Training Course on Advanced Analog Integrated Circuit (IC) Design

Professional Development Training Course Outline

Category	Engineering	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Introduction

The Advanced Analog Integrated Circuit (IC) Design Training Course is a comprehensive program tailored for engineers, researchers, and technical professionals who seek to deepen their expertise in analog and mixed-signal IC design. In an age where high-performance analog systems, low-power electronics, and smart sensor integration are at the heart of technological advancement, mastering analog IC design is crucial. Training Course on Advanced Analog Integrated Circuit (IC) Design provides cutting-edge knowledge and practical tools for designing, simulating, and verifying complex analog circuits used in IoT devices, biomedical instruments, telecommunications, and automotive applications.

This hands-on course integrates real-world case studies, advanced simulation techniques, and the latest industry tools such as Cadence Virtuoso, LTspice, and Spectre RF. Participants will explore topics such as bandgap references, low-noise amplifiers (LNAs), operational transconductance amplifiers (OTAs), phase-locked loops (PLLs), and analog-to-digital converters (ADCs). By the end of the course, learners will be equipped to innovate, troubleshoot, and optimize analog circuits for high efficiency, precision, and market competitiveness.

Programme Curriculum

Training Course on Advanced Analog Integrated Circuit (IC) Design

Introduction

The Advanced Analog Integrated Circuit (IC) Design Training Course is a comprehensive program tailored for engineers, researchers, and technical professionals who seek to deepen their expertise in analog and mixed-signal IC design. In an age where high-performance analog systems, low-power electronics, and smart sensor integration are at the heart of technological advancement, mastering analog IC design is crucial. Training Course on Advanced Analog Integrated Circuit (IC) Design provides cutting-edge knowledge and practical tools

for designing, simulating, and verifying complex analog circuits used in IoT devices, biomedical instruments, telecommunications, and automotive applications.

This hands-on course integrates real-world case studies, advanced simulation techniques, and the latest industry tools such as Cadence Virtuoso, LTspice, and Spectre RF. Participants will explore topics such as bandgap references, low-noise amplifiers (LNAs), operational transconductance amplifiers (OTAs), phase-locked loops (PLLs), and analog-to-digital converters (ADCs). By the end of the course, learners will be equipped to innovate, troubleshoot, and optimize analog circuits for high efficiency, precision, and market competitiveness.

Course duration

10 Days

Course Objectives

1. Understand the fundamentals of analog and mixed-signal IC design.
2. Analyze the role of low-power design techniques in analog circuits.
3. Design and simulate operational amplifiers (Op-Amps) using industry tools.
4. Implement high-frequency and RF analog circuits.
5. Explore advanced CMOS technologies for analog design.
6. Build and optimize data converters (ADC/DAC).
7. Apply noise analysis and signal integrity methods.
8. Design bandgap voltage references and current mirrors.
9. Understand layout techniques for analog performance.
10. Apply DFM (Design for Manufacturability) in analog IC projects.
11. Perform Monte Carlo and corner analysis for design reliability.
12. Integrate power management circuits such as LDOs and DC-DC converters.
13. Apply machine learning for analog IC verification (emerging trend).

Organizational Benefits

1. Boost innovation in product development and analog systems.
2. Reduce time-to-market through optimized design practices.
3. Improve reliability of analog IC products.
4. Enhance technical competency and in-house design capacity.
5. Strengthen competitive advantage in high-tech markets.
6. Promote knowledge transfer and engineering excellence.
7. Support R&D with skilled design capabilities.
8. Foster cross-functional collaboration in hardware development.
9. Reduce design errors and silicon iterations.
10. Cultivate a team of industry-ready analog design engineers.

Target Participants

- Analog and Mixed-Signal Design Engineers
- Electrical and Electronics Engineers
- IC Layout Engineers

- Research Scientists in Semiconductor Technology
- Embedded Systems Designers
- University Lecturers and Postgraduate Students in EEE
- Product Development Engineers
- RF and Wireless Communication Engineers

Course Outline

Module 1: Introduction to Analog IC Design

- Analog vs. Digital Design
- Overview of CMOS Processes
- Design Flow and EDA Tools
- Case Study: Analog Front-End in ECG Monitors
- Design Challenges in Submicron Nodes

Module 2: Device Physics and MOS Transistor Models

- MOS Operation Modes
- Small-Signal Models
- Short-Channel Effects
- Threshold Voltage Variation
- Case Study: Device Mismatch in Analog Design

Module 3: Current Mirrors and Biasing

- Basic and Cascode Mirrors
- Start-Up Circuits
- Current Reference Stability
- Temperature Compensation
- Case Study: Bias Circuit in Temperature Sensors

Module 4: Operational Amplifiers (Op-Amps)

- Single and Two-Stage Op-Amps
- Compensation Techniques
- Slew Rate and PSRR
- Op-Amp Design Tradeoffs
- Case Study: Op-Amp in Audio Circuits

Module 5: Frequency Response and Stability

- Bode Plot Interpretation
- Gain and Phase Margins
- Miller Compensation
- Poles and Zeros
- Case Study: LDO Stability Analysis

Module 6: Noise and Distortion Analysis

- Thermal and Flicker Noise
- SNR and Dynamic Range
- Distortion Metrics

- Noise Modeling in Tools
- Case Study: Noise Optimization in LNAs

Module 7: Data Converters (ADC/DAC)

- Flash and SAR ADCs
- Sigma-Delta Converters
- R-2R DACs
- INL and DNL Analysis
- Case Study: ADC Design for Audio Applications

Module 8: Bandgap References and Voltage Regulators

- Bandgap Design Basics
- PTAT and CTAT Circuits
- LDO and DC-DC Converter Design
- Load/Line Regulation
- Case Study: Power Management in IoT Nodes

Module 9: Layout Techniques and Parasitics

- Matching and Symmetry
- Guard Rings and Shielding
- Parasitic Extraction
- Latch-Up Prevention
- Case Study: Layout Impact on Offset Voltage

Module 10: High-Frequency Analog Design

- RF Amplifier Design
- Impedance Matching Networks
- Transmission Line Effects
- On-Chip Inductors and Capacitors
- Case Study: PLL Design for GHz Range

Module 11: OTA and Filters Design

- OTA Structures
- Gm-C Filters
- Switched-Capacitor Filters
- Active Filter Design
- Case Study: Biomedical Filter Circuits

Module 12: Phase Locked Loops (PLLs)

- Phase Detectors and Charge Pumps
- VCO and Loop Filter Design
- Frequency Synthesis
- Lock Range and Jitter
- Case Study: PLL in Wireless Transceivers

Module 13: Advanced Simulation and Verification

- Monte Carlo Simulation

- Corner Analysis
- Mismatch and Yield Analysis
- Behavioral Modeling
- Case Study: Post-Layout Simulation Debugging

Module 14: Machine Learning in Analog Design

- Data-Driven Modeling of Analog Circuits
- Fault Prediction Algorithms
- AI in Layout Optimization
- ML-Assisted Verification
- Case Study: Predictive Modeling in SAR ADCs

Module 15: Project Implementation & Review

- Project Planning and Spec Development
- Full Chip Design Walkthrough
- Group Design Review
- Case Study Presentation
- Certificate of Completion and Feedback

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com