

Course Title : Analog Integrated Circuit

Course Instructor : Syed Arsalan Jawed

	Topics	Hours
1	Introduction to Basic Circuit-Design and Micro-Electronics Concepts <ul style="list-style-type: none">- Overview of Semiconductor Physics- Overview of MOS Device Structure and Operation- Overview of MOS Fabrication Process cycle- Review of Circuit Elements and Circuit-Analysis Techniques- Review of Poles and Zeros in Circuits- Development of MOS small-signal model- Introduction to MOS design parameters; gm, gds, Rin, Rout etc- Introduction to the analog design trade-off octagon	9
2	DC Biasing and Quiescent Point Selection for MOSFETs <ul style="list-style-type: none">- Current Mirrors- Cascode Current Mirrors- Low Voltage Current Mirrors	3
3	Single-Stage MOSFET Amplifiers <ul style="list-style-type: none">- Identification for Critical Parameters for an Amplifier- Common-Source Amplifier with resistive load<ul style="list-style-type: none">o Large and Small Signal Analyses- Common-Source Amplifier with Current Source Loads<ul style="list-style-type: none">o Large and Small signal Analyses- Common-Gate Amplifier<ul style="list-style-type: none">o Large and Small Signal Analyses- Common-Drain Amplifier<ul style="list-style-type: none">o Large and Small Signal Analyses	9
4	MOSFET Differential Pair <ul style="list-style-type: none">- Motivations behind employing a differential topology- With resistive loads- with current source loads- common-mode feedback- CMRR, PSRR	3
5	Noise in Analog Circuits <ul style="list-style-type: none">- Types of Noises- Modeling and Analysis of Noise- Noise Bandwidth, Fold-over- Noise Transfer Function in different amplifier configurations	3
6	Feedback in Analog Circuits <ul style="list-style-type: none">- Review of feedback in linear systems- Different feedback configurations- Stability criteria- Effect of feedback on gain, bandwidth and noise	3
7	Output Stages	3

	<ul style="list-style-type: none"> - Class A - Class B - Class AB 	
8	Systematic Design of Complete Amplifiers <ul style="list-style-type: none"> - Operational Transconductance Amplifier - Operational Amplifier 	3
9	Switched-Capacitor Circuits <ul style="list-style-type: none"> - Overview of sampling - Overview of transformation between s-domain and z-domain - Emulation of a resistor with switches and capacitor - Parasitic-insensitive Integrator - Enhancement techniques; CDS, AZ, Chopping 	3
10	Advanced Topics (students are expected to undertake one of these as their mini-project) <ul style="list-style-type: none"> - Data Converters <ul style="list-style-type: none"> o Nyquist Rate o Oversampled - Switched-Capacitor/Continuous-Time BiQuad Bandpass Filter - Phase-Locked-Loops 	6

Text Books

Design of CMOS Analog Integrated Circuits by Behzad Razavi

Microelectronic Circuits by Adel Sedra, 6th Edition.

Reference Books

Analog Integrated Circuit Design by David Johns and Ken Martin

CMOS Circuit Design, Layout and Simulations by R. Jacob Baker

Switched Capacitor Circuits by Philip E. Allan

Design of Analog Filters by Ralph Schaumann

Analysis and Design of Analog Integrated Circuits by Paul R. Gray

CAD Tools Employed

LTSpice, freely available from <http://www.linear.com/designtools/software/>