CMOS/BiCMOS Analog Integrated Circuit Design

Introduction

The development of VLSI technology, coupled with the demand for more signal processing integrated on a single chip, has resulted in an increased need for the design of effective Analog Integrated Circuits. It is clear that analog circuits and systems have an important role in the implementation and application of VLSI technology. Course Aims This course has been designed:

To provide a state-of-the-art review of the principles, concepts and techniques needed to carry out the successful design of CMOS and BiCMOS analog integrated circuits.

To expose participants to the methods used in the processing and design of such circuits, including electrical modelling, characterisation of the process parameters, SPICE simulation techniques, testability considerations, and methods of experimental verification.

To combine an academic viewpoint with practical examples and experience from industry.

Who Should Attend?

The course has been designed for circuit designers who need to implement analog integrated circuits using CMOS/BiCMOS technology. The programme will provide experienced analog circuit designers with a valuable updating on the latest and forthcoming developments in the field. It will give novices, and those considering entering the field, an indispensable grounding in the fundamentals of the technology, and ways in which it can be implemented successfully. Participants should have a general knowledge of analog circuits, electrical circuit analysis, and familiarity with integrated circuit technology.
The course will consist of a series of well-illustrated lectures on the above topics, interspersed with ample opportunities for participants to discuss the material and its bearing on their own practical problems with one of the leading international authorities in the field of analog circuit design. Participants will receive a copy of Professor Allen s text book and relevant course notes to support the lectures.

Presenter

The course will be presented by Professor Phillip Allen who holds the Schlumberger Chair in Micro-Electronics at Georgia Institute of Technology in Atlanta, USA.

Prof. Allen is widely regarded as one of the foremost international authorities on analog circuit design. He has worked and consulted with many companies, including Lawrence Livermore Laboratory, General Motors (Delco), Pacific Missile Range, Texas Instruments and Lockheed Research Laboratory. Phillip Allen has carried out research and teaching in several universities in the USA, including Nevada, Reno, Kansas, California and Texas.

His publications include Introduction to Theory and Design of Active Filters (1980), Switched Capacitor Circuits (1984) and CMOS Analog Circuit Design (1987), VLSI Design Techniques for Analog and Digital Circuits (1990).

Comments From Previous Course Participants

The best technical course I have attended from both the course material and the presenter...recommended for people interested in design at ALL levels
The course content and support documentation was very good

Prof. Allen s excellent way of presenting the course material...very worthwhile attending
Excellent coverage of huge subject in short time...An excellent 12 week course neatly fitted into 5 days
Informative, enjoyable, full of excellent circuit ideas...I learned a lot!
Best feature of the course is the explanations of the concepts required for analog design without all the equations
Intuitive approach to circuit design...detailed circuit analysis
Highly recommended for experienced and new engineers requiring an improvement in analog design
Several new design ideas which I as a bipolar designer, found very useful...
I am now far more confident of success with my analog CMOS designs
Excellent! The most useful course I have ever been on. I would have paid for this personally (but I m glad I didn t have to)
I could improve my knowledge of analog circuits very much. It s a very application orientated course. The understanding of circuits become possible
An excellent course for a digital designer seeking a broad-based understanding of the issues involved in analog IC design.
This course takes the ‘anal out of analogue design. A most enjoyable week.
An excellent choice of course for an excellent choice of career

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COURSE CONTENT

Introduction and Background
Analog IC Design
Technology Impact on Analog IC Design
Analog Signal Processing
Notation
Symbology and Terminology

Introduction to Technology
Basic MOS Semiconductor Fabrication Processes
CMOS Technology
PN Junction
MOS Transistor
Passive Components
BiCMOS Technology

Analog Circuit Modelling
Simple MOS Large-signal Model
Modifications for Submicron Technology
Small-signal MOS Model
BJT Large-signal Model
BJT Small-signal Model
SPICE2 Model
Other Computer Models

Analog Subcircuits
The MOS Switch
MOS Diode
Current and Voltage References
Current Mirrors
MOS and Bipolar Current Source/Sinks

Amplifiers
Simple Inverters
Current Amplifiers
Cascode Amplifiers
Differential Amplifiers
Output Amplifiers
High Gain Architectures

Operational Transconductance Amplifiers
General Design Principles of Op Amps
Compensation of OTA's
Two-stage CMOS OTA Design
Cascode Op Amps
Macromodels for Op Amps
Power Supply Rejection Ratio of the Two-Stage Op Amp
Simulation and Measurement Techniques

High Performance Op Amps
Buffered Amplifiers
High-Speed/Frequency Op Amps
Differential Output Op Amps

Micropower Op Amps
Low Noise Op Amps
Low Power Supply Op Amps

Comparators
Characterization of Comparators
Two-stage Open-loop Comparator
Other Open-loop Comparators
Improving the Performance of Open-loop Comparators
Discrete-time comparators
High-speed comparators

Digital-Analog & Analog-Digital Converters
Current Scaling D/A Converters
Voltage Scaling D/A Converters
Charge Scaling D/A Converters
Voltage and Charge Scaling D/A Converters
Other Types of D/A Converters
Characterization and Definition of A/D Converters
Oversampled A/D Converters
Characterization and Definition of D/A and A/D Converters
Medium-Speed A/D Converters
High-Speed A/D Converters
Serial A/D Converters
State of the Art A/D Converters
Limits of A/D Converters