography
Lecture 7 - Photolithography
Lecture 8 - Photolithography
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
Lecture 29 - Basic building blocks of Electronics System

Lecture 30 - Basic building blocks of Electronics System
Lecture 31 - Basic building blocks of Electronics System
Lecture 32 - Basic building blocks of Electronics System
Lecture 33 - Basic building blocks of Electronics System
Lecture 34 - Basic building blocks of Electronics System
Lecture 35 - Basic building blocks of Electronics System
Lecture 36 - Basic building blocks of Electronics System
Lecture 37 - Etching Process and Figure of Merits
Lecture 38 - ECG Signal Processing to calculate BPM
Lecture 39 - ECG Signal Processing to calculate BPM (Continued...)
Lecture 40 - ECG Signal Processing to calculate BPM (Continued...)
Lecture 41 - ECG Signal Processing to calculate BPM (Continued...)
Lecture 42 - ECG Signal Processing to calculate BPM (Continued...)
Lecture 43 - ECG Signal Processing to calculate BPM [Continued...)
Lecture 44 - MEMS based Force Sensor for Catheter Contact Force Measurement
Lecture 45 - 3D Printing
Lecture 46 - 3D Fabrication Techniques
Lecture 47 - Gowning Procedure in Clean Room
Lecture 48 - Introduction to Equipments
Lecture 49 - PDMS Moulding procedure
Lecture 50 - Introduction to Equipments
Lecture 51 - Introduction to Equipments
Lecture 52 - Micromanipulator
Lecture 53 - Biosafety Cabinet and Ultrasonicbath
Lecture 54 - Incubator Shaker
Lecture 55 - Hotplate and Microcentrifuge
Lecture 56 - Autoclave
Lecture 57 - Impedance Analyser
Lecture 58 - Rapid Prototyping using 3D Printer
Lecture 59 - Etching Process
Lecture 60 - Electronic System for Drug Screening
Lecture 61 - Introduction to Equipments
Lecture 62 - Introduction to Equipments
Lecture 63 - Electronic Module for Gas sensor
Lecture 64 - Fabrication process flow for a metal oxide gas sensor
Lecture 65 - MEMS Simulation using Comsol Multiphysics
Lecture 66 - Introduction to COMSOL Multiphysics
Lecture 67 - COMSOL Examples for MEMS Applications
Lecture 68 - COMSOL Examples for MEMS Applications (Continued...)

Lecture 69 - Demonstration of Thermal Acutator and Understanding of Application Builder
Lecture 70 - Closed loop control of temperature sensor
Lecture 71 - Experimental Set-up of closed loop control of temperature sensor

NPTEL Video Course - Electrical Engineering - NOC:Electronic Modules for Industrial Applications using Op-Amp

Subject Co-ordinator - Prof. Hardik Jeetendra Pandya

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction to Op-amp
Lecture 2 - Introduction Wafer Manufacturing Process and Clean room Protocols
Lecture 3 - Introduction to Fabrication Process Technology and Op-amp
Lecture 4 - Op-amp Characteristics and Datasheet Parameters
Lecture 5 - Overview of Active Filters and Oscillators
Lecture 6 - Overview of Op-amp Oscillators
Lecture 7 - Introduction to ECG Experiment
Lecture 8 - Design and Implementation of ECG Preprocessing Stage - Part 1
Lecture 9 - Design and Implementation of ECG Preprocessing Stage - Part 2
Lecture 10 - Design and Implementation of ECG Preprocessing Stage - Part 3
Lecture 11 - Design and Implementation of ECG Preprocessing Stage - Part 4
Lecture 12 - Design and Implementation of Peak Detector and Thresholding Circuit for ECG Signal Conditioning
Lecture 13 - Experiment
Lecture 14 - Application
Lecture 15 - Photolithography
Lecture 16 - Understanding the process of photolithography
Lecture 17 - Photolithography
Lecture 18 - Photolithography
Lecture 19 - Fabrication of Piezoresistive Sensor
Lecture 20 - Fabrication of MEMS based Catheter Contact Force Sensor
Lecture 21 - Design of Speed Control of DC Motor
Lecture 22 - Design of Speed Control of DC Motor
Lecture 23 - Design of Speed Control of DC Motor
Lecture 24 - Design of Speed Control of DC Motor
Lecture 25 - Design of Speed Control of DC Motor
Lecture 26 - Design of Speed Control of DC Motor
Lecture 27 - Design of Speed Control of DC Motor
Lecture 28 - Design of Speed Control of DC Motor
Lecture 29 - Design of Speed Control of a DC Motor using Op-amp

Lecture 30 - Design of Speed Control of a DC Motor using Op-amp
Lecture 31 - Design of Speed Control of a DC Motor using DAQ - Part 1
Lecture 32 - Design of Speed Control of a DC Motor using DAQ - Part 2
Lecture 33 - Design of Speed Control of a DC Motor using DAQ - Part 3
Lecture 34 - Introduction to Hot-Wire Anemometer
Lecture 35 - Signal-conditioning Circuit for Hot-Wire Anemometer
Lecture 36 - Signal-conditioning Circuit for Hot-Wire Anemometer Part 2
Lecture 37 - Signal-conditioning Circuit for Hot-Wire Anemometer
Lecture 38 - Signal-conditioning Circuit for Hot-Wire Anemometer
Lecture 39 - Introduction to Gas Sensors
Lecture 40 - Fabrication Process for Gas Sensor
Lecture 41 - Signalconditioning Circuit for Operating Heater Voltage of MQ-7 Gas Sensor - Part 1
Lecture 42 - Signalconditioning Circuit for Operating Heater Voltage of MQ-7 Gas Sensor - Part 2
Lecture 43 - Signalconditioning Circuit for Operating Heater Voltage of MQ-7 Gas Sensor - Part 3
Lecture 44 - Fundamentals of Electrophysiological signals
Lecture 45 - Fundamentals of EEG Signal
Lecture 46 - Application of EEG Signal for Detection of Hearing Loss
Lecture 47 - Closed loop control of temperature using DAQ and LabVIEW
Lecture 48 - Experimental Set-up of closed loop control of temperature sensor
Lecture 49 - Introduction to MEMS Simulation using Comsol Multiphysics
Lecture 50 - Introduction to COMSOL Multiphysics
Lecture 51 - COMSOL Examples for MEMS Applications
Lecture 52 - COMSOL Examples for MEMS Applications (Continued...)
Lecture 53 - Demonstration of Thermal Acutator and Understanding of Application Builder

NPTEL Video Course - Electrical Engineering - NOC:Sensors and Actuators

Subject Co-ordinator - Prof. Hardik Jeetendra Pandya

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Sensors - Part 1
Lecture 2 - Sensors - Part 2
Lecture 3 - Sensors - Part 3
Lecture 4 - Sensors - Part 4
Lecture 5 - Sensors - Part 5
Lecture 6 - Recent Microsensors based system
Lecture 7 - Recent Microsensors based system
Lecture 8 - Microfabrication Basics
Lecture 9 - Introduction to cleanroom
Lecture 10 - Cleanroom Protocols
Lecture 11 - Introduction to Cleanroom Equipments
Lecture 12 - Fabrication Process Flow of Microheater and Micromachining
Lecture 13 - Wafer Bonding and PDMS moulding
Lecture 14 - Overview of MEMS based sensors
Lecture 15 - Introduction to Cleanroom Equipments
Lecture 16 - Introduction to Cleanroom Equipments
Lecture 17 - Process Sensor Process Flow, Cell based Diagnosis Device
Lecture 18 - Basics of Patterning and Drug Screening Device
Lecture 19 - MEMS applications in automobile system
Lecture 20 - Arduino Interfacing for Sensors and Actuators
Lecture 21 - Demonstration of DC Motor as an actuator
Lecture 22 - Demonstration of peristaltic pump using Arduino
Lecture 23 - Demonstration of PDMS Patterning
Lecture 24 - Crystal Orientation and Si-SiO2 interface
Lecture 25 - Surface Profilometry and Physical Vapour Deposition Techniques
Lecture 26 - Introduction to COMSOL Multiphysics and Modelling Examples
Lecture 27 - Demonstration of Thermal Actuators using COMSOL
Lecture 28 - Demonstration of MQ3 Gas sensor using Arduino
Lecture 29 - Photolithography - Part 1

Lecture 30 - Signal Conditioning Circuit for Temperature Sensors
Lecture 31 - Demonstration of Microheaters in COMSOL Multiphysics
Lecture 32 - Introduction to Cleanroom facilities for biomedical applications
Lecture 33 - Physical Deposition Techniques
Lecture 34 - Demonstration on peristaltic pump in cleanroom
Lecture 35 - Installation of Oxygen Plasma System
Lecture 36 - Demonstration of IR Based Sensor using Arduino
Lecture 37 - Illustration of fabricated Microfluidic Device for biochips with PDMS moulding
Lecture 38 - Photolithography - Part 2
Lecture 39 - Photolithography - Part 3
Lecture 40 - Introduction and Demonstration of Shape Memory Alloy
Lecture 41 - Applications of Shape Memory Alloy as a light weight actuators
Lecture 42 - Discussion on Fabricated Sensor with Silicon as Substrate
Lecture 43 - Discussion and Microscopic Inspection of Fabricated Sensor with Silicon as a Substrate
Lecture 44 - Tissue Deparaffinization for Biosensors
Lecture 45 - Clean room guidelines and Cancer Dianostic tool
Lecture 46 - Basics of Pressure Sensor and Demonstration using Arduino Microcontroller
Lecture 47 - Basics of Stepper Motor and Demonstration using Arduino Microcontroller
Lecture 48 - Microscopic Inspection of Diced wafers and CNT Sensing Layer for fabricated sensor
Lecture 49 - Process flow for Microcantilever for Mechanical Phenotyping of breast cancer tissues
Lecture 50 - Applications of microcantilever for Mechanical Phenotyping of breast cancer tissues
Lecture 51 - Installation and Introduction to Physical Vapour Deposition System
Lecture 52 - Human Machine Interface for Controlling Deposition System
Lecture 53 - Flexible MEMS for phenotyping tissue properties - I
Lecture 54 - Flexible MEMS for phenotyping tissue properties - II
Lecture 55 - System Demonstration for Physical Vapor Deposition
Lecture 56 - Introduction to CAD Modelling - I
Lecture 57 - Introduction to CAD Modelling - II
Lecture 58 - Biosensors for ETM Phenotyping of breast cancer tissues for better prognosis
Lecture 59 - Biosensors for Electrothermal sensor
Lecture 60 - MEMS based sensor for catheter contact force measurement
Lecture 61 - Microfluidics based Drug Screening
Lecture 62 - Basic aspects of 3D Printing
Lecture 63 - 3D Printing Materials and Demonstration of Remote 3D Printing

NPTEL Video Course - Electrical Engineering - NOC:Neural Networks for Signal Processing-I

Subject Co-ordinator - Prof. Shayan Srinivasa Garani

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - The human brain
Lecture 2 - Introduction to Neural Networks
Lecture 3 - Models of a neuron
Lecture 4 - Feedback and network architectures
Lecture 5 - Knowledge representation
Lecture 6 - Prior information and invariances
Lecture 7 - Learning processes
Lecture 8 - Perceptron - 1
Lecture 9 - Perceptron - 2
Lecture 10 - Batch perceptron algorithm
Lecture 11 - Perceptron and Bayes classifier
Lecture 12 - Linear regression - 1
Lecture 13 - Linear regression - 2
Lecture 14 - Linear regression - 3
Lecture 15 - Logistic regression
Lecture 16 - Multi-layer perceptron - 1
Lecture 17 - Multi-layer perceptron - 2
Lecture 18 - Back propagation - 1
Lecture 19 - Back propagation - 2
Lecture 20 - XOR problem
Lecture 21 - Universal approximation function
Lecture 22 - Complexity Regularization and Cross validation
Lecture 23 - Convolutional Neural Networks (CNN)
Lecture 24 - Coverâ s Theorem
Lecture 25 - Multivariate interpolation problem
Lecture 26 - Radial basis functions (RBF)
Lecture 27 - Recursive least squares algorithm
Lecture 28 - Comparison of RBF with MLP
Lecture 29 - Kernel regression using RBFs

Lecture 30 - Kernel Functions
Lecture 31 - Basics of constrained optimization
Lecture 32 - Optimization with equality constraint
Lecture 33 - Optimization with inequality constraint
Lecture 34 - Support Vector Machines (SVM)
Lecture 35 - Optimal hyperplane for linearly separable patterns
Lecture 36 - Quadratic optimization for finding optimal hyperplane
Lecture 37 - Optimal hyperplane for non-linearly separable patterns
Lecture 38 - Inner product kernel and Mercerâ s theorem
Lecture 39 - Optimal design of an SVM
Lecture 40 - Îµ-insensitive loss function
Lecture 41 - XOR problem revisited using SVMs
Lecture 42 - Hilbert Space
Lecture 43 - Reproducing Kernel Hilbert Space
Lecture 44 - Representer Theorem
Lecture 45 - Generalized applicability of the representer theorem
Lecture 46 - Regularization Theory
Lecture 47 - Euler-Lagrange Equation
Lecture 48 - Regularization Networks
Lecture 49 - Generalized RBF networks
Lecture 50 - XOR problem revisited using RBF
Lecture 51 - Structural Risk Minimization
Lecture 52 - Bias-Variance Dilemma
Lecture 53 - Estimation of regularization parameters
Lecture 54 - Basics of L1 regularization
Lecture 55 - Grafting
Lecture 56 - Kernel PCA
Lecture 57 - Hebbian based maximum eigen filter - 1
Lecture 58 - Hebbian based maximum eigen filter - 2
Lecture 59 - Hebbian based maximum eigen filter - 3
Lecture 60 - VC dimension
Lecture 61 - Autoencoders
Lecture 62 - Denoising Autoencoders
Lecture 63 - Demo - Perceptron
Lecture 64 - Demo - Motivation for CNN
Lecture 65 - Back propagation in Convolutional Neural Network
Lecture 66 - Ethics in AI research and coverage summary

NPTEL Video Course - Electrical Engineering - NOC:Electronics Equipment Integration and Prototype Building

Subject Co-ordinator - Prof. N.V.Chalapathi Rao

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction to electronics products
Lecture 2 - Examples from real life
Lecture 3 - Common Simulation of flat prismatic parts
Lecture 4 - Common flat parts enclosures
Lecture 5 - Real life parts to scale on a graph
Lecture 6 - Early First steps
Lecture 7 - Top down, outside to internals
Lecture 8 - Using a print and fabrication video
Lecture 9 - Details of displays and keys
Lecture 10 - Improvement on marking and skill
Lecture 11 - Mass production in sheet metal
Lecture 12 - Prototyping of user interfaces for concepts
Lecture 13 - Stacking of equipment to make a system
Lecture 14 - Recapitualising a sub system
Lecture 15 - Off the shelf enclosures and making a user interface
Lecture 16 - Looking around for concepts and integration
Lecture 17 - Representation on paper
Lecture 18 - Example features of surfaces and solids
Lecture 19 - Simple and curved surfaces
Lecture 20 - Describing inclined surfaces
Lecture 21 - Basics of engineering Drawing
Lecture 22 - Introduction to sizing and fits
Lecture 23 - Practical mechanical assemblies
Lecture 24 - Analogous Mechanical - Electronics detailing
Lecture 25 - Solid modelling
Lecture 26 - Importance of dimensioning
Lecture 27 - Ease of editing redesign
Lecture 28 - Dimensioning of electronics components
Lecture 29 - 2D flat representation

Lecture 30 - Electronics to Mechanical interfacing
Lecture 31 - Complexity of 3D assemblies with wiring
Lecture 32 - Illustrative simple design
Lecture 33 - Practical detailing
Lecture 34 - Rendered on screen
Lecture 35 - Fastenings and hardware
Lecture 36 - Fastener representation, deatiling
Lecture 37 - Practical detailing.
Lecture 38 - Recapitulation, context of course
Lecture 39 - Low cost is the key

NPTEL Video Course - Electrical Engineering - NOC:Design and Simulation of Power Conversion using Open Source

Subject Co-ordinator - Prof. L. Umanand

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Getting started with NgSpice
Lecture 2 - Refractoring the .cir
Lecture 3 - Sub-circuits
Lecture 4 - gschem and netlist generation
Lecture 5 - Setting up for simulation with Octave
Lecture 6 - Getting started with equation based simulation
Lecture 7 - Resuming a simulation in Octave
Lecture 8 - PV cell model - review
Lecture 9 - PV cell characteristic - review
Lecture 10 - PV cell - symbol and subcircuit
Lecture 11 - Rectifier-capacitor filter - operation review
Lecture 12 - Rectifier-capacitor filter - NgSpice simulation
Lecture 13 - Rectifier-capacitor filter with non-idealities
Lecture 14 - 3 phase Rectifier-capacitor filter
Lecture 15 - Equation based simulation in Octave
Lecture 16 - Passive power factor improvement - review
Lecture 17 - Passive power factor circuit in NgSpice
Lecture 18 - Buck converter - review
Lecture 19 - Buck converter - NgSpice
Lecture 20 - Boost converter - review
Lecture 21 - Boost converter - NgSpice
Lecture 22 - Buck-boost converter - review
Lecture 23 - Buck-boost converter - NgSpice
Lecture 24 - Equation based simulation of converters
Lecture 25 - Forward Converter - review
Lecture 26 - Forward Converter simulation
Lecture 27 - Understanding Core flux reset
Lecture 28 - Core flux reset - simulation
Lecture 29 - Flyback converter - review

Lecture 30 - Flyback converter - simulation
Lecture 31 - Pushpull converter - review
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 Video Course - Electrical Engineering - NOC:Introductory Neuroscience and Neuro-Instrumentation

Subject Co-ordinator - Prof. Mahesh Jayachandra

Co-ordinating Institute - IISc - Bangalore

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

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
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
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
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
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
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
Lecture 47 - Wavelet Analysis with VEP (2)
Lecture 48 - Demonstration
Lecture 49 - Demonstration
Lecture 50 - Photoresist (SU-8) and soft lithography
Lecture 51 - Physical Vapour Deposition
Lecture 52 - Introduction to Epilepsy and Classification
Lecture 53 - Epileptogenisis
Lecture 54 - Demonstration
Lecture 55 - Demonstration
Lecture 56 - Demonstration
Lecture 57 - Demonstration
Lecture 58 - Physical Vapour Deposition
Lecture 59 - Physical Vapour Deposition
Lecture 60 - Recent Trends
Lecture 61 - Demonstration
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

NPTEL Video Course - Electrical Engineering - NOC:Information Theory

Subject Co-ordinator - Prof. Himanshu Tyagi

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - What is information?
Lecture 2 - How to model uncertainty?
Lecture 3 - Basic concepts of probability
Lecture 4 - Estimates of random variables
Lecture 5 - Limit theorems
Lecture 6 - Review
Lecture 7 - Source model
Lecture 8 - Motivating examples
Lecture 9 - A compression problem
Lecture 10 - Shannon entropy
Lecture 11 - Random hash
Lecture 12 - Review 2
Lecture 13 - Uncertainty and randomness
Lecture 14 - Total variation distance
Lecture 15 - Generating almost random bits
Lecture 16 - Generating samples from a distribution using uniform randomness
Lecture 17 - Typical sets and entropy
Lecture 18 - Review 3
Lecture 19 - Hypothesis testing and estimation
Lecture 20 - Examples
Lecture 21 - The log-likelihood ratio test
Lecture 22 - Kullback-Leibler divergence and Stein's lemma
Lecture 23 - Properties of KL divergence
Lecture 24 - Review 4
Lecture 25 - Information per coin-toss
Lecture 26 - Multiple hypothesis testing
Lecture 27 - Error analysis of multiple hypothesis testing
Lecture 28 - Mutual information
Lecture 29 - Fano's inequality

Lecture 30 - Measures of information
Lecture 31 - Chain rules
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
Lecture 57 - Compression of databases
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
Lecture 65 - Additive Gaussian Noise channel
Lecture 66 - Mutual information and differential entropy
Lecture 67 - Channel coding theorem for Gaussan channel
Lecture 68 - Parallel channels and water-filling

NPTEL Video Course - Electrical Engineering - NOC:Photonic Integrated Circuit

Subject Co-ordinator - Prof. Shankar Kumar Selvaraja

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Photonic integrated circuits course introduction
Lecture 2 - Wave optics review
Lecture 3 - Electromagnetic theory review - 1
Lecture 4 - Electromagnetic theory review - 2
Lecture 5 - Photonic integrated circuits: an introduction
Lecture 6 - Photonic integrated circuits evolution
Lecture 7 - Photonic integrated circuit components - 1
Lecture 8 - Photonic integrated circuit components - 2
Lecture 9 - Dispersion
Lecture 10 - Phase velocity and Group velocity
Lecture 11 - Anisotropic medium and reciprocity
Lecture 12 - Polarisation in anisotropic medium
Lecture 13 - Optical axes
Lecture 14 - Waveguide structure
Lecture 15 - Waveguide modes - 1
Lecture 16 - Waveguide modes - 2
Lecture 17 - Field Equation
Lecture 18 - Guided modes in symmetric slab waveguides
Lecture 19 - Waveguide design - Boundary value formulation
Lecture 20 - Waveguide design - BVP solution
Lecture 21 - Waveguide design - Perturbation approach
Lecture 22 - Waveguide design - Effective Index method
Lecture 23 - Coupled mode theory - 1
Lecture 24 - Coupled mode theory - 2
Lecture 25 - Two-mode coupling
Lecture 26 - Co and counter propagating mode coupling
Lecture 27 - Phase matching
Lecture 28 - Directional coupler
Lecture 29 - Y-splitter

Lecture 30 - Multi-Mode Interference coupler
Lecture 31 - MZI
Lecture 32 - Micro-Ring Resonators
Lecture 33 - Light-chip coupling
Lecture 34 - End-fire coupling
Lecture 35 - Light Modulator introduction
Lecture 36 - Electro-Optic effect
Lecture 37 - Waveguide modulator
Lecture 38 - Optical transition in semiconductors
Lecture 39 - Transition rates
Lecture 40 - Absorption and gain in semiconductors
Lecture 41 - Semiconductor Light Emitting Diodes
Lecture 42 - Semiconductor Light Emitting Diodes (Continued...)
Lecture 43 - Semiconductor Lasers
Lecture 44 - Semiconductor photodetector
Lecture 45 - Semiconductor photodetector noise
Lecture 46 - Fabrication process - 1
Lecture 47 - Fabrication process - 2
Lecture 48 - PIC technology - Building a simple circuit
Lecture 49 - PIC for communication
Lecture 50 - PIC for sensing - 1
Lecture 51 - PIC for sensing - 2

NPTEL Video Course - Electrical Engineering - NOC:Design for Internet of Things (2021)

Subject Co-ordinator - Prof. T V Prabhakar

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction and Definition of IoT
Lecture 2 - Location, Applications, and Power
Lecture 3 - Challenges - Part 1
Lecture 4 - Challenges - Part 2
Lecture 5 - Challenges - Part 3
Lecture 6 - Challenges - Part 4
Lecture 7 - Unique ID
Lecture 8 - Introduction to RFID
Lecture 9 - RFID DEMO
Lecture 10 - RFID Theory - 1
Lecture 11 - RFID Theory - 2
Lecture 12 - RFID Theory - 3
Lecture 13 - Energy harvesting - 1
Lecture 14 - Energy harvesting - 2
Lecture 15 - Energy harvesting - 3
Lecture 16 - Power management systems - 1
Lecture 17 - Power management systems - 2
Lecture 18 - Battery life calculation
Lecture 19 - Introduction to System Design for low power
Lecture 20 - LDO - 1
Lecture 21 - LDO - 2
Lecture 22 - LDO - 3
Lecture 23 - Buck converter - 1
Lecture 24 - Buck converter - 2
Lecture 25 - Lab experiment
Lecture 26 - Introduction to Sensors and Actuators
Lecture 27 - Sensors
Lecture 28 - Actuators
Lecture 29 - Case study on Sensing and Actuation

Lecture 30 - Introduction to low power software
Lecture 31 - ADC driver design and development
Lecture 32 - Power optimization
Lecture 33 - Introduction to protocols
Lecture 34 - MQTT - 1
Lecture 35 - MQTT - 2
Lecture 36 - COAP - 1
Lecture 37 - COAP - 2
Lecture 38 - Websockets
Lecture 39 - Introduction to low power wireless - 1
Lecture 40 - Introduction to low power wireless - 2
Lecture 41 - Bluetooth low energy (BLE) - 1
Lecture 42 - Bluetooth low energy (BLE) - 2
Lecture 43 - IEEE 802.15.4e - 1
Lecture 44 - IEEE 802.15.4e - 2
Lecture 45 - IEEE 802.15.4e - 3
Lecture 46 - Wi-Fi
Lecture 47 - Introduction to Wide area technologies
Lecture 48 - LoRa - 1
Lecture 49 - LoRa - 2
Lecture 50 - NBIoT, LTEM1
Lecture 51 - BLE mesh technology
Lecture 52 - Course conclusion

NPTEL Video Course - Electrical Engineering - NOC:Mathematical Aspects of Biomedical Electronic System Design

Subject Co-ordinator - Prof. Chandramani Singh

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction to Signals and Systems
Lecture 2 - MATLAB Demo on Signal Types and Moving Average System
Lecture 3 - Microfabrication Basics for Biomedical Systems
Lecture 4 - Fluid Flow in Body Lumen
Lecture 5 - Fourier Series
Lecture 6 - Continuous Time Fourier Transform
Lecture 7 - Biological Tissues as disordered systems
Lecture 8 - Introduction to electrical equivalent circuit models for biological systems
Lecture 9 - Discrete Time Fourier Transform and Sampling
Lecture 10 - Percolation Theory and applications in biological tissues
Lecture 11 - Electrical properties of cells and tissues revisited: Examples and Applications
Lecture 12 - Linear Algebra - I
Lecture 13 - MATLAB Live Demo on Moving average and signal acquisition
Lecture 14 - Oxidation and Thickness Characterization
Lecture 15 - Basics of Photolithography with Process flow examples
Lecture 16 - Linear Algebra - II
Lecture 17 - Introduction to Biomedical Optics
Lecture 18 - Optical Properties of Tissues and Mathematical modelling
Lecture 19 - System of Linear Equations
Lecture 20 - Scaling Laws
Lecture 21 - Thermal Properties of a tissue
Lecture 22 - Introduction to Probability
Lecture 23 - Tissue Electrode Interface
Lecture 24 - Thermal Properties of a tissue and cells
Lecture 25 - Probability: Random Variables and CDF
Lecture 26 - Basics of Silicon, Silicon Dioxide for Microfabrication Process
Lecture 27 - Mechanical Properties of human brain tissues and modelling
Lecture 28 - Probability: Important measures and generating functions
Lecture 29 - Near Infrared Spectroscopy and Ultrasound Techniques

Lecture 30 - Thermal Properties of Tissues and Modelling
Lecture 31 - Multisim Simulations for Biomedical Signal Conditioning Circuit
Lecture 32 - Cleanroom Entry Demonstration
Lecture 33 - Spin Coating Demonstration
Lecture 34 - Common Random Variables
Lecture 35 - Introduction to signal Conditioning circuits for biomedical devices
Lecture 36 - Siganl Conditioning circuits units and design
Lecture 37 - E Beam Evaporation System Demonstration
Lecture 38 - Joint and Marginal Probability Distribution
Lecture 39 - Temprature Sensor Interfacing Analysis
Lecture 40 - Demo of Temprature data acqusitio system using LabVIEW
Lecture 41 - Recent Trends in Biomedical Electronic System Design
Lecture 42 - Aspects of Biomedical Electronics System Design

NPTEL Video Course - Electrical Engineering - NOC:Concentration Inequalities

Subject Co-ordinator - Prof. Himanshu Tyagi

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Why study concentration inequalities?
Lecture 2 - Chernoff bound
Lecture 3 - Examples of Chernoff bound for common distributions
Lecture 4 - Hoeffding and Bernstein inequalities
Lecture 5 - Azuma and McDiarmid inequalities
Lecture 6 - Bounding variance using the Efron-Stein inequality
Lecture 7 - The Gaussian-Poincare inequality
Lecture 8 - Tail bounds using the Efron-Stein inequality
Lecture 9 - Herbst's argument and the entropy method
Lecture 10 - Log-Sobolev inequalities
Lecture 11 - Binary and Gaussian Log-Sobolev inequalities and concentration
Lecture 12 - Variational formulae forKullback-Leibler and Bregman Divergence
Lecture 13 - A modified log-Sobolev inequality and concentration
Lecture 14 - Introduction to the transportation method for showing concentration bounds
Lecture 15 - Transportation lemma and a proof of McDiarmid's inequality using the transportation method
Lecture 16 - Concentration bounds for functions beyond bounded difference using transportation method
Lecture 17 - Marton's conditional transportation cost inequality
Lecture 18 - Isoperimetry and concentration of measure
Lecture 19 - Isoperimetry and bounded difference
Lecture 20 - Equivalence of Stam's inequality and log Sobolev inequality
Lecture 21 - An information theoretic proof of log Sobolev inequality
Lecture 22 - Hypercontractivity and strong data processing inequality for RÃ©nyi divergence
Lecture 23 - An information theoretic characterization of hypercontractivity
Lecture 24 - Equivalence of Gaussian hypercontractivity and Gaussian log Sobolev inequality
Lecture 25 - Uniform deviation bounds for random walks and the law of the iterated logarithm
Lecture 26 - Self normalized concentration inequalities and application to online regression

NPTEL Video Course - Electrical Engineering - NOC:Real-Time Digital Signal Processing

Subject Co-ordinator - Prof. Rathna G N

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction
Lecture 2 - Basics of Signal Processing
Lecture 3 - Lab - CCS
Lecture 4 - Number System
Lecture 5 - Architecture - 1
Lecture 6 - Architecture - 2
Lecture 7 - Real-time Constraints
Lecture 8 - FIR - Filters
Lecture 9 - Pipelining and Parallel Processing for Low Power Applications - I
Lecture 10 - Pipelining and Parallel Processing for Low Power Applications - II
Lecture 11 - Lab: Sine Generation
Lecture 12 - IIR Filters - 1
Lecture 13 - IIR Filters - 2
Lecture 14 - Lab: Sine Generatioon, FIR and IIR
Lecture 15 - Lab 3 IIR Filter as Resonator
Lecture 16 - Lab 4 Use of FDA tool box to generate co-efficients
Lecture 17 - Lab: Real-Time Audio Output through Sine Generation
Lecture 18 - IIR Filters 4
Lecture 19 - Lab: FIR Filter in generation of music
Lecture 20 - Lab: Real-Time Audio Output through FIR Filter
Lecture 21 - DFT, DTFT, twiddle factors, properties, circular convolution and examples
Lecture 22 - Complexity of Filtering and the FFT
Lecture 23 - Lab: Filtering Using FFT
Lecture 24 - Lab: FFT in CCS
Lecture 25 - FFT - 1
Lecture 26 - FFT - 2
Lecture 27 - FFT - 3
Lecture 28 - Overlap - Add
Lecture 29 - Overlap Save Method

Lecture 30 - Lab: Overlap Add and Save Method using MATLAB
Lecture 31 - Correlation
Lecture 32 - Lab: Different ways of implementing FFT in CCS
Lecture 33 - Adaptive Filter
Lecture 34 - Lab: LMS Algorith in MATLAB
Lecture 35 - LMS Algorithm
Lecture 36 - Lab: Error surface and error contour
Lecture 37 - Adaptive Filter Applications
Lecture 38 - Lab: Application of adaptive filter in MATLAB
Lecture 39 - Adaptive Echo Cancellation
Lecture 40 - Lab: Application of adaptive filter in CCS, Echo, scrambling and graphic equilizer in MATLAB
Lecture 41 - Graphic Equalizer
Lecture 42 - Lab: Adaptive filters (MATLAB)
Lecture 43 - Speech Coding - I
Lecture 44 - Speech Coding - II
Lecture 45 - Speech Coding - III
Lecture 46 - Lab: LPC for speech synthesis
Lecture 47 - Discrete Cosine Transform - 1
Lecture 48 - Discrete Cosine Transform - 2
Lecture 49 - Discrete Cosine Transform - 3
Lecture 50 - Discrete Cosine Transform - 4
Lecture 51 - Lab: Adaptive filters (CCS) - 1
Lecture 52 - Lab: Adaptive filters (CCS) - 2
Lecture 53 - Lab: Discrete Cosine Transformation
Lecture 54 - Lab: Echogeneration
Lecture 55 - Lab: Using JiDSP
Lecture 56 - Summary

NPTEL Video Course - Electrical Engineering - NOC:Advanced Neural Science for Engineers

Subject Co-ordinator - Prof. Vikas V

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction to Biomedical Research
Lecture 2 - Fabricated Biosensors and Systems
Lecture 3 - Lab 1 - Introduction to the Fabrication lab
Lecture 4 - Lab 2 - Cleanroom and Gowning Protocol
Lecture 5 - Developed Systems at a glance
Lecture 6 - Silicon and Silicon Dioxide
Lecture 7 - Piranha Cleaning of Silicon Wafer
Lecture 8 - Polyimide Coating on Silicon Wafer
Lecture 9 - Thermal Oxidation of Silicon and Thickness measurement
Lecture 10 - Fundamental of Physical Vapour Deposition
Lecture 11 - Lab 3 - Lithography: Demonstration
Lecture 12 - Sputtering
Lecture 13 - Basics of Photolithography
Lecture 14 - Lab 4 - E-Beam Evaporation: Demo
Lecture 15 - Photolithography - II
Lecture 16 - Photolithography - III
Lecture 17 - Lab 5 - E-Beam Evaporation: Demo - II
Lecture 18 - Lab 6 - Liftoff Demonstration
Lecture 19 - Lithography Optics - I
Lecture 20 - Soft Lithography - I
Lecture 21 - Soft Lithography - II
Lecture 22 - Lab 7 - Sputtering Demonstration - I
Lecture 23 - Lab 8 - Sputtering Demonstration - II
Lecture 24 - Thin Film Deposition: CVD - I
Lecture 25 - Thin Film Deposition: CVD - II
Lecture 26 - Lithography Optics - II
Lecture 27 - Role of Fabrication in Neural Engineering
Lecture 28 - Micromachining
Lecture 29 - Overview of Experimental Neurophysiology

Lecture 30 - Fabrication of Neural Implants
Lecture 31 - Introduction to Packaging for Neural Systems
Lecture 32 - Lab 9 - 3D Printing for neural devices
Lecture 33 - Introduction to Biopotentials
Lecture 34 - EEG: Introduction, Demonstration and Applications
Lecture 35 - Neural Implants: Fabrication and Characterization
Lecture 36 - Design of Wireless Biphasic Pulse Generator
Lecture 37 - Basics of EEG/ERP Experimental Desing
Lecture 38 - Micromachining and Etching
Lecture 39 - Epileptic Seizure Detection and Classification
Lecture 40 - Newborn Hearing Screening - I
Lecture 41 - Newborn Hearing Screening - II
Lecture 42 - Applications of EEG/ERP Experimental Design
Lecture 43 - Flexible MEA for Electrocorticography Signal Acquisition
Lecture 44 - Flexible biodegradable MEAs
Lecture 45 - Microneedle Electrode Array
Lecture 46 - Neurosurgery-based MEA Implantation - I
Lecture 47 - Neurosurgery-based MEA Implantation - II
Lecture 48 - Neurosurgery-based MEA Implantation - III
Lecture 49 - Neurosurgery-based MEA Implantation - IV
Lecture 50 - Deep Brain Stimulation/Recording for Parkinson's - I
Lecture 51 - Deep Brain Stimulation/Recording for Parkinson's - II
Lecture 52 - Computational Neuroscience Fundamentals
Lecture 53 - Mathematical Analysis in Neural Science
Lecture 54 - Neuroanatomy for Neural Engineering

NPTEL Video Course - Electrical Engineering - NOC:Design of Electric Motors

Subject Co-ordinator - Dr. Prathap Reddy

Co-ordinating Institute - IISc - Bangalore

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

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
Lecture 32 - Analysis of Copper Function and Output Function w r t the Electric Machine D3L Product Eqn
Lecture 33 - Example Problems on Output Power Equation in terms of D3L Product
Lecture 34 - Electric Machine Sizing Equations-Output Power Equation in terms of D the power 2.5 L Product
Lecture 35 - Design Procedure of an Electric Machine
Lecture 36 - Name Plate Details and Datasheets of Induction Motor
Lecture 37 - Design of Induction Machine- Stator Design - 1 (Stator Core design)
Lecture 38 - Design of Induction Machine- Stator Design - 2 (Stator Winding Design)
Lecture 39 - Design of Induction Machine- Stator Design - 3 (Stator Slot Geometry)
Lecture 40 - Design of Induction Machine- Rotor Design - 1 (Rotor Slots Selection)
Lecture 41 - Design of Induction Machine- Rotor Design - 2 (Rotor MMF and Bar Currents)
Lecture 42 - Design of Induction Machine- Rotor Design - 3 (Rotor Slot Geometry)
Lecture 43 - Design of Induction Machine- Rotor Design - 4 (Skewing of Rotor)
Lecture 44 - Design of Induction Machine- Rotor Design - 4 (Resistance of Rotor Winding)
Lecture 45 - Carter's Coefficient of Electrical Machines
Lecture 46 - Effective Length Equations of the Machine Core with Different Stator and Rotor Lengths
Lecture 47 - Stator MMF and Magnetizing Current Equations of Induction Machine
Lecture 48 - Magnetizing Inductance of Induction Machine
Lecture 49 - Stator and Rotor Leakage Inductances of Induction Machine
Lecture 50 - Equivalent Circuit Parameters of Induction Machine
Lecture 51 - Loss Calculation of Induction Machine - 1
Lecture 52 - Loss Calculation of Induction Machine - 2 and Performance Parameters of Induction Motor
Lecture 53 - Switched Reluctance Machine Sizing Equations-Output Power and Volume (D2L) Product Equation
Lecture 54 - The Figure of Merits for SRM and Example Problem on Output Power Equation i t f D2L Product
Lecture 55 - Design of Switched Reluctance Machine: Stator Design - 1
Lecture 56 - Design of Switched Reluctance Machine: Stator Design - 2 and Rotor Design
Lecture 57 - Procedure for Calculation of SRM Inductance: Aligned Inductance - 1
Lecture 58 - Calculation of SRM Inductance: Aligned Inductance - 2
Lecture 59 - Efficiency and Loss Calculation of SRM
Lecture 60 - Importance of Thermal Design and Thermal Limits for Electrical Machines
Lecture 61 - Electric and Thermal Circuits Interface
Lecture 62 - Heat Transfer Methods and Basic Equations for Thermal Resistance
Lecture 63 - Heat Flow in Electrical Machines
Lecture 64 - Cooling Methods and Standards for Electrical Machines
Lecture 65 - Basics of Thermal Equivalent Circuits
Lecture 66 - Thermal Equivalent Circuit - 1
Lecture 67 - Thermal Equivalent Circuit - 2

NPTEL Video Course - Electrical Engineering - NOC:Basics of Semiconductor Microwave Devices

Subject Co-ordinator - Prof Digbijoy N Nath

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - An Introduction to the course and outline of the course
Lecture 2 - Historical overview of the development of microwave devices
Lecture 3 - Applications of semiconductor microwave devices
Lecture 4 - Applications of semiconductor microwave devices (Continued...)
Lecture 5 - Heterojunction device physics
Lecture 6 - Heterojunction device physics (Continued...) and III-nitrides
Lecture 7 - III-nitrides and polarization
Lecture 8 - III-nitride high electron mobility transistors
Lecture 9 - Varactors and Schottky multipliers
Lecture 10 - Varactors and Schottky multipliers (Continued...)
Lecture 11 - Diodes for microwave applications
Lecture 12 - IMPATT diode
Lecture 13 - Tunnel diodes and Introduction to Gunn diodes
Lecture 14 - Gunn diode and its modes
Lecture 15 - Introduction to MESFETs
Lecture 16 - Advanced concepts of GaAs MESFETs
Lecture 17 - GaAs MESFET fabrication and practical aspects
Lecture 18 - Practical aspects of FET design and small-signal model
Lecture 19 - GaAs MESFETs: cut-off frequency and aspects of power devices
Lecture 20 - GaAs MESFETs for power amplifiers
Lecture 21 - Modulation doping in compound semiconductors
Lecture 22 - Band diagram of MODFETs/HEMTs
Lecture 23 - Design issues and methodology for microwave HEMTs
Lecture 24 - Small-signal model and noise in HEMTs
Lecture 25 - The concept of pseudomorphic or pHEMTs
Lecture 26 - Multi-finger HEMTs
Lecture 27 - pHEMTs for low noise and introduction to InP HEMT
Lecture 28 - InP HEMTs for power and the concept of metamorphic HEMTs
Lecture 29 - AlGaN/GaN HEMT: applications, structure, substrates and FOM

Lecture 30 - AlGaN/GaN HEMT: device basics, current collapse and passivation
Lecture 31 - AlGaN/GaN HEMT: gate process, field-plate and trade-offs in design
Lecture 32 - AlGaN/GaN HEMT: Practical aspects and commercial HEMTs
Lecture 33 - GaN RF HEMT on eval board, and emerging topics of research
Lecture 34 - Linearity in GaN HEMTs - A device perspective
Lecture 35 - Nanoscale MOSFETs and short channel effects
Lecture 36 - Parasitic resistances and capacitances in nanoscale MOSFETs
Lecture 37 - RF MOSFET Layout and RF Silicon-on-insulator
Lecture 38 - Noise in MOSFETs and Introduction to LDMOS
Lecture 39 - Working of LDMOS and VDMOS
Lecture 40 - LDMOS: Parasitics, and the concept of RESURF
Lecture 41 - LDMOS: HCI, snapback, finger layout and some aspects of commercial devices
Lecture 42 - BJT: common base and common emitter from the device point of view
Lecture 43 - BJT: Kirk effect, Ebers-Moll model and base transit time
Lecture 44 - BJT: small-signal model, gain and cut-off frequency
Lecture 45 - BJT: Emitter and base designs and drift transistor
Lecture 46 - Collector design in modern BJT and Introduction to HBTs
Lecture 47 - HBT: base current and collapse of the current gain
Lecture 48 - High-frequency HBT and Introduction to SiGe HBT
Lecture 49 - SiGe HBT: various resistances and capacitances, scaling and aspects of BiCMOS
Lecture 50 - Basics of microwave: transmission line theory
Lecture 51 - Waveguides, T-lines and introduction to 2-port networks
Lecture 52 - S-parameters and the basics of Smith Chart
Lecture 53 - Smith chart and matching
Lecture 54 - Impedance matching using Smith Chart and stub line
Lecture 55 - Passives in microwave circuits
Lecture 56 - Inductors in microwave circuits
Lecture 57 - More on passive elements in microwave circuits
Lecture 58 - On-wafer measurement and S-parameters
Lecture 59 - On-wafer de-embedding
Lecture 60 - On-wafer and fixture-based measurements and calibration
Lecture 61 - More on fixtures and basic transistor concepts for power amplifiers