NPTEL : Nonlinear Dynamical Systems (Electrical Engineering)

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

NPTEL : Power System Dynamics and Control (Electrical Engineering)

Co-ordinators : Dr. A.M. Kulkarni

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

Co-ordinators : Prof. S.D. Agashe

NPTEL : Power Electronics (Electrical Engineering)

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

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

Co-ordinators : Prof. A.N. Chandorkar

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

Co-ordinators : Prof.Krish Sankaran

NPTEL : NOC:Basic Electronics (Electrical Engineering)

Co-ordinators : Prof. Mahesh B. Patil

NPTEL : NOC:Antennas (Electrical Engineering)

Co-ordinators : Prof. Girish Kumar

Lecture 1 - Antenna Introduction - I

Lecture 2 - Antenna Introduction - II

Lecture 3 - Antenna Introduction - III

Lecture 4 - Antenna Fundamentals - I

Lecture 5 - Antenna Fundamentals - II

Lecture 6 - Antenna Radiation Hazards - I

Lecture 7 - Antenna Radiation Hazards - II

Lecture 8 - Dipole Antennas - I

Lecture 9 - Dipole Antennas - II

Lecture 10 - Dipole Antennas - III

Lecture 11 - Monopole Antennas - I

Lecture 12 - Monopole Antennas - II

Lecture 13 - Loop Antennas

Lecture 14 - Slot Antennas

Lecture 15 - Linear Arrays - I

Lecture 16 - Linear Arrays - II

Lecture 17 - Linear Arrays - III

Lecture 18 - Planar Arrays

Lecture 19 - Microstrip Antennas (MSA)

Lecture 20 - Rectangular MSA

Lecture 21 - MSA Parametric Analysis - I

Lecture 22 - MSA Parametric Analysis - II

Lecture 23 - Circular MSA

Lecture 24 - Broadband MSA - I

Lecture 25 - Broadband MSA - II

Lecture 26 - Broadband MSA - III

Lecture 27 - Broadband MSA - IV

Lecture 28 - Broadband MSA - V

Lecture 29 - Compact MSA - I

Lecture 30 - Compact MSA - II

Lecture 31 - Compact MSA - III

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

Co-ordinators : Prof. V.M. Gadre

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

Co-ordinators : Prof. Jayanta Mukherjee

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

Co-ordinators : Prof. Girish Kumar

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

Co-ordinators : Prof. S.N. Merchant

Lecture 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: Hamming Codes

Lecture 65 - Channel Coding: Decoding using Standard Arrays

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

Co-ordinators : Prof. Vivek Agarwal

Lecture 98 - Simulation of sinusoidal PWM

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

Co-ordinators : Prof. Shrikrishna V. Kulkarni

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

Co-ordinators : Prof. V. M. Gadre

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

Co-ordinators : Prof. Ankur A. Kulkarni

Lecture 65 - Communication Theory - V

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

Co-ordinators : Prof. Dwaipayan Mukherjee

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

Co-ordinators : Prof. Kumar Appaiah

NPTEL : NOC:Network Security (Electrical Engineering)

Co-ordinators : Prof. Gaurav S. Kasbekar

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

Co-ordinators : Prof. Debasattam Pal

NPTEL : Circuit Theory (Electrical Engineering)

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

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

Co-ordinators : Prof. M. Gopal

NPTEL : Embedded Systems (Electrical Engineering)

Co-ordinators : Prof. Santanu Chaudhary

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

Co-ordinators : Prof. D.P. Kothari

NPTEL : Power System Dynamics (Electrical Engineering)

Co-ordinators : Dr. M.L. Kothari

NPTEL : Analog Electronic Circuits (Electrical Engineering)

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

NPTEL : Digital Communication (Electrical Engineering)

Co-ordinators : Prof. Surendra Prasad

NPTEL : Introduction To Electronic Circuits (Electrical Engineering)

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

NPTEL : NOC:Analog Electronic Circuit (Electrical Engineering)

Co-ordinators : Dr. Shouribrata Chatterjee

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

Co-ordinators : Prof. Shubhendu Bhasin

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

Co-ordinators : Prof. Ranjan Bose

NPTEL : Engineering Electromagnetics (Electrical Engineering)

Co-ordinators : Prof. Sheel Aditya

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

Co-ordinators : Prof. Abhishek Dixit

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

Co-ordinators : Prof. Amit Jain

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 : NOC:Power Electronics (Electrical Engineering)

Co-ordinators : Prof. G.Bhuvaneshwari

NPTEL : NOC:Electrical Machines (Electrical Engineering)

Co-ordinators : Prof. G.Bhuvaneshwari

NPTEL : Special Electromechanical Systems (Electrical Engineering)

Co-ordinators : Prof. S.S. Murthy

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

Co-ordinators : Prof. Anand Rup

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

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

NPTEL : NOC:Power Quality (Electrical Engineering)

Co-ordinators : Prof. Bhim Singh

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

Co-ordinators : Prof. Bhim Singh

NPTEL : NOC:Transducers for Instrumentation (Electrical Engineering)

Co-ordinators : Ankur Gupta

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

Co-ordinators : Prof. Bhim Singh

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

Co-ordinators : Prof. Ankur Gupta

NPTEL : NOC:Advance Power Electronics (Electrical Engineering)

Co-ordinators : Prof. Bhim Singh

NPTEL : Advanced Control Systems (Electrical Engineering)

Co-ordinators : Prof. S. Majhi

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

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

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

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

Co-ordinators : Prof. Prabin K Bora

NPTEL : NOC:Microwave Engineering (Electrical Engineering)

Co-ordinators : Dr. Ratnajit Bhattacharjee

NPTEL : NOC:Microprocessors and Interfacing (Electrical Engineering)

Co-ordinators : Prof. Shaik Rafi Ahamed

NPTEL : NOC:Statistical Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Prabin Kumar Bora

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

Co-ordinators : Prof. M. K. Bhuyan

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

Co-ordinators : Prof. Shaik Rafi Ahamed

NPTEL : NOC:Usability Engineering (Electrical Engineering)

Co-ordinators : Prof. Debayan Dhar

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

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

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

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

Co-ordinators : Dr. Ribhu

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

Co-ordinators : Prof. M.K. Bhuyan

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

Co-ordinators : Prof. Shaik Rafi Ahamed

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

Co-ordinators : Prof. Debabrata Sikdar

NPTEL : Advanced Electric Drives (Electrical Engineering)

Co-ordinators : Dr. S.P. Das

NPTEL : High Voltage DC Transmission (Electrical Engineering)

Co-ordinators : Dr. S.N. Singh

NPTEL : Intelligent Systems and Control (Electrical Engineering)

Co-ordinators : Prof. Laxmidhar Behera

Lecture 32 - Linear controllers using T-S fuzzy model

NPTEL : Power Systems Operation and Control (Electrical Engineering)

Co-ordinators : Dr. S.N. Singh

NPTEL : NOC:Electromagnetic theory (Electrical Engineering)

Co-ordinators : Dr. Pradeep Kumar K

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

Co-ordinators : Prof. Aditya K. Jagannatham

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

Co-ordinators : Dr. Adrish Banerjee

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

Co-ordinators : Prof. Aditya K. Jagannatham

NPTEL : NOC:Applied Engineering Electromagnetics (Electrical Engineering)

Co-ordinators : Dr. Pradeep Kumar K

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

Co-ordinators : Prof. Aditya K. Jagannatham

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

Co-ordinators : Prof. Aditya K. Jagannatham

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

Lecture 33 - Examples on Convex Functions

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

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

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

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

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

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

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

Lecture 41 - Linear modeling and Approximation Problems: Least Squares

Lecture 42 - Geometric Intuition for Least Squares

Lecture 43 - Practical Application: Multi antenna channel estimation

Lecture 44 - Practical Application:Image deblurring

Lecture 45 - Least Norm Signal Estimation

Lecture 46 - Regularization: Least Squares + Least Norm

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

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

Lecture 49 - Stochastic Linear Program,Gaussian Uncertainty

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

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

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

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

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

Lecture 55 - Practical Application: Compressive Sensing

Lecture 56 - Practical Application

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

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

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

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

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

Lecture 62 - Practical Application: Approximate Classifier Design

Lecture 63 - Concept of Duality

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

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

Co-ordinators : Dr. Pradeep Kumar K

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: Transfer function approach

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

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

Co-ordinators : Dr. Pradeep Kumar K

NPTEL : NOC:Basic Electric Circuits (Electrical Engineering)

Co-ordinators : Prof. Ankush Sharma

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

Co-ordinators : Prof. Shyama Prasad Das

Lecture 29 - Closed-loop operation of slip ring induction motor with static rotor resistance control, Slip power recovery in slip ring induction motor - Static Kramer drive

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 synchronous motor, Speed-torque characteristics of cylindrical synchronous motor

Lecture 32 - Phasor diagram of salient pole synchronous motor, Expression of power and torque for a salient pole synchronous motor, Synchronous reluctance motor, Open-loop V/f control of synchronous motor

Lecture 33 - Open-loop V/f control, Torque-speed characteristics, Self controlled synchronous motor drive employing load commutated thyristor inverter

Lecture 34 - Detailed analysis of commutation of load commutated thyrisor inverter, Derivation of overlap angle and margin angle, Closed-loop speed control scheme for load commutated inverter-fed synchronous motor drive

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 trapezoidal BLDC motor, Introduction to switched reluctance motor

Lecture 37 - Construction and operating principle of switched reluctance motor

Lecture 38 - Current/ voltage control for switched reluctance motor, operating modes of switched reluctance motor, Introduction to traction drives

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 and drive rating

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

Co-ordinators : Prof. Nishchal K Verma

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

Co-ordinators : Prof. Yatindra N Singh

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

Co-ordinators : Prof. Aditya K. Jagannatham

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

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

NPTEL : NOC:Digital Switching (Electrical Engineering)

Co-ordinators : Prof. Yatindra N Singh

NPTEL : NOC:Analog VLSI Design (Electrical Engineering)

Co-ordinators : Prof. Imon Mondal

Lecture 65

NPTEL : Electrical Machines I (Electrical Engineering)

Co-ordinators : Dr. D. Kastha

NPTEL : Optimal Control (Electrical Engineering)

Co-ordinators : Prof. G.D. Ray

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

Co-ordinators : Prof. S. Banerjee

NPTEL : Digital Signal Processing (Electrical Engineering)

Co-ordinators : Prof. T.K. Basu

NPTEL : Dynamics of Physical Systems (Electrical Engineering)

Co-ordinators : Prof. S. Banerjee

NPTEL : Energy Resources and Technology (Electrical Engineering)

Co-ordinators : Prof. S. Banerjee

NPTEL : Estimation of Signals and Systems (Electrical Engineering)

Co-ordinators : Prof. S. Mukhopadhyay

NPTEL : Illumination Engineering (Electrical Engineering)

Co-ordinators : Prof. N.K. Kishore

NPTEL : Industrial Automation and Control (Electrical Engineering)

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

NPTEL : Industrial Instrumentation (Electrical Engineering)

Co-ordinators : Prof. Alok Barua

NPTEL : Networks Signals and Systems (Electrical Engineering)

Co-ordinators : Prof. T.K. Basu

NPTEL : Power System Analysis (Electrical Engineering)

Co-ordinators : Prof. A.K. Sinha

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

Co-ordinators : Prof. S. Mukhopadhyay

NPTEL : NOC:Medical Image Analysis (Electrical Engineering)

Co-ordinators : Prof. Debdoot Sheet

NPTEL : NOC:Biomedical Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Sudipta Mukhopadhyay

NPTEL : NOC:Microprocessors and Microcontrollers (Electrical Engineering)

Co-ordinators : Prof. Santanu Chattopadhyay

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

Co-ordinators : Prof. Debdoot Sheet

NPTEL : NOC:Power System Engineering (Electrical Engineering)

Co-ordinators : Prof. Debapriya Das

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

Co-ordinators : Prof. Debapriya Das

NPTEL : NOC:Digital Circuits (Electrical Engineering)

Co-ordinators : Prof. Santanu Chattopadhyay

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

Co-ordinators : Dr. Amitabha Bhattacharya

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

Co-ordinators : Prof. Indranil Hatai

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

Co-ordinators : Prof.Tapas Kumar Bhattacharya

Lecture 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: Its Importance and Range for Motor Operation

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: Slip Line

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...)

NPTEL : NOC:Digital Electronic Circuits (Electrical Engineering)

Co-ordinators : Prof. Goutam Saha

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

Co-ordinators : Prof. Debapriya Das

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

Co-ordinators : Prof. Suvra Sekhar Das

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

Co-ordinators : Prof. Avishek Chatterjee

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

Co-ordinators : Dr. Amitabha Bhattacharya

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

Co-ordinators : Prof.Tapas Kumar Bhattacharya

NPTEL : NOC:VLSI Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Mrityunjay Chakraborty

NPTEL : NOC:Analog Electronic Circuits (Electrical Engineering)

Co-ordinators : Prof. Pradip Mandal

NPTEL : NOC:Network Analysis (Electrical Engineering)

Co-ordinators : Prof. T.K. Bhattacharya

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 : NOC:Power System Protection (Electrical Engineering)

Co-ordinators : Prof. Ashok Kumar Pradhan

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

Co-ordinators : Prof. Amit Kumar Dutta

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

Co-ordinators : Prof. Santanu Kapat

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

Co-ordinators : Prof. Bratin Ghosh

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

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

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

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

Co-ordinators : Prof. Santanu Kapat

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

NPTEL : NOC:VLSI Interconnects (Electrical Engineering)

Co-ordinators : Prof. Sarang Pendharker

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

Co-ordinators : Prof. Vivek Dixit

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

Co-ordinators : Prof. Bratin Ghosh

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

Co-ordinators : Prof. Mrityunjoy Chakraborty

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

Co-ordinators : Dr. Basudev Lahiri

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

Co-ordinators : Prof. Amitabha Bhattacharya

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

Co-ordinators : Prof. Banibrata Mukherjee

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

Co-ordinators : Prof. Ashok Kumar Pradhan

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

Co-ordinators : Prof. Pawan Goyal

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

Co-ordinators : Dr. Krishna Vasudevan

NPTEL : Analog ICs (Electrical Engineering)

Co-ordinators : Prof. K. Radhakrishna Rao

NPTEL : Digital Integrated Circuits (Electrical Engineering)

Co-ordinators : Prof. Amitava Dasgupta

NPTEL : Electromagnetic Fields (Electrical Engineering)

Co-ordinators : Prof. Harishankar Ramachandran

NPTEL : Networks and Systems (Electrical Engineering)

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

NPTEL : Probability Foundation for Electrical Engineers (Electrical Engineering)

Co-ordinators : Dr. Krishna Jagannathan

NPTEL : NOC:Analog Circuits (Electrical Engineering)

Co-ordinators : Dr. Nagendra Krishnapura

Lecture 131 - PNP transistor

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

Co-ordinators : Prof. Gaurav Raina

NPTEL : NOC:Control Engineering (Electrical Engineering)

Co-ordinators : Prof. Ramkrishna.P

NPTEL : NOC:Analog IC Design (Electrical Engineering)

Co-ordinators : Prof. S. Aniruddhan

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

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

Lecture 32 - Marginal PMF

Lecture 33 - Trinomial joint PMF

Lecture 34 - Events and Conditioning with Two Random Variables

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

Lecture 36 - Independent random variables

Lecture 37 - More on independence

Lecture 38 - Example: IID Repetitions

Lecture 39 - Addition of Random Variables

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

Lecture 41 - More Computations: Min of Two Random Variables

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

Lecture 43 - Real line as sample space

Lecture 44 - Probability density function (pdf)

Lecture 45 - Cumulative distribution function (CDF)

Lecture 46 - Continuous random variables

Lecture 47 - pdf and CDF of continuous random variables

Lecture 48 - Spinning pointer example

Lecture 49 - Important continuous distributions

Lecture 50 - More continuous distributions

Lecture 51 - Two-dimensional real sample space

Lecture 52 - Joint pdf and joint CDF

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

Lecture 54 - Darts example and marginal pdfs

Lecture 55 - Independence to two continuous random variables

Lecture 56 - Examples: two independent continuous random variables

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

Lecture 58 - Transformations of random variables

Lecture 59 - CDF method

Lecture 60 - pdf method

Lecture 61 - Examples

Lecture 62 - One-to-one transformations

Lecture 63 - Expected Value or Mean of a Random Variable

Lecture 64 - Properties of Expectation

NPTEL : NOC:Introduction to Photonics (Electrical Engineering)

Co-ordinators : Prof. Balaji Srinivasan

NPTEL : NOC:Multirate DSP (Electrical Engineering)

Co-ordinators : Prof. David Kovil Pillai

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

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

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

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

Co-ordinators : Dr. Andrew Thangaraj

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

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

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

Co-ordinators : Prof. Nitin Chandrachoodan

Lecture 32 - Balanced pipeline

Lecture 33 - Retiming basic concept

Lecture 34 - Retiming basic concept

Lecture 35 - Example and uses of retiming

Lecture 36 - Resource sharing: adder example

Lecture 37 - Changing iteration period

Lecture 38 - Hardware assumptions and constraint analysis

Lecture 39 - Mathematical formulation

Lecture 40 - Examples with formulation

Lecture 41 - Example: Biquad filter

Lecture 42 - Hardware architecture

Lecture 43 - Review biquad folding sets

Lecture 44 - Complete biquad hardware

Lecture 45 - DEMO: FFT in Vivado HLS

Lecture 46 - DEMO: FFT synthesis

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: Analyze FFT implementation

Lecture 58 - DEMO: FFT interface

Lecture 59 - Scheduling: problem formulation

Lecture 60 - Example: differential equation solver

Lecture 61 - Heuristic approaches to scheduling

Lecture 62 - Mathematical formulation

Lecture 63 - ILP formulation

Lecture 64 - List scheduling

NPTEL : NOC:Linear System Theory (Electrical Engineering)

Co-ordinators : Prof. Ramakrishna Pasumarthi

NPTEL : NOC:Digital Signal Processing (Electrical Engineering)

Co-ordinators : C. S. Ramalingam

Lecture 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

NPTEL : NOC:Computational Electromagnetics (Electrical Engineering)

Co-ordinators : Prof. Uday Khankhoje

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

Co-ordinators : Dr. Ananth Krishnan

NPTEL : NOC:Digital IC Design (Electrical Engineering)

Co-ordinators : Prof. Janakiraman

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

Co-ordinators : Prof. Qadeer Ahmad Khan

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

Co-ordinators : Prof. Krishna S

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: Valve utilization factor

Lecture 7 - Choice of converter configuration: Transformer utilization factor

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: Jumps in voltage across a valve

Lecture 11 - Analysis of 6 pulse LCC neglecting inductance: Average DC side voltage

Lecture 12 - Fourier series - Part 1

Lecture 13 - Fourier series - Part 2

Lecture 14 - Analysis of 6 pulse LCC neglecting inductance: DC side voltage harmonics

Lecture 15 - Analysis of 6 pulse LCC neglecting inductance: Fundamental and harmonic components of AC side current

Lecture 16 - Definitions: Delay angle, angle of advance, commutation margin angle

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: DC side voltage harmonics

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

Lecture 25 - 2 and 3 valve conduction mode of 6 pulse LCC: Fundamental and harmonic components of AC side current

Lecture 26 - Extinction angle

Lecture 27 - Extinction angle: Commutation margin angle for normal inverter operation of 6 pulse LCC

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: Monopolar

Lecture 52 - Types of DC link: Bipolar and homopolar

Lecture 53 - DC link control

Lecture 54 - DC link control: Control variables

Lecture 55 - Considerations that influence selection of control

Lecture 56 - Converter control characteristics

Lecture 57 - MTDC systens: Applications

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

NPTEL : NOC:Optical Engineering (Electrical Engineering)

Co-ordinators : Prof. Shanti Bhattacharya

NPTEL : NOC:Nonlinear System Analysis (Electrical Engineering)

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

NPTEL : NOC:Signals and Systems (Electrical Engineering)

Co-ordinators : Prof. Kushal K. Shah

Lecture 65 - LTI System Response for Periodic Input Signal

Lecture 66 - Fourier Series in Continuous-Time : Examples I

Lecture 67 - Fourier Series in Continuous-Time : Examples II

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 : Examples I

Lecture 76 - DTFT Properties I: Periodicity, Linearity, Time/Frequency shifting, and Conjugation

Lecture 77 - DTFT Properties II: Differencing and Accumulation in Time Domain, Differentiation in Frequency Domain

Lecture 78 - DTFT Properties III: Time Reversal, Time Expansion, Convolution and Parsevaalâ€™s Relation

Lecture 79 - DTFT : Examples II

Lecture 80 - DTFT in Complex Frequency Domain

Lecture 81 - Z-Transform : Properties of ROC

Lecture 82 - Z-Transform Properties I: Linearity, Time-Shifting, Time-Expansion, Time-Reversal, and Z-Scaling

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

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

Lecture 85 - Z-Transform : Examples I

Lecture 86 - Z-Transform : Examples II

Lecture 87 - Block Diagram Representation

NPTEL : NOC:Linear Dynamical Systems (Electrical Engineering)

Co-ordinators : Prof. Tushar Jain

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

Co-ordinators : Prof. Santanu Talukder

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

Co-ordinators : Prof. Deepa Venkitesh

NPTEL : NOC:Image Signal Processing (Electrical Engineering)

Co-ordinators : Prof. A. N. Rajagopalan

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

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

NPTEL : NOC:Applied Linear Algebra (Electrical Engineering)

Co-ordinators : Prof. Andrew Thangaraj

NPTEL : NOC:Basic Electrical Circuits (Electrical Engineering)

Co-ordinators : Dr. Nagendra Krishnapura

Lecture 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: Example

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: Current source

NPTEL : NOC:Optical Fiber Sensors (Electrical Engineering)

Co-ordinators : Prof. Balaji Srinivasan

NPTEL : NOC:Introduction to Time - Varying Electrical Networks (Electrical Engineering)

Co-ordinators : Prof. Shanthi Pavan

NPTEL : NOC:Digital System Design (Electrical Engineering)

Co-ordinators : Prof. Neeraj Goel

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

Co-ordinators : Prof. Krishna Jagannathan

Lecture 32 - Elementary Renewal Theorem

Lecture 33 - The Renewal Equation

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

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

Lecture 36 - Little's theorem

Lecture 37 - M/G/1 Queue

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

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

Lecture 40 - Ensemble rewards - Age and Duration

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

Lecture 42 - Key Renewal Theorem and Ensemble rewards

Lecture 43 - Introduction to finite state Discrete Time Markov Chains

Lecture 44 - Class and Types of Classes in a DTMC

Lecture 45 - Periodicity in a DTMC

Lecture 46 - Matrix Representation of a DTMC

Lecture 47 - The long term behaviour of a DTMC

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

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

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

Lecture 51 - Spectral Properties of Stochastic Matrices - Part 1

Lecture 52 - Spectral Properties of Stochastic Matrices - Part 2

Lecture 53 - The Short-term Behaviour of a DTMC

Lecture 54 - Introduction to Countable-state DTMC

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

Lecture 56 - The Strong Markov Property

Lecture 57 - Renewal Theory applied to DTMC's

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

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

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

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

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

Lecture 63 - The Birth-Death Markov Chains

Lecture 64 - The Reversibility Markov Chains

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

Co-ordinators : Prof. Bijoy Krishna Das

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

Co-ordinators : Prof. Naresh Kumar Emani

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

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

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

Lecture 33 - Charging Batteries

Lecture 34 - Fundamentals of Battery Pack Design

Lecture 35 - Electrical Design of Battery Pack - Part 1

Lecture 36 - Electrical Design of Battery Pack - Part 2

Lecture 37 - Electrical Design of Battery Pack - Part 3

Lecture 38 - Mechanical Design of Battery Pack - Part 1

Lecture 39 - Mechanical Design of Battery Pack - Part 2

Lecture 40 - Mechanical Design of Battery Pack - Part 3

Lecture 41 - Mechanical Design of Battery Pack - Part 4

Lecture 42 - Thermal Design of Battery Pack - Part 1

Lecture 43 - Thermal Design of Battery Pack - Part 2

Lecture 44 - Thermal Design of Battery Pack - Part 3

Lecture 45 - Thermal Design of Battery Pack - Part 4

Lecture 46 - BMS Design and Embedded System - Part 1

Lecture 47 - BMS Design and Embedded System - Part 2

Lecture 48 - BMS Design and Embedded System - Part 3

Lecture 49 - BMS Design and Embedded System - Part 4

Lecture 50 - BMS Design and Embedded System - Part 5

Lecture 51 - Cell Testing and Characterization - Part 1

Lecture 52 - Cell Testing and Characterization - Part 2

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

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

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

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

Lecture 57 - Power and Efficiency

Lecture 58 - Torque Production - Part 1

Lecture 59 - Torque Production - Part 2

Lecture 60 - Torque Production - Part 3

Lecture 61 - Speed and Back EMF

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

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

Lecture 64 - Field-oriented Control

NPTEL : Phase-locked loops (Electrical Engineering)

Co-ordinators : Dr. Saurabh Saxena

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 65 - Course Summary

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

Co-ordinators : Prof. Naresh Kumar Emani

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

Co-ordinators : Prof. Shanthi Pavan

NPTEL : NOC:Modern Computer Vision (Electrical Engineering)

Co-ordinators : Prof. A. N. Rajagopalan

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

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

Co-ordinators : Prof. Anand Srivastava

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

Co-ordinators : Prof. Sneh Saurabh

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

Co-ordinators : Dr.Vivek Bohara

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

Co-ordinators : Prof.Mitradip Bhattacharjee

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

Co-ordinators : Prof. Vivek Ashok Bohara

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

Co-ordinators : Prof A P Tiwari

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

Co-ordinators : Prof. Uday K Khankhoje

Lecture 65 - Linearised feasible directions

Lecture 66 - Feasible sequences and tangent cone

Lecture 67 - LICQ conditions

Lecture 68 - KKT conditions (First order necessary conditions)

Lecture 69 - Proof sketch for KKT conditions - Part 1

Lecture 70 - Proof sketch for KKT conditions - Part 2

Lecture 71 - Introduction to Projected gradient descent

Lecture 72 - Projected gradient descent and proof of convergence

Lecture 73 - Proof of convergence - Part 2

Lecture 74 - Subgradients and Subdifferential

Lecture 75 - Projection onto l1 ball

Lecture 76 - Soft thresholding example

Lecture 77 - Recap of Projection onto l1 ball

Lecture 78 - KKT and duality introduction

Lecture 79 - Intuition of duality and dual problem

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

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

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

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

Co-ordinators : Prof. Moumita Das

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

Co-ordinators : Prof. Vivek Ashok Bohara

NPTEL : NOC:Optimal Control (Electrical Engineering)

Co-ordinators : Prof. Barjeev Tyagi

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

Co-ordinators : Dr. Meenakshi Rawat

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

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

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 : NOC:Introduction to Smart Grid (Electrical Engineering)

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

NPTEL : NOC:Facts Devices (Electrical Engineering)

Co-ordinators : Prof. Avik Bhattacharya

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

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

Co-ordinators : Prof. Yogesh Vijay Hote

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

Co-ordinators : Prof. Biswarup Das

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

Co-ordinators : Prof. Avik Bhattacharya

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

Co-ordinators : Prof. Sudeb Dasgupta

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

Co-ordinators : Prof. Sudeb Dasgupta

NPTEL : NOC:DC Microgrid (Electrical Engineering)

Co-ordinators : Prof. Avik Bhattacharya

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

Co-ordinators : Prof. Avik Bhattacharya

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

Co-ordinators : Prof. Bhaveshkumar R. Bhalja

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

Co-ordinators : Prof. Darshak Bhatt

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

Co-ordinators : Prof. Bishnu Prasad Das

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

Co-ordinators : Prof. Biswarup Das

NPTEL : NOC:Semiconductor Devices for Next Generation Field Effect Transistors (More than Moore): A Physics Perspective (Electrical Engineering)

Co-ordinators : Prof. Sudeb Dasgupta

NPTEL : NOC:Intelligent Control of Robotic Systems (Electrical Engineering)

Co-ordinators : Prof. M. Felix Orlando

NPTEL : An Introduction to Electronics Systems Packaging (Electrical Engineering)

Co-ordinators : Prof. G.V. Mahesh

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 alloys

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 processes

Lecture 41 - Embedded capacitors; Processes for embedding capacitors; Case study examples; Summary of materials in packaging

Lecture 42 - Chapter-wise summary

NPTEL : Power Electronics and Distributed Generation (Electrical Engineering)

Co-ordinators : Dr. Vinod John

NPTEL : Pulse width Modulation for Power Electronic Converters (Electrical Engineering)

Co-ordinators : Dr. G. Narayanan

NPTEL : Switched Mode Power Conversion (Electrical Engineering)

Co-ordinators : Prof. L. Umanand, Prof. V. Ramanarayanan

NPTEL : Basic Electrical Technology (Electrical Engineering)

Co-ordinators : Prof. L. Umanand

Lecture 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 : Industrial Drives - Power Electronics (Electrical Engineering)

Co-ordinators : Prof. K. Gopakumar

NPTEL : NOC:Design for Internet of Things (Electrical Engineering)

Co-ordinators : Prof. T.V. Prabhakar

NPTEL : NOC:Advances in UHV Transmission and Distribution (Electrical Engineering)

Co-ordinators : Prof Subba Reddy B

NPTEL : NOC:Mathematical Methods and Techniques in Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Shayan Srinivasa Garani

NPTEL : NOC:Electronics Enclosures Thermal Issues (Electrical Engineering)

Co-ordinators : Prof. N. V Chalapathi Rao

NPTEL : NOC:Integrated Circuits, MOSFETs, Op-Amps and their Applications (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

NPTEL : NOC:Semiconductor Devices and Circuits (Electrical Engineering)

Co-ordinators : Prof. Sanjiv Sambandan

Lecture 32 - Metal Oxide Semiconductor Capacitor (MOSCAP)

Lecture 33 - MOSCAP (Continued...)

Lecture 34 - MOSCAP: CV Characteristics

Lecture 35 - MOSCAP: CV Characteristics (Continued...)

Lecture 36 - MOSFET: Introduction

Lecture 37 - MOSFET: I-V characteristics

Lecture 38 - MOSFET: I-V characteristics (Continued...)

Lecture 39 - MOSFET: I-V characteristics (Continued...)

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: Parameter extraction

Lecture 45 - MOSFET characterization: Trapped charges, contact resistance

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: Frequency Response, Noise

Lecture 51 - Introduction: Amorphous Semiconductors

Lecture 52 - Thin Film Transistors

Lecture 53 - Tutorials Session - 1

Lecture 54 - Tutorials Session - 2

Lecture 55 - Tutorials Session - 3

NPTEL : NOC:Fabrication Techniques for MEMs-based Sensors: Clinical Perspective (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

NPTEL : NOC:Op-Amp Practical Applications: Design, Simulation and Implementation (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

NPTEL : NOC:Physical Modelling for Electronics Enclosures using Rapid prototyping (Electrical Engineering)

Co-ordinators : Prof. N. V Chalapathi Rao

NPTEL : NOC:Recent Advances in Transmission Insulators (Electrical Engineering)

Co-ordinators : Prof Subba Reddy B

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

Co-ordinators : Prof. Digbijoy N. Nath

NPTEL : NOC:Advanced IOT Applications (Electrical Engineering)

Co-ordinators : Prof. T V Prabhakar

NPTEL : NOC:Electronic Systems for Cancer Diagnosis (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

Lecture 32 - Basic building blocks of Electronics System: Filters (Continued...)

Lecture 33 - Basic building blocks of Electronics System: Filters (Continued...)

Lecture 34 - Basic building blocks of Electronics System: Data Converteres

Lecture 35 - Basic building blocks of Electronics System: Data Converteres (Continued...)

Lecture 36 - Basic building blocks of Electronics System: Signal Conditioning Circuits

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: Introduction and Work Flow

Lecture 46 - 3D Fabrication Techniques

Lecture 47 - Gowning Procedure in Clean Room

Lecture 48 - Introduction to Equipments: Desiccators

Lecture 49 - PDMS Moulding procedure

Lecture 50 - Introduction to Equipments: Pristaltic Pump

Lecture 51 - Introduction to Equipments: Stereo Microscopy, Metallurgical Microscopy, Inverted Microscopy

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: DAQ

Lecture 62 - Introduction to Equipments: DAQ (Continued...)

Lecture 63 - Electronic Module for Gas sensor

Lecture 64 - Fabrication process flow for a metal oxide gas sensor

NPTEL : NOC:Electronic Modules for Industrial Applications using Op-Amps (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

NPTEL : NOC:Sensors and Actuators (Electrical Engineering)

Co-ordinators : Prof. Hardik Jeetendra Pandya

NPTEL : NOC:Neural Networks for Signal Processing-I (Electrical Engineering)

Co-ordinators : Prof. Shayan Srinivasa Garani

NPTEL : NOC:Electronics Equipment Integration and Prototype Building (Electrical Engineering)

Co-ordinators : Prof. N.V.Chalapathi Rao

NPTEL : NOC:Design and Simulation of Power Conversion using Open Source Tools (Electrical Engineering)

Co-ordinators : Prof. L. Umanand

NPTEL : NOC:Introductory Neuroscience and Neuro-Instrumentation (Electrical Engineering)

Co-ordinators : Prof. Mahesh Jayachandra

Lecture 1 - Cellular (Microscopic) Structure of the Central Nervous System (CNS)

Lecture 2 - Anatomical (Macroscopic) structure of the CNS

Lecture 3 - Introduction to Cleanroom and IC Fabrication Techniques

Lecture 4 - Introduction to EEG applications for Hearing Loss

Lecture 5 - Electrophysiological Recordings

Lecture 6 - Neocortical Circuits

Lecture 7 - The resting Membrane Potential

Lecture 8 - Applications of MEMS Fabrication Technologies

Lecture 9 - Fundamentals of biopotentials and applications

Lecture 10 - Fundamentals of EEG and applications

Lecture 11 - The Action Potential (1)

Lecture 12 - The Action Potential (2)

Lecture 13 - Axonology, Neuronal Biophysics (1)

Lecture 14 - Axonology, Neuronal Biophysics (2)

Lecture 15 - Experimental Setup for EEG Recording

Lecture 16 - Introduction to Cleanroom Protocols and Demonstration of Gowning Procedure

Lecture 17 - Electromagnetic Stimulation of the Brain (1)

Lecture 18 - Electromagnetic Stimulation of the Brain (2)

Lecture 19 - Introduction to Event Related Potentials

Lecture 20 - Introduction to 3D Printing

Lecture 21 - 3D Printing: Applications and Demonstrations

Lecture 22 - Introduction to Event Related Potentials (2)

Lecture 23 - Different Event Related Potentials (1)

Lecture 24 - Different Event Related Potentials (2)

Lecture 25 - Introduction to Silicone Wafer Processing Techniques

Lecture 26 - Basics of Silicone Dioxide: Oxidation, Characterization and Applications

Lecture 27 - Inverse Problem, EEG source localization (1)

Lecture 28 - Inverse Problem, EEG source localization (2)

Lecture 29 - Introduction to Brain Computer Interfaces

Lecture 30 - Signal Conditioning Circuit for EEG Bioamplifiers

Lecture 31 - Basics of BCI Experimentation: Introdcution BCI Applications

Lecture 32 - Different Brain Computer Interfaces

Lecture 33 - Introduction to EEGLAB, ERPLAB and AEP Demonstration (1)

Lecture 34 - Introduction to EEGLAB, ERPLAB and AEP Demonstration (2)

Lecture 35 - Introduction to Photolithography

Lecture 36 - Basics of BCI Experimentation: Stimuli Generation and Insertion

Lecture 37 - MMN Demonstration with EEGLAB and ERPLAB (1)

Lecture 38 - MMN Demonstration with EEGLAB and ERPLAB (2)

Lecture 39 - Introduction to Photolithography (2)

Lecture 40 - Basics of Instrumentation Amplifier and Online Simulation

Lecture 41 - Basics of BCI Experimentation: Experimental Setup and Biopotential Acquisition

Lecture 42 - P300 Demonstration with EEGLAB/ERPLAB (1)

Lecture 43 - P300 Demonstration with EEGLAB/ERPLAB (2)

Lecture 44 - Wavelet Analysis with VEP (1)

Lecture 45 - Details of Lithography, E-beam Lithography and Mask Aligner

Lecture 46 - Basics of BCI Experimentation: Signal Acquisition using MATLAB (EEGLAB)

Lecture 47 - Wavelet Analysis with VEP (2)

Lecture 48 - Demonstration: Resting Membrane Potential

Lecture 49 - Demonstration: Membrane Time Constant (Ï„)

Lecture 50 - Photoresist (SU-8) and soft lithography

Lecture 51 - Physical Vapour Deposition: Thermal Evaporation

Lecture 52 - Introduction to Epilepsy and Classification

Lecture 53 - Epileptogenisis

Lecture 54 - Demonstration: Membrane Length Constant (Î»)

Lecture 55 - Demonstration: Action Potential

Lecture 56 - Demonstration: Voltage Clamp

Lecture 57 - Demonstration: Synaptic Potentials & Current

Lecture 58 - Physical Vapour Deposition: E-beam Evaporation

Lecture 59 - Physical Vapour Deposition: Sputtering

Lecture 60 - Recent Trends: Epilepsy Classification using EEG data

Lecture 61 - Demonstration: Wireless EEG with dry electrodes

Lecture 62 - Basics of EEG, ERP and acquisition

Lecture 63 - Photolithography with example

Lecture 64 - Stress Tissue Analysis using COMSOL Multiphysics

Lecture 65 - Recent Trends: Microelectrode Arrays and Deep Brain Stimulation

NPTEL : NOC:Information Theory (Electrical Engineering)

Co-ordinators : Prof. Himanshu Tyagi

Lecture 32 - Shape of measures of information

Lecture 33 - Data processing inequality

Lecture 34 - Midyear Review

Lecture 35 - Proof of Fano's inequality

Lecture 36 - Variational formulae

Lecture 37 - Capacity as information radius

Lecture 38 - Proof of Pinsker's inequality

Lecture 39 - Continuity of entropy

Lecture 40 - Lower bound for compression

Lecture 41 - Lower bound for hypothesis testing

Lecture 42 - Review 7

Lecture 43 - Lower bound for random number generation

Lecture 44 - Strong converse

Lecture 45 - Lower bound for minmax statistical estimation

Lecture 46 - Variable length source codes

Lecture 47 - Review 8

Lecture 48 - Kraft's inequality

Lecture 49 - Shannon code

Lecture 50 - Huffman code

Lecture 51 - Minmax Redundancy

Lecture 52 - Type based universal compression

Lecture 53 - Review 9

Lecture 54 - Arithmetic code

Lecture 55 - Online probability assignment

Lecture 56 - Compression of databases: A scheme

Lecture 57 - Compression of databases: A lower bound

Lecture 58 - Repetition code

Lecture 59 - Channel capacity

Lecture 60 - Sphere packing bound for BSC

Lecture 61 - Random coding bound for BSC

Lecture 62 - Random coding bound for general channel

Lecture 63 - Review 11

Lecture 64 - Converse proof for channel coding theorem

NPTEL : NOC:Photonic Integrated Circuit (Electrical Engineering)

Co-ordinators : Prof. Shankar Kumar Selvaraja

NPTEL : NOC:Design for Internet of Things (2021) (Electrical Engineering)

Co-ordinators : Prof. T V Prabhakar

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

NPTEL : NOC:Mathematical Aspects of Biomedical Electronic System Design (Electrical Engineering)

Co-ordinators : Prof. Chandramani Singh

NPTEL : NOC:Concentration Inequalities (Electrical Engineering)

Co-ordinators : Prof. Himanshu Tyagi

NPTEL : NOC:Real-Time Digital Signal Processing (Electrical Engineering)

Co-ordinators : Prof. Rathna G N

NPTEL : NOC:Advanced Neural Science for Engineers (Electrical Engineering)

Co-ordinators : Prof. Vikas V

NPTEL : NOC:Design of Electric Motors (Electrical Engineering)

Co-ordinators : Dr. Prathap Reddy

NPTEL : NOC:Basics of Semiconductor Microwave Devices (Electrical Engineering)

Co-ordinators : Prof Digbijoy N Nath