

OLD Syllabus

Course Code : ECL DC 102
Course Title : Solid State Devices
L-T-P/S=Credits : 3-0-0 = 0
Course Category : Departmental Core Course
Pre-requisite Courses (if any) :
Equal Course Code (if any) :
Equivalent Course Code (if any) :

Detailed Syllabus

Sr	Contents	Approx. Contact Hours
1	Introduction to Quantum Theory of Solids: basic principles of quantum mechanics, Schrodinger equation and its applications, atoms and formation of energy bands, electrical conduction in solids, density of states functions, bonding forces and energy bands in solids. Semiconductor in Equilibrium: charge carriers in semiconductors, carrier concentrations, dopant atoms and energy levels, intrinsic and extrinsic semiconductors, charge neutrality, Fermi energy level. Carrier Transport Phenomena: carrier drift, diffusion, graded impurity distribution, Hall effect, scattering in semiconductors, velocity-electric field relations, high field transport, charge injection, and quasi Fermi levels. Non-Equilibrium Excess Carriers in Semiconductors: carrier generation and recombination, characteristics of excess carriers, and excess carrier lifetime.	11
2	PN junction and hetero-structures: basic structure and principle of operation, PN junction under bias, junction capacitance, steady state conditions, transient and AC conditions, reverse bias breakdown, metal-semiconductor junctions. Diodes: PN junction I/V characteristics, diode equivalent circuits, semiconductor diodes, rectifiers (efficiency, ripple factor), filters, clippers, and clampers.	8
3	Bipolar Junction Transistors: fundamental operation, amplification with BJTs, generalized biasing and equivalent circuit models, non-ideal effects, switching. BJT construction, characteristics (CB, CE, CC), load line, and BJT biasing. Transistor Modeling: BJT small signal model, hybrid equivalent model, and FET small signal model.	9
4	Field-Effect Transistors: transistor operations, JFET, MOSFET and their operations, device characteristics, non-ideal effects, MOS junction C-V characteristics, threshold voltage, body effect, and equivalent circuits.	8

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	Solid State Electronic Devices Ben G Streetman and S. K. Banerjee Pearson	7th Edition
2	Electronic Devices and Circuits Christos C. Halkias, Jacob Millman, Satyabrata Jit Tata McGraw Hill Education Pvt Ltd.	Third Edition (2010)
3	Fundamentals of Microelectronics, 3rd Edition Behzad Razavi ISBN: 978-1-119-69514-1	April 2021
4	Microelectronic Circuits (The Oxford Series in Electrical and Computer Engineering) Sedra Smith	2009
Reference Books		

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Course Outcome

Sr	Course Outcome	CO
1	To learn the basic physics of semiconductor electronic devices.	CO1
2	The study the importance of electrons and holes in semiconductors, the charge density and distribution, the charge transport mechanisms.	CO2
3	To learn the physics of a p-n junction and semiconductor-metal junctions.	CO3
4	To learn the internal workings of the most basic solid state electronic devices.	CO4

COURSE CODE : ECP DC 102

COURSE TITLE : DEVICES LAB.

L-T-P/S=CREDITS : 0-0-2 = 1

COURSE CATEGORY : DEPARTMENT CORE COURSE

PRE-REQUISITE COURSES (IF ANY) :

EQUAL COURSE CODE (IF ANY) :

EQUIVALENT COURSE CODE (IF ANY) :

LIST OF EXPERIMENTS

Sr	Contents
1	To study the front panel control of Multimeter.
2	To study the front panel control of DC Multiple Power Supply
3	To study the front panel control of Cathode Ray Oscilloscope (CRO).
4	To study the front panel control of Function Generator.
5	To determine and plot the operating characteristics of a PN junction diode.
6	To study the characteristics of Zener Diode and its application as voltage regulator.
7	To study the input / output waveforms of Half-wave rectifier using diode and find out its ripple factor and efficiency.
8	To study the input / output waveform of Full-wave Bridge rectifier using diode and find out its ripple factor and efficiency.
9	To study different Clipper circuits using PN junction diode for both positive and negative configurations.
10	To study different Clamper circuits using PN junction diode.
11	To plot and determine the characteristics of common-emitter configuration of a transistor.
12	To plot and determine the characteristics of common-base configuration of a transistor.

SUGGESTED BOOKS:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	BASIC ELECTRONICS: DEVICES, CIRCUITS & IT FUNDAMENTALS, KAL, PHI	
2	ELECTRONIC DEVICES & CIRCUITS, MILMAN&HALKIAS	
3	Electronic Devices & Circuits, Theodore Bogart, Jr	
Reference Books		
1	Basic Electronics for Scientists	
2	Electronic Devices & Circuits, Boylestad, Nashelky, PHI	

Course Outcome

Sr	Course Outcome	CO
1	To learn basic concepts of Semiconductor Devices	CO1
2	To Study various BJT and MOS Devices	CO2
3	Learn and able to apply small signal BJT and FET analysis.	CO3
4	Able to understand advanced semiconductor devices.	CO4
5	To analyze and design amplifiers.	CO5

COURSE CODE : ECL DC 205

COURSE TITLE: ELECTRONIC DEVICES AND CIRCUITS

L-T-P/S=CREDITS : 3-0-0 =3

COURSE CATEGORY : DEPARTMENT CORE COURSE

PRE-REQUISITE COURSES (IF ANY) :

EQUAL COURSE CODE (IF ANY) :

EQUIVALENT COURSE CODE (IF ANY) :

DETAILED SYLLABUS

Detailed Syllabus

Sr	Contents	Approx. Contact Hours
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1	Transistor biasing and basic characteristics: operating point, bias stability, different biasing arrangements, stabilization, thermal runaway and thermal stability, small signal low frequency amplifiers, analysis of generalized amplifier models, transistor hybrid models, determination and measurement of h-parameters, analysis of transistor amplifier circuits using h-parameters.	9
2	Low frequency response of amplifiers: Cascading transistor amplifiers, calculations for different amplifier configurations, Emitter follower, Miller's theorem, Cascode transistor configurations, few configurations of high frequency response, Basic overview on difference and power amplifiers.	7
3	Basic overview on difference and power amplifiers. Large Signal Amplifier a) Difference between voltage and power amplifiers b) Importance of impedance matching in amplifiers c) Class A, Class B, Class AB, and Class C amplifiers d) Single ended power amplifiers, push-pull amplifier, and complementary symmetry push-pull amplifier	7
4	Feedback : Feedback concept, positive and negative feedback, different feedback configurations, Introduction to operational amplifiers: The difference amplifier and the ideal operational amplifier models, concept of negative feedback and virtual short;	6
5	MOS Basics, MOS Amplifier Topologies Biasing, Realization of Current Sources, Common-Source Stage, CS Core, CS Stage with Current-Source Load, CS Stage with different conditions, Common Gate Stage and Source Follower under different biasing conditions.	7

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	Electronic Devices and Circuits Christos C. Halkias, Jacob Millman, Satyabrata Jit Tata McGraw Hill Education Pvt Ltd.	Third Edition (2010)
2	Fundamentals of Microelectronics, 3rd Edition Behzad Razavi ISBN: 978-1-119-69514-1	April 2021
3	Microelectronic Circuits (The Oxford Series in Electrical and Computer Engineering) Sedra Smith	2009
Reference Books		
1		

Course Outcome

Sr	Course Outcome	CO
1	To introduce and verify basic principles, operation and applications of the various analog electronic circuits and devices like: BJT and MOSFET for various functions.	CO1
2	To make students understand and analyze the design and working of amplifiers and their configurations.	CO2
3	To Learn about frequency response of the amplifier configurations.	CO3
4	To Learn about feedback its configurations and impact on designed amplifiers.	CO4
5	To learn MOSFET as amplifier and work under different conditions	CO5

COURSE CODE : ECP DC 205

COURSE TITLE : ELECTRONIC DEVICES AND CIRCUITS LAB

L-T-P/S=CREDITS : 0-0-2 =1

COURSE CATEGORY : DEPARTMENT CORE COURSE

PRE-REQUISITE COURSES (IF ANY) :

EQUAL COURSE CODE (IF ANY) :

EQUIVALENT COURSE CODE (IF ANY) :

LIST OF EXPERIMENTS

Sr	Contents
1	Design a transistor bias circuit.
2	Study of h-parameters of Transistor
3	Design a two stage RC coupled amplifier-using BJT.
4	Design a bias circuit of FET
5	Design a single stage amplifier using FET.
6	Design a power supply with C filter.
7	Design a voltage regulator.
8	Design a push pull class B amplifier without input and output transformer.
9	Study of Feedback Amplifier
10	Input impedance output impedance of common emitter Amplifier and measurement of gain.
11	Exercises on circuit simulation using PSPICE

SUGGESTED BOOKS:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	INTEGRATED ELECTRONICS, MILLMAN&HALKIAS, TATA MC GRAW HILL	
2	MICROELECTRONICS, MILLMAN&GRABEL, TATA MC GRAW HILL	
3	Electronics Circuits, Schilling &Belove, McGraw Hill	
Reference Books		
1	Introduction to PSpice using OrCad for Circuits & Electronics, Rashid, Pearson Education	

COURSE CODE : ECL DC 202

COURSE TITLE : LINEAR INTEGRATED CIRCUITS APPLICATION

L-T-P/S=CREDITS : 3-0-0 =3

COURSE CATEGORY : DEPARTMENT CORE COURSE

PRE-REQUISITE COURSES (IF ANY) :

EQUAL COURSE CODE (IF ANY) :

EQUIVALENT COURSE CODE (IF ANY) :

DETAILED SYLLABUS

Sr	Contents	Approx. Contact Hours
1	Differential Amplifiers: Basics of Differential Amplifier, Transistorized Differential Amplifier, Configurations of Differential Amplifier, Analysis of Dual Input Balanced Output Differential Amplifier, Constant Current Bias, Current Mirror Circuit, Cascading of Differential Amplifiers.	
2	Introduction to Operational Amplifiers: The Ideal Op-Amp, Block diagram Representation of Op-Amp, Voltage Transfer Curve of Op-Amp, Integrated Circuit: Package Types, Pin Identification and Temperature- Ranges, Interpretation of Data sheets and Characteristics of an Op-Amp, Inverting and Non-Inverting Configuration, Ideal Open-Loop and Closed-Loop Operation of Op-Amp, Block diagram Representation of Feedback Configurations, Voltage-Series Feedback Amplifier, Voltage-Shunt Feedback Amplifier, Differential Amplifiers with One & Two Op-Amps.	
3	Frequency Response of an Op-Amp: Introduction, Frequency Response, Compensating Networks, Frequency Response of Internally Compensated Op-Amp, Frequency response of Non-compensated Op-Amp, Closed-Loop Frequency Response, Circuit Stability, Slew Rate.	
4	General Linear Applications: DC & AC Amplifiers, Peaking Amplifier, Summing, Scaling and Averaging amplifier, Instrumentation Amplifier, Voltage-to-Current Converter, Current-to-Voltage Converter, The Integrator, The Differentiator, Log and Antilog Amplifier, Peak Detector, Precision Rectifiers, Comparator, Zero Crossing Detector, Schmitt Trigger, Sample and Hold Circuit, Clippers and Clampers, A/D and D/A Converters.	
5	Active Filters and Oscillators: Active Filters:- Butterworth Filters, Band-Pass Filters, Band Reject Filters, All-Pass Filters. Oscillators and Wave Generators:- Phase Shift Oscillator, Wien Bridge Oscillator, Voltage-Controlled Oscillator(VCO), Square Wave Generator, Triangular Wave Generator, Saw-tooth Wave Generator.	
6	Specialized IC Applications: Introduction, Universal Active Filter, The 555 Timer, Monostable and Astable Multivibrator using IC 555, Phase-Locked Loop(PLL), Voltage Regulators.	

SUGGESTED BOOKS:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	OP-AMP AND LINEAR IC'S BY RAMAKANT A. GAYAKWAD, PRENTICE HALL	
2	DIGITAL INTEGRATED ELECTRONICS, BY TAUB AND SCHILLING, MCGRAW HILL	
3	Integrated Electronics, By Millman J. and Halkias C.C., McGraw Hill.	
Reference Books		

1	Op-Amp and Linear IC's, By Caughlier and Driscoll, PHI	
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Course Outcome

Sr	Course Outcome	CO
1	To understand the concept of differential amplifiers	CO1
2	To understand the basics of Operational amplifiers and its applications	CO2
3	To be able to perform the Frequency response analysis of Op-amp	CO3
4	To be able to design active filters and oscillators using Op-amp	CO4
5	To be introduced about some specialized IC applications of OP-amp	CO5

Course Code : ECL DC 204
Course Title : Analog Communication
L-T-P/S=Credits : 3-0-0 =3
Course Category : Department core Course
Pre-requisite Courses (if any) :
Equal Course Code (if any) :
Equivalent Course Code (if any) :

Detailed Syllabus

Sr	Contents	Approx. Contact Hours
1	Signals, and Transforms: Introduction: Signals, Fourier Series, Complex Fourier Spectrum, Fourier Transform, Convolution, Parseval's Theorem, Linear Systems; Hilbert Transform, Pre-envelope and Complex envelope of signals, Representation of BPS in terms of In-phase and Quadrature phase signals.	8
2	Analog Modulation: Concept Of Modulation, Amplitude modulation: Double-Sideband Suppressed Carrier, Double-Sideband Full Carrier, Single Sideband and vestigial sideband modulation; Demodulation: Carrier Recovery in AM,PLL, coherent Demodulation, Envelope Detector, Square-Law Demodulator; Integrated Circuit Modulators And Demodulators, Superheterodyne Receiver.	15
3	Angle Modulation: Frequency Modulation, Phase Modulation, Narrow Band Angle Modulation, Wideband FM, Modulators, Demodulators, Broadcast FM And Stereo, QAM.	10
4	Noise: Effects Of Noise In Analog Modulation Systems	4
5	Sampling and Pulse Modulations: Sampling, Pulse amplitude modulation, pulse width modulation, pulse position modulation.	4

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	Fundamentals of Communication Systems: J. G. Proakis and M. Salehi- Prentice Hall.	
2	Communication Systems:S. Haykin- John Wiley & Sons	
Reference Books		
1	Fundamentals of Communication Systems: J. G. Proakis and M. Salehi- Prentice Hall.	
2	Communication Systems: S. Haykin- John Wiley & Sons	

Course Outcome

Sr	Course Outcome	CO
1	To understand signals, their transformations, and various representations.	CO1
2	To Learn different amplitude modulation techniques and their demodulation methods.	CO2
3	To Study frequency and phase modulation, including narrowband and wideband FM and QAM.	CO3
4	Students can understand the effects of noise in analog communication systems.obtain the ability to analyze various aspects of sequential circuit design.	CO4
5	To learn sampling and different pulse modulation techniques (PAM, PWM, PPM).	CO5

NEW Syllabus

Course Code : ECL DC 102
 Course Title : Solid State Devices
 L-T-P/S=Credits : 3-0-0 = 0
 Course Category : Departmental Core Course

Sr	Contents	Approx. Contact Hours
1	Unit-0 Brief Introduction to Different types of voltage and current sources. VCCS, CCVS, VCCS and CCCS. Node and Mesh Analysis of circuits, Superposition and Thevenin Theorem.	4
2	Unit-1 Introduction to Semiconductors :- Intrinsic Semiconductors, Doped or Extrinsic Semiconductors, Current flow in Semiconductors, pn junction with an applied voltage, Reverse breakdown, Capacitive effects in the pn junction.	7
3	Unit-2 Diode Models and Circuits: Ideal diode, pn Junction as diode, Large Signal and small signal operation, Applications of Diodes, rectifiers, voltage doublers, diodes as level shifters and switches, clippers.	8
4	Unit-3 Bipolar transistors Bipolar transistor structure, Operation of Bipolar transistor in Active mode, Bipolar Transistor Models and Characteristics, Operation of Bipolar Transistor in Saturation mode, The PNP transistor structure and operation, Large and Small signal model.	11
5	Unit-4 Bipolar Amplifiers: Input and output impedance, Biasing, DC and small signal analysis, Operating point analysis and design for simple biasing, resistive divider biasing, biasing with emitter degeneration, self biased stage, biasing of PNP transistors. Bipolar amplifier topologies, CE, CB and emitter follower.	12

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	Solid State Electronic Devices Ben G Streetman and S. K. Banerjee Pearson	7th Edition
2	Fundamentals of Microelectronics, 3rd Edition Behzad Razavi ISBN: 978-1-119-69514-1	April 2021

3	Microelectronic Circuits (The Oxford Series in Electrical and Computer Engineering) Sedra Smith	2009
Reference Books		
1	R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, Pearson Education	2015
2	Donald A. Neamen, Semiconductor Physics and Devices, McGraw-Hill Education	2012
3	S. M. Sze and Kwok K. Ng, <i>Physics of Semiconductor Devices</i> , Wiley	2007

Course Outcome

S r	Course Outcome	CO
1	Explain and analyze the behavior of intrinsic and extrinsic semiconductors and PN junction devices under biasing conditions.	CO1
2	Apply diode models to analyze and design basic diode circuits such as rectifiers, clippers, and switches.	CO2
3	Analyze the operation and characteristics of bipolar junction transistors using large- and small-signal models.	CO3
4	Design and evaluate bipolar amplifier circuits with appropriate biasing and analyze CE, CB, and emitter follower configurations.	CO4



COURSE CODE : ECP DC 102
 COURSE TITLE : DEVICES LAB.
 L-T-P/S=CREDITS : 0-0-2 = 1
 COURSE CATEGORY : DEPARTMENT CORE COURSE
 PRE-REQUISITE COURSES (IF ANY) :
 EQUAL COURSE CODE (IF ANY) :
 EQUIVALENT COURSE CODE (IF ANY) :

LIST OF EXPERIMENTS

Sr	Contents
1	To study the digital multimeter. And dc multiple power supply
2	To study the front panel control of digital storage oscilloscope and the function generator
3	To determine and plot the operating characteristics of a pn junction diode.
4	To study the characteristics of zener diode and its application as voltage regulator.
5	To study the input / output waveforms of half-wave rectifier using diode and find out its ripple factor and efficiency.
6	To study the input / output waveform of full-wave bridge rectifier using diode and find out its ripple factor and efficiency.
7	To study different clipper circuits using pn junction diode for both positive and negative configurations.
8	To study different clamper circuits using pn junction diode.
9	To plot and determine the characteristics of common-emitter configuration of a transistor.
10	To plot and determine the characteristics of common-base configuration of a transistor.
11	to design bjt amplifier in common emitter configuration.
12	To design bjt amplifier in common base configuration.

SUGGESTED BOOKS:

Sr.	Name of book, author, publisher	Year of publication / reprint
Text books		

1	BASIC ELECTRONICS: DEVICES, CIRCUITS & IT FUNDAMENTALS, KAL, PHI	
2	ELECTRONIC DEVICES & CIRCUITS, MILMAN&HALKIAS	
3	Electronic devices & circuits, theodore bogart, jr	
Reference books		
1	Basic electronics for scientists	
2	Electronic devices & circuits, boylestad, nashelky, phi	

COURSE CODE : ECP DC 205

COURSE TITLE : ELECTRONIC DEVICES AND CIRCUITS LAB

L-T-P/S=CREDITS : 0-0-2 =1

COURSE CATEGORY : DEPARTMENT CORE COURSE

PRE-REQUISITE COURSES (IF ANY) :

EQUAL COURSE CODE (IF ANY) :

EQUIVALENT COURSE CODE (IF ANY) :

LIST OF EXPERIMENTS

Sr	Contents
1	Design a transistor bias circuit.to be used an amplifier.
2	Characteristics of 2N5486 or JFET
3	Characteristics of N channel MOSFET
4	To study SPICE simulator to be used in MOS based circuits.
5	Design a bias circuit of FET
6	Design a single stage amplifier using FET.

7	To design and analyze a source follower, focusing on voltage gain, output impedance, and buffering action.
8	To implement and study MOS and bipolar current mirrors, analyze current transfer ratio and output resistance.
9	To design and analyze a MOS differential amplifier, and measure differential gain and common-mode gain.
10	To experimentally determine low-frequency and high-frequency response of CS/CG amplifiers and verify Bode plots.
11	To implement a negative feedback amplifier, study gain desensitization, bandwidth extension, and analyze stability and phase margin.

SUGGESTED BOOKS:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	INTEGRATED ELECTRONICS, MILLMAN&HALKIAS, TATA MC GRAW HILL	
2	MICROELECTRONICS, MILLMAN&GRABEL, TATA MC GRAW HILL	
3	Electronics Circuits, Schilling &Belove, McGraw Hill	
Reference Books		
1	Introduction to PSpice using OrCad for Circuits & Electronics, Rashid, Pearson Education	

COURSE CODE : ECL DC 205
 COURSE TITLE: ELECTRONIC DEVICES AND CIRCUITS
 L-T-P/S=CREDITS : 3-0-0 =3
 COURSE CATEGORY : DEPARTMENT CORE COURSE
 PRE-REQUISITE COURSES (IF ANY) :
 EQUAL COURSE CODE (IF ANY) :
 EQUIVALENT COURSE CODE (IF ANY) :

S r	Contents	Approx. Contact Hours
1	MOS Transistors:- Structure of MOSFET, Operation of MOSFET(derivation of Current characteristics, Channel length modulation, MOS Transconductance, Velocity saturation) , MOS Device Models(Large signal model and small signal model), PMOS Transistor, CMOS Technology	8
2	CMOS Amplifiers: MOS Amplifier topologies, Biasing, realization of current sources, Common Source stage with Core, Current Source Load , degeneration and CS core with Biasing. Common Gate stage with biasing. Source follower with core and Biasing.	8
3	Cascode Stages and Current Mirrors Cascode stage as a current source and an amplifier, Current Mirrors using bipolar and MOS. Differential amplifiers :- Bipolar differential pair, MOS Differential pair.	8
4	Frequency Response of Amplifiers Fundamental concepts of frequency response including general considerations, relationship between transfer function and frequency response, Bode plots and rules, pole–node association, Miller’s theorem, and overall frequency response; high-frequency models of bipolar transistors and MOSFETs, transit frequency, and frequency limitations; systematic procedure for frequency response analysis; low- and high-frequency response of CE/CS amplifiers using Miller’s theorem and direct analysis with input impedance considerations; frequency response of CB/CG stages, emitter/source followers with input and output impedances; frequency response of cascode amplifiers and differential pairs including common-mode frequency response.	9

5	Feedback in Amplifiers General considerations of feedback and loop gain; properties of negative feedback including gain desensitization, bandwidth extension, modification of input and output impedances, and improvement in linearity; classification of amplifiers with simple amplifier models and examples; sensing and return techniques and polarity of feedback; feedback topologies—voltage–voltage, voltage–current, current–voltage, and current–current; effect of nonideal input/output impedances with inclusion of I/O effects; stability of feedback systems including review of Bode’s rules, instability issues, stability conditions, phase margin, frequency compensation, and Miller compensation.	9
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Detailed Syllabus

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	Adel S. Sedra and Kenneth C. Smith, <i>Microelectronic Circuits</i> , 8th Edition, Oxford University Press.	2009
2	Robert L. Boylestad and Louis Nashelsky, <i>Electronic Devices and Circuit Theory</i> , Pearson Education, 2009.	2009
3	<i>Fundamentals of Microelectronics</i> , 3rd Edition Behzad Razavi ISBN: 978-1-119-69514-1	2021
Reference Books		
1	Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, and Robert G. Meyer, <i>Analysis and Design of Analog Integrated Circuits</i> , Wiley, 6 th Edition.	2024

Course Outcome

S r	Course Outcome	CO
1	Explain and analyze the structure, operation, and characteristics of MOS transistors including large- and small-signal models, PMOS operation, and CMOS technology.	CO1

2	Analyze and design CMOS amplifier topologies with appropriate biasing, current sources, and load configurations such as common-source, common-gate, and source follower stages.	CO2
3	Analyze cascode stages and current mirrors using MOS and bipolar devices and evaluate their performance as current sources and amplifiers.	CO3
4	Analyze the frequency response of amplifiers using transfer functions, Bode plots, high-frequency models, and Miller's theorem for various amplifier configurations.	CO4
5	Evaluate feedback amplifier systems for gain, bandwidth, stability, and impedance modification and apply compensation techniques to ensure stable operation.	CO5

Course Code : ECL DC 202
 Course Title : Linear Integrated Circuits and Applications
 L-T-P/S=Credits : 3-0-0 =3
 Course Category : Department Core Course
 Pre-requisite Courses (if any) :
 Equal Course Code (if any) :
 Equivalent Course Code (if any) :

Detailed Syllabus

Sr	Contents	Approx. Contact Hours
1	Output Stages and Power Amplifiers Introduction to output stages and power amplifiers; classification of output stages; Class-A output stage in, Class-B, Class-AB , Class C ,Class-D power amplifiers,	6
2	Operational Amplifiers Introduction to operational amplifiers; ideal op-amp concept including terminals, functions, characteristics, and differential and common-mode signals; inverting amplifier configuration covering closed-loop gain, effects of finite open-loop gain, input and output resistances, and applications such as weighted summing; non-inverting amplifier configuration including closed-loop gain, effect of finite open-loop gain, input/output resistance, and voltage follower.	7
3	Operational Amplifier based circuits: Difference amplifiers including single op-amp difference amplifier and instrumentation amplifier; op-amp integrators and differentiators using inverting configurations with general impedances; DC imperfections such as offset voltage, input bias and offset currents and their effect on circuit operation; impact of finite open-loop gain and bandwidth on frequency response of closed-loop amplifiers; large-signal operation of op-amps including output saturation, current limits, slew rate, and full-power bandwidth. Non linear function operations :- Logarithmic Amplifiers, Antilogarithmic amplifiers and Analog Multipliers, Sample and Hold Circuits.	10

4	<p>Filters and Tuned Amplifiers</p> <p>Introduction to filters and tuned amplifiers; filter transmission characteristics, types, and specifications; filter transfer function; Butterworth and Chebyshev filters; first-order and second-order filter functions; second-order LCR resonator including natural modes and realization of transmission zeros; realization of low-pass, high-pass, band-pass, notch, and all-pass filter functions; second-order active filters based on inductor replacement, including Antoniou inductance-simulation circuit, op-amp RC resonator, and realization of various filter types.</p>	10
5	<p>Signal Generators and Waveform-Shaping Circuits</p> <p>Introduction to signal generators and waveform-shaping circuits; basic principles of sinusoidal oscillators including oscillator feedback loop, oscillation criterion, analysis of oscillator circuits, nonlinear amplitude control, and limiter circuits for amplitude stabilization; op-amp RC oscillators such as Wien-bridge, phase-shift, quadrature, and active-filter-tuned oscillators; LC and crystal oscillators including Colpitts, Hartley, cross-coupled LC, and crystal oscillators; multivibrators including bistable, astable, and monostable circuits with feedback loop analysis, transfer characteristics, triggering, memory applications, and comparator operation; generation of square and triangular waveforms using astable multivibrators; IC timers including the 555 timer and its use in monostable and astable configurations; nonlinear waveform-shaping circuits using breakpoint and nonlinear-amplification methods.</p>	9

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits, 8th Edition, Oxford University Press.	2009
2	Fundamentals of Microelectronics, 3rd Edition Behzad Razavi ISBN: 978-1-119-69514-1	2021
3	Operational Amplifiers & Linear Ics, Ramakant A. Gayakwad Pearson	2018
4	Design with Operational Amplifiers and Analog Integrated Circuits Sergio Franco, McGraw-Hill.	2014
5	Op-Amps and Linear Integrated Circuits, David A. Bell, Oxford University Press	2014
Reference Books		
1	Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, and Robert G. Meyer, <i>Analysis and Design of Analog Integrated Circuits</i> , Wiley, 6 th Edition.	2024

Course Outcome

Sr	Course Outcome	CO
1	Understand the characteristics, classification, and operation of output stages and power amplifiers, including Class-A, B, AB, and D.	CO1
2	Analyze and design operational amplifier circuits, including inverting, non-inverting, difference, integrator, and differentiator configurations.	CO2
3	Design and evaluate active and passive filters, oscillators, and waveform shaping circuits, including sinusoidal and multivibrator circuits.	CO3
4	Apply concepts of nonlinear and IC-based circuits, addressing practical issues like offset, slew rate, and thermal considerations.	CO4
5	Evaluate circuit performance and implement solutions for stability, efficiency, and accuracy in analog systems.	CO5

Course Code : ECP DC 203
Course Title : Digital Electronics Lab
L-T-P/S=Credits : 0-0-2 =1
Course Category : Department core Course
Pre-requisite Courses (if any) :
Equal Course Code (if any) :
Equivalent Course Code (if any) :

List of Experiments

Sr	Contents
1	Introduction to Digital Electronics Lab- Nomenclature of Digital ICs, Specifications, Study of the Data Sheet, Concept of V-CC and Ground, Verification of the Truth Tables of Logic Gates using TTL ICs.
2	To Study and Verify NAND and NOR as a Universal Gate.
3	To Design & Verify Operation of Half Adder & Full Adder.
4	To Study & Verify Half Subtractor and Full Subtractor.
5	Implementation of 4x1 Multiplexer using IC 74153.
6	Implementation of Seven segment decoder.
7	Implementation and Verification of Decoder/Demultiplexer using IC74139.
8	Verification of State Tables of Rs, J-k, T and D Flip-Flops using NAND & NOR Gates
9	To Design & Verify the Operation of Magnitude Comparator.
10	Design, and Verify the 4-Bit Asynchronous Counter.

11	To design and implement a binary to gray and gray to binary converter.
12	Introduction to FPGA and projects.

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	“Digital Fundamentals” by Thomas L. Floyd, Prentice Hall, Inc	
2	“Digital Systems - Principles and Applications” by Tocci, R. J. and Widner, Prentice Hall	
3	Switching and finite automata theory: Z V Kohavi.–TMH	
4	Digital Logic Circuit Analysis & Design, by Victor P. Nelson, H. Troy Nagle, Bill D. Carroll and J. David Irwin, Prentice Hall,	
5	Digital logic and computer design: M Morris Mano –PHI	
6	Modern digital electronics: R.P. Jain. TMH	

Reference Books		
1	Digital Design: Principles and Practices, by Wakerly J F, Prentice-Hall,	
2	“Digital Experiments Emphasizing Systems and Design,” by David Buchla, Prentice Hall, Inc	

Course Outcome

Sr	Course Outcome	CO
1	Identify different logic gates ICs and verify their truth table.	CO1
2	Illustrate realization of Boolean expression in SOP and POS form.	CO2
3	Examine various arithmetic and logical combinational circuit.	CO3
4	Implement synchronous and asynchronous sequential circuits.	CO4
5	Implement applications of combinational & sequential logic circuits.	CO5

Course Code : ECL DC 204
Course Title : Analog Communication
L-T-P/S=Credits : 3-0-0 =3
Course Category : Department Core course
Pre-requisite Courses (if any) :
Equal Course Code (if any) :
Equivalent Course Code (if any) :

Detailed Syllabus

Sr	Contents	Approx. Contact Hours
1	Introduction: Historical Review, Elements of an Electronic Communication System, Communication Channel and their Characteristics, Mathematical Models for Communication Channels.	
2	Frequency Domain Analysis of Signals and Systems: The Fourier Transform, Properties of the Fourier Transform, Rayleigh's Energy Theorem, the inverse relationship between time and frequency, Dirac Delta Function, Fourier transform of Periodic signals, transformation of signals through Linear systems, Paley-Wiener Criterion, Hilbert transform, Band Pass signals, Transmission of Band Pass signals, Phase and group delay.	
3	Analog Signals Transmission and Reception: Introduction, Amplitude Modulation, Double side Band Suppressed carrier Amplitude Modulation, Single side band Amplitude Modulation, Vestigial side band Modulation, Implementation of AM Modulators and De-Modulators, Frequency division Multiplexing, Analog Modulation, representation of FM and PM signals, Spectral Characteristic of Analog Modulated Signals, Implementation of Angle Modulators and De-Modulators, AM Radio Broadcasting, FM Radio Broadcasting	
4	Effect of Noise on Analog communication System: White noise, shot noise, thermal noise, noise equivalent bandwidth, Effect of Noise on AM, Effect of Noise on DSB-SCAM, Effect of Noise on SSBAM, Carrier Phase Estimation with Phase Locked loop, Effect of Noise on Angle Modulation, Threshold Effect in Angle Modulation, Pre-emphasis and De-emphasis in FM.	

Suggested Books:

Sr.	Name of Book, Author, Publisher	Year of Publication / Reprint
Text Books		
1	Communication Systems, Simon Haykin, John Wiley & Sons	
2	Communication Systems Engineering, Proakis&Salehi, Pearson Education	
3	Radio Engineering, G.K. Mithal	
Reference Books		
1	Electronic Communication, Roody&Coolen	

2	Electronic Communication, Kennedy	
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Course Outcome

Sr	Course Outcome	CO
1	Able to understand basic concept of signals and Fourier transform.	CO1
2	Able to learn amplitude modulation and angle modulation.	CO2
3	Able to learn the basic design concept of communication transmitters and receivers.	CO3
4	Acquire knowledge of random signal theory.	CO4
5	Able to learn noise analysis in communication systems.	CO5