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

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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: General Relations

Lecture 8 - Spectral Properties of Line Codes: On-off / Polar / Bipolar Signalling

Lecture 9 - Spectral Properties of Line Codes: Duobinary Manchester and HDB Codes

Lecture 10 - Baseband Pulse Shaping: Nyquist's First Criterion

Lecture 11 - Baseband Pulse Shaping: Raised Cosine Family of Pulses

Lecture 12 - Partial Response Signalling: Duobinary and Modified Duobinary Pulse Shaping

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 - M-ary Baseband Digital Modulation Techniques

Lecture 17 - Passband Digital Modulations - I : PSK and QPSK

Lecture 18 - Passband Digital Modulations - II : Offset QPSK

Lecture 19 - Passband Digital Modulations - III : Minimum Shift Keying (MSK)

Lecture 20 - Passband Digital Modulations - IV : MSK (Continued...) : Passband Waveforms for M-ary Signalling

Lecture 21 - Passband Modulations for Band Limited Channels

Lecture 22 - Baseband and Passband Digital Demodulations : General Issues and Concepts

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...) : Coherent and Noncoherent Receivers for Orthogonal Signalling (OOK and FSK)

Lecture 27 - Performance Analysis of Binary Digital Modulations: Signal and Noise Statistics in Coherent and Noncoherent Receivers

Lecture 28 - Error Rates for Binary Signalling : Coherent Receivers

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 : Introduction To Electronic Circuits (Electrical Engineering)

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

- 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 \(Continued...\)](#)

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: 2-pole systems phase margin

Lecture 31 - Diversion Continued: Two Pole Systems

[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](#)

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[Lecture 39 - Introduction to Voltage Regulators](#)

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[Lecture 2 - Preliminaries](#)

[Lecture 3 - Model Reference Adaptive Control - Part 1](#)

[Lecture 4 - Model Reference Adaptive Control - Part 2](#)

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[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](#)

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: Huffman, Arithmetic, Lempel Ziv, Run Length

Lecture 7 - Optimum Quantizer, Practical Application of Source Coding: JPEG Compression

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: Generator Polynomials

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: Generator Polynomial Matrix and Encoding using Trellis

Lecture 28 - Viterbi Decoding and Known good Convolutional Codes

Lecture 29 - Introduction to Turbo Codes

Lecture 30 - Introduction to Trellis Coded Modulation (TCM)

Lecture 31 - Ungerboeck'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 \(STBC\)](#)

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[Lecture 37 - Some Well-Known Algorithms: DES, IDEA, PGP, DH Protocol](#)

[Lecture 38 - Introduction to Physical Layer Security: Notion of Secrecy Capacity](#)

[Lecture 39 - Secrecy Outage Capacity, Secrecy Outage Probability, Cooperative Jamming](#)

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Lecture 2 - Transmission Lines : Wave Propagation

Lecture 3 - Transmission Lines : Reflection,Transmission; Travelling Waves

Lecture 4 - Transmission Lines : Travelling Waves (Continued...); Sinusoidal Signals; Impedence Transformation

Lecture 5 - Transmission Lines : Standing Wave Ratio:Measurement of Impedence

Lecture 6 - Transmission Lines : General Transmission Lines Equations,Low loss,Transmission Lines,Transmission Lines as Circuit Elements

Lecture 7 - Transmission Lines : Section as Circuit Elements

Lecture 8 - Transmission Lines : Velocities of Propagation, Transmission Lines Charts

Lecture 9 - Transmission Lines : Smith Chart

Lecture 10 - Transmission Lines : Impedance Matching using Stub-Lines

Lecture 11 - Transmission Lines : Transmission Lines Parameters; (primary Constants)

Lecture 12 - Wave Propagation

Lecture 13 - Wave Propagation (Continued...)

Lecture 14 - Wave Propagation : Polarisation,Poynting Vector

Lecture 15 - Wave Propagation : Power Flow,Complex Poynting vector,wave equation for a conducting Medium

Lecture 16 - Wave Propagation : Conducting Medium;Conductors and Dielectrics Depth of Penetration;Surface Impedance

Lecture 17 - Wave Propagation : Surface Impedance; Power Loss in a Conductor Reflection at a Perfect conductor (Normal Inc.)

Lecture 18 - Reflection and Refraction of waves : Reflection at the Surface of a Conducting Medium,Reflection at a Perfect Conductor (Oblique Inc.)

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,Superposition of Plane Waves

Lecture 25 - Wave Guides (Continued...)

Lecture 26 - Wave Guides (Continued...) Parallel plane Guide,Characteristics of TE and Tm Waves,TEM Waves,Wave Impedances

Lecture 27 - Wave Guides (Continued...) - 1

Lecture 28 - Wave Guides (Continued...) - 2

Lecture 29 - Wave Guides (Continued...) Rectangular Wave Guides

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[Lecture 33 - Resonators \(Continued...\) Transmission Line Resonators](#)

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[Lecture 36 - Radiation \(Continued...\)](#)

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Lecture 4 - Signal Spaces : Gram Schmidt Orthogonalization and Receiver Structures

Lecture 5 - Signal Spaces : Fourier Series and Related expansions

Lecture 6 - Signal Spaces : Bandwidth and Degree of Freedom

Lecture 7 - Random Variables and Random Processes : Discrete Random Variable

Lecture 8 - Random Variables and Random Processes : Continuous Random Variable

Lecture 9 - Random Variables and Random Processes : Multiple Random Variable

Lecture 10 - Random Variables and Random Processes : Random Vectors

Lecture 11 - Random Variables and Random Processes : Introduction to Random Process

Lecture 12 - Random Variables and Random Processes : Properties of Random Process

Lecture 13 - Random Variables and Random Processes : Gaussian Random Process - Part 1

Lecture 14 - Random Variables and Random Processes : Gaussian Random Process - Part 2

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Lecture 16 - Random Variables and Random Processes : Random Process through an LTI system

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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

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Lecture 12 - Vehicle Dynamics Simulation and dynamic equation

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Lecture 20 - Open Loop Operation of Chopper Fed DC Motor Drive

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Lecture 23 - Speed Controller Design and Performance Evaluation of DC Motor Drive

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Lecture 28 - Impact of Non-Sinusoidal Voltage on Induction Motor

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- Lecture 9 - Numericals on devices and Single-phase Rectifiers
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- Lecture 12 - Communication Overlap - II and AC-AC Converter-Introduction
- Lecture 13 - Single-Phase and Three-Phase AC Voltage Controllers
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- Lecture 19 - Voltage Source Inverters
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- Lecture 23 - Current Source Inverter
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Lecture 29 - Frequency Modulation (FM) with Sinusoidal Modulation Signal and Pictorial Examples, Insights of PM and FM signals

Lecture 30 - Indirect Method for Generation of FM Signals - Generation of Narrowband FM Signal

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- Lecture 31 - Indirect Method for Generation of FM Signals - Generation of Wideband FM Signal through Frequency Multiplication
- Lecture 32 - Spectrum of Frequency Modulated (FM) Signals
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- Lecture 34 - Demodulation of Frequency Modulated (FM) Signals, Condition of Envelope Detection
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- Lecture 41 - Quantization, Mid-Rise Quantizer, PDF and Power of Quantization Noise, Quantization Noise Power versus Quantizer Resolution
- Lecture 42 - Introduction to Lloyd-Max Quantization Algorithm, Optimal Quantizer Design
- Lecture 43 - Lloyd-Max Quantization Algorithm, Iterative Computation of Optimal Quantization Levels and Intervals
- Lecture 44 - Companding for Non-Uniform Quantization, μ -law Compressor, A-law Compressor
- Lecture 45 - Introduction to Delta Modulation, One-bit Quantizer
- Lecture 46 - Signal Reconstruction in Delta Modulation, Schematic Diagrams, Slope Overload Distortion and Granular Noise
- Lecture 47 - Differential Pulse Coded Modulation (DPCM), DPCM Signal Reconstruction and Schematic Diagram
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- Lecture 49 - Frequency Translation and Super Heterodyne Receivers, Problem of Image Frequency
- Lecture 50 - Frequency Division Multiplexing (FDM), Carrier Spacing in FDM
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Lecture 12 - Some Simple Linear Block Codes - II: Reed Muller Codes

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Lecture 13 - Optimal Decision Rule for Amplitude Shift Keying (ASK), Bit Error Rate (BER) and Comparison with Binary Phase Shift Keying (BPSK) Modulation

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Lecture 15 - Introduction to Frequency Shift Keying (FSK)

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Lecture 21 - M-ary PAM (Pulse Amplitude Modulation) -Part-II, Optimal Decision Rule and Probability of Error

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Lecture 24 - M-ary PSK (Phase Shift Keying) Part-I, Introduction , Transmitted Waveform and Constellation Diagram

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- Lecture 4 - Terminating T-lines: Reflection and Transmission coefficient
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- Lecture 3 - Uniform plane waves (UWPs) in free-space
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- Lecture 6 - Obliquely incident waves-I (TE and TM waves, Snell's laws)
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- Lecture 11 - Introduction to optical fibers
- Lecture 12 - Ray theory of light propagation in optical fibers
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- Lecture 30 - Graded Index Fibers
- Lecture 31 - Light Sources, Detectors and Amplifiers

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Lecture 54 - Coherent receiver for BPSK systems and BER calculation

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Co-ordinators : Prof. N.K. Kishore

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

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Co-ordinators : Prof. A.K. Sinha

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NPTEL : Phase-locked loops (Electrical Engineering)

Co-ordinators : Dr. Saurabh Saxena

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

Co-ordinators : Prof. Sudeb Dasgupta

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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](#)

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 : Switched Mode Power Conversion (Electrical Engineering)

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

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](#)

Lecture 1 - Basic Electrical Technology

Lecture 2 - Passive Components

Lecture 3 - Sources

Lecture 4 - Kirchhoff'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](#)

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](#)

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

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 and 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](#)

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 reconstruction](#)

[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: Pointwise and uniform continuity of functions](#)

[Lecture 66 - Basic Analysis : Convergence of sequence of functions](#)

[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](#)

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 24

Lecture 25

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](#)

Lecture 1 - Introduction to Integrated Circuits (IC) Technology

Lecture 2 - Introduction to fabrication of IC: Substrates

Lecture 3 - Introduction to IC fabrication

Lecture 4 - Introduction to IC fabrication (Continued...)

Lecture 5 - Introduction to the fabrication of sensors

Lecture 6 - Introduction to fabrication technology

Lecture 7 - Introduction to fabrication technology (Continued...)

Lecture 8 - Introduction to fabrication technology (Continued...)

Lecture 9 - Introduction to fabrication technology (Continued...)

Lecture 10 - Introduction to fabrication technology (Continued...)

Lecture 11 - Process flow for Fabrication of MOSFETs

Lecture 12 - Operation of Enhancement type MOSFET

Lecture 13 - Operation of Depletion type MOSFET

Lecture 14 - MOSFETs Characteristics and Applications (Current Mirrors)

Lecture 15 - Introduction to Operational Amplifiers

Lecture 16 - Operational Amplifier Characteristics

Lecture 17 - Operational Amplifier Characteristics (Continued...)

Lecture 18 - Characteristics of an op-amp (Continued...)

Lecture 19 - Operational Amplifier Configurations

Lecture 20 - Operational Amplifier Configurations (Continued...)

Lecture 21 - Applications of Operational Amplifier: Differential Amplifier

Lecture 22 - Applications of Operational Amplifier: Integrator

Lecture 23 - Applications of Operational Amplifier: Differentiator

Lecture 24 - Introduction to Passive and Active Filters and op-amp as Low Pass Filter

Lecture 25 - Operational Amplifier as a High Pass Filter

Lecture 26 - Operational Amplifier as a Band Pass and Band Reject Filter

Lecture 27 - Introduction to Oscillator

Lecture 28 - RC Phase Shift Oscillator using Op-amp

Lecture 29 - Wein Bridge Oscillator using Op-amp

Lecture 30 - Hartley and Colpitts Oscillator using Op-amp

Lecture 31 - Working of Crystal Oscillators

[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: Power Supply](#)

[Lecture 40 - Experiment - Working with Laboratory Equipment: Function Generator, Oscilloscope](#)

[Lecture 41 - Experiment - Op-Amp Characteristics: Input Bias Current](#)

[Lecture 42 - Experiment - Op-Amp Characteristics: Input Offset Current](#)

[Lecture 43 - Experiment - Op-Amp Characteristics: Input Offset Voltage](#)

[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](#)

Lecture 1 - Quantum Mechanics: Concept of Wave Particle, Schrodingers Equation

Lecture 2 - Quantum Mechanics: Particle in a Box

Lecture 3 - Quantum Mechanics: Particle in a Box (Continued...), Harmonic Oscillator

Lecture 4 - Solids: Formation of Bands, Kronig-Penny Model

Lecture 5 - Solids: Kronig-Penny Model (Continued...)

Lecture 6 - Solids: Electrons and Holes

Lecture 7 - Solids: Electrons and Holes (Continued...)

Lecture 8 - Solids: Crystals

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: Electrostatics

Lecture 22 - Schottky Contact: Current-Voltage (IV) Characteristics

Lecture 23 - Schottky Contact: IV Characteristics (Continued...)

Lecture 24 - Schottky Contact: Small Signal Impedance

Lecture 25 - PN Junctions: Electrostatics

Lecture 26 - PN Junctions: IV Characteristics

Lecture 27 - PN Junctions: Small Signal Impedance

Lecture 28 - PN Junctions: Non-Idealities

Lecture 29 - Bipolar Junction Transistors (BJT)

Lecture 30 - BJT: IV Characteristics

Lecture 31 - BJT: Non-Idealities and Equivalent Circuit Modeling

[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](#)

[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: Fabrication of VOC Sensor](#)

[Lecture 13 - Micromachining: Fabrication of VOC Sensor \(Continued...\)](#)

[Lecture 14 - Micromachining: Fabrication of VOC Sensor and Cantilever](#)

[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 Interdigitated Electrodes](#)

[Lecture 20 - Process flow for Fabrication of Interdigitated 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: Flexible Force Sensor](#)

[Lecture 32 - Smart Catheter: Flexible Force Sensor \(Continued...\)](#)

[Lecture 33 - Tissue and Cell Culture Techniques](#)

[Lecture 34 - Clean Room: Equipments Required](#)

[Lecture 35 - GLP: Gowning Procedure for using Lab](#)

[Lecture 36 - Introduction to Equipments: Refridgerator](#)

[Lecture 37 - Gowning Procedure for using Biological Lab Setup](#)

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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](#)

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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 - AlGaIn/GaN HEMT: applications, structure, substrates and FOM

Lecture 30 - AlGaIn/GaN HEMT: device basics, current collapse and passivation

Lecture 31 - AlGaIn/GaN HEMT: gate process, field-plate and trade-offs in design

- Lecture 32 - AlGaIn/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