

RF/Wireless Training Courses



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**Besser Associates
Web Classroom**SM

Attend classes from your desk!

**EMC/Shielding/Grounding Techniques for
Chip & PCB Layout**

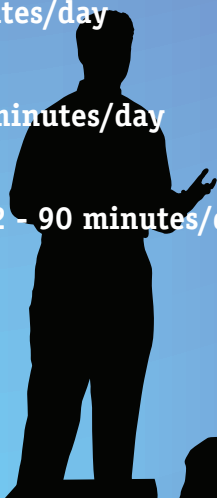
Jan 23-27, 2012 - 90 minutes/day

New! Impedance Matching Tutorial
February 9, 2012

GaN Power Amplifier Design
March 12-16 - 90 minutes/day

RF Fundamentals
Jun 25-29, 2012 - 90 minutes/day

Power Amplifier ABC's
September 10-14, 2012 - 90 minutes/day



San Diego: February 2012

- Applied RF Techniques I • Understanding Digital Signal Processing (DSP) • Frequency Synthesis and Phase-Locked Loop Design
- Applied Design of RF/Wireless Products and Systems • Wireless LANs • Digital Predistortion Techniques For RF Power Amplifier Systems

San Jose: March 2012

- Transceiver and Systems Design for Digital Communications • Practical Digital Wireless Signals - Measurements and Characteristics • RF and High Speed PC Board Design Fundamentals • LTE & LTE-Advanced: A Comprehensive Overview • RF Measurements: Principles & Demonstration
- CMOS RF Design

Boston: May 2012

- BER and EVM Testing for Test & Product Engineers • Antennas & Propagation for Wireless Communications • Modern Digital Modulation Techniques • Radio System Design - Theory and Practice • Power Conversion & Regulation Circuits for VLSI Systems :4-day • Wireless/Computer Network Security

San Jose: August 2012

- Applied RF Techniques I • Applied RF II: Advanced Wireless and Microwave Techniques • RF Power Amplifier Techniques
- Advanced Radio System Architectures
- Power Amplifier ABC's

Besser Associates' On-site Courses

can be conducted at any US or International location and any course can be customized to fit the specific needs of your group.

Many of our courses can also be offered to your company via our Corporate-Exclusive Web Classroom - an increasingly popular choice!

San Jose • Boston • San Diego • On-Site • Web Classroom

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Schedule at a Glance

Web Classroom Courses		Dates	Earlybird Deadline & Price	Reg. Price
140-4460	EMC/Shielding/Grounding Techniques for Chip & PCB Layout	Jan 23-27	Jan 16... \$449.00	\$495.00
229-4488	Introduction to Impedance Matching	Feb 9	Dec 31.... \$59.00	\$99.00
228-4485	GaN Power Amplifier Design	Mar 12-16	Mar 5... \$449.00	\$495.00
059-4461	RF Fundamentals	Jun 25-29	June 18... \$449.00	\$495.00
216-4489	Power Amplifier ABC's	Sep 10-14	Sep 3... \$449.00	\$495.00

San Diego, CA February/March 2012		Dates	Earlybird Deadline & Price	Reg. Price
161-4466	Applied Design of RF/Wireless Products and Systems	Feb 27-29	Jan 23. \$1,495.00	\$1,595.00
001-4463	Applied RF Techniques I	Feb 27-Mar 2	Jan 23. \$2,095.00	\$2,295.00
170-4465	Digital Predistortion Techniques For RF Power Amp Systems	Mar 1-2	Jan 23... \$995.00	\$1,095.00
052-4467	Frequency Synthesis and Phase-Locked Loop Design	Feb 27-29	Jan 23. \$1,495.00	\$1,595.00
027-4464	Understanding Digital Signal Processing (DSP)	Feb 27-29	Jan 23. \$1,495.00	\$1,595.00
227-4468	Wireless LANs	Feb 27-29	Jan 23. \$1,495.00	\$1,595.00

San Jose, CA March/April 2012		Dates	Earlybird Deadline & Price	Reg. Price
225-4483	LTE & LTE-Advanced: A Comprehensive Overview	Mar 19-21	Feb 13. \$1,495.00	\$1,595.00
210-4462	Practical Digital Wireless Signals - Meas & Characteristics	Mar 19-23	Feb 13. \$2,095.00	\$2,295.00
042-4428	RF and High Speed PC Board Design Fundamentals	Mar 19-21	Feb 13. \$1,495.00	\$1,595.00
208-4470	Transceiver and Systems Design for Digital Communications	Mar 19-21	Feb 13. \$1,495.00	\$1,595.00
206-4422	CMOS RF Design	Apr 23-25	Mar 30. \$1,495.00	\$1,595.00
135-4469	RF Measurements: Principles & Demonstration	Apr 23-27	Mar 30. \$2,395.00	\$2,495.00

Boston Area, MA May 2012		Dates	Earlybird Deadline & Price	Reg. Price
037-4474	Antennas & Propagation for Wireless Communications	May 21-23	Apr 16. \$1,495.00	\$1,595.00
221-4471	BER and EVM Testing for Test & Product Engineers	May 21-25	Apr 16. \$2,495.00	\$2,695.00
016-4475	Modern Digital Modulation Techniques	May 21-25	Apr 16. \$2,095.00	\$2,295.00
224-4472	Power Conversion & Regulation Circuits for VLSI Systems	May 22-25	Apr 16. \$1,795.00	\$1,895.00
180-4476	Radio System Design - Theory and Practice	May 21-25	Apr 16. \$2,095.00	\$2,295.00
226-4473	Wireless/Computer Network Security	May 23-25	Apr 16. \$1,495.00	\$1,595.00

San Jose, CA August 2012		Dates	Earlybird Deadline & Price	Reg. Price
214-4491	Advanced Radio System Architectures	Aug 22-24	Jul 16. \$1,595.00	\$1,695.00
086-4492	Applied RF II: Advanced Wireless and Microwave Techniques	Aug 20-24	Jul 16. \$2,095.00	\$2,295.00
001-4490	Applied RF Techniques I	Aug 20-24	Jul 16. \$2,095.00	\$2,295.00
222-4493	RF Power Amplifier Techniques	Aug 21-24	Jul 16. \$1,795.00	\$1,995.00

Course Descriptions

WEB - Web Class, MAR, APR, AUG - San Jose, CA, FEB - San Diego, CA, MAY - Boston, MA

214 Advanced Radio System Architectures

The ideas associated with sampling and digital signals that revolutionised modulation systems and are now revolutionising radio system design. This course continues the theme of block diagram rather than circuit diagram design, presenting an up to date view on concepts for advanced radio systems that incorporate digital signal processing at RF frequencies and the concepts of software defined radio. It is a practical approach for technical professionals to understand the latest designs and architectures for radio systems that include DSP. **Aug**

037 Antennas & Propagation for Wireless Communications

This three-day course provides participants with comprehensive coverage of a wide variety of antenna and propagation topics. The course provides an understanding of basic antenna property definitions, antenna design fundamentals and considerations, numerous antenna types and RF propagation fundamentals. The course also provides an overview of how antenna properties and propagation characteristics affect communication system performance. Topics covered include antenna fundamentals, basic antenna types, elementary antennas, electrically small antennas, microstrip patch antennas, low profile antennas, aperture and reflector antennas, circular polarized antennas, antenna arrays, propagation channel characteristics, and an overview of different antennas used in today's wireless communication devices and markets. **May**

161 Applied Design of RF/Wireless Products and Systems

This 3-day intermediate-level course focuses on the practical design and development of modern RF and wireless communications circuits and systems using common digital modulation standards. In today's ultra-competitive global wireless industry, the design-to-production cycle is of crucial importance. However, developing modern wireless products, such as 3G/4G cellular telephones, Wi-Fi and WiMAX systems, presents many challenges. Advanced skills and knowledge are required not only to architect these systems and devise suitable circuit topologies, but also to solve the challenging integration and manufacturability issues associated with high-volume products. This course teaches the practical aspects of developing robust RF and wireless designs suitable for high-volume production. **Feb**

086 Applied RF II: Advanced Wireless and Microwave Techniques

This five-day course provides participants with an in-depth examination of advanced RF and microwave design techniques. Antennas and filters are covered briefly, followed by a detailed discussion of figures of merit. Mixers and oscillator designs are also evaluated. Considerable attention is devoted to defining, classifying, and improving the efficiency and linearity of power amplifiers. Numerous design examples are provided for participant exploration. **Aug**

001 Applied RF Techniques I

Switching from traditional definitions based on voltages and currents, to power-flow concepts and scattering parameters, the course has smooth transition into the wireless domain. We review S-parameter measurements and applications for both single-ended (unbalanced) and balanced circuits



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and have a brief introduction to RF systems and their components. **Feb Aug**

221 BER and EVM Testing for Test & Product Engineers

This class focuses on learning and applying BER and EVM measurement techniques to RF SOC/SIP products and is ideal for test and product engineers working with production ATE (Automatic Test Equipment). Each pair of students will be given hardware and software to use during the class. Throughout the class students will develop BER and EVM test solutions and analyze and compare results. Students will get to develop both parametric and system level test solutions that are used throughout industry for a variety of RF and Mixed Signal devices including: ZigBee, Bluetooth, DECT, WiFi, FM, GPS, 3G 4G mobile/cellular phones. Students will develop EVM & BER test solutions for OOK, BPSK, QPSK, QAM, AM/FM, and OFDM modulation for production ATE. **May**

206 CMOS RF Design

The surge in demand for high performance and low cost wireless circuits has accelerated the shift to CMOS RFIC technology. As future wireless radios continue to push the available bandwidth and shift to mm-wave range, RF CMOS is expected to remain the predominant technology. This 3-day course will cover in depth the practical aspects of CMOS RF design at both the circuit and device level. The course will begin by an overview of the CMOS transistor and passives from RF perspective, analyzing key concepts in modeling and noise behavior. An overview of various RF circuit blocks highlighting design architectures and circuit implementation tradeoffs will be provided. This will include selected topics in designing low noise amplifiers (LNAs), mixers, voltage controlled oscillators (VCOs) and power amplifiers (PAs). The course will provide insightful guidance in the circuit design process including transistor sizing, layout effects, parasitic reduction techniques and tradeoffs between various circuit topologies. The focus throughout this course will be on providing practical circuit design and implementation techniques utilizing numerous design examples. **Apr**

170 Digital Predistortion Techniques For RF Power Amplifier Systems

Cellular, TV Broadcast, Satellite and Terrestrial point-to-point links all require linear performance from their RF Transmitters. Modern modulation formats such as OFDM and CDMA now demand linearity from their transmitters that are increasingly impossible to achieve without some form of linearisation. Digital Predistortion has increasingly become the preferred linearisation method in the past few years. This course explains the techniques involved and how to implement them. **Mar**

140 EMC/Shielding/Grounding Techniques for Chip & PCB Layout

This seminar discusses techniques for identifying the sources of unwanted coupling and radiation, and systematic approaches for their minimization. **Web**

052 Frequency Synthesis and Phase-Locked Loop Design

This three-day course provides both the theoretical and practical knowledge necessary to design frequency synthesis circuits and systems using phase-locked loops and related technologies. **Feb**

228 GaN Power Amplifier Design

This course introduces attendees to the GaN transistor, its properties, various structures, discrete devices and MMIC sources, including the latest GaN power amplifier (PA) design techniques. The properties of GaN will be presented showing the advantage of these devices over GaAs and Si. GaN HEMT transistors will be shown delineating the various geometries, semiconductor processes and structures with associated breakdown voltages, power capability, gain, efficiency, and frequency performance. Guidelines for reliable operation will be presented considering device junction temperature including thermal management techniques. Available GaN HEMT devices from various companies including discrete as well as MMIC elements will be presented. MMIC matching and biasing elements will be shown. The nonlinear models of GaN HEMT devices necessary for the CAD of PAs will be presented. Design considerations for both constant amplitude envelope signals (GSM) as well as the non-constant amplitude envelope signals (Edge, CDMA, WCDMA, WIMAX, LTE) will be presented. Step-by-step design procedures will be shown for various

GaN PA examples including different classes of operation as well as the popular Doherty PA. **Web**

229 Introduction to Impedance Matching

The need for impedance matching is rooted in basic AC circuit analysis principles. In basic terms, maximum power transfer occurs when the current and voltage are in phase. This workshop examines the ins and outs of delivering the most power possible to an RF load. Q factor and its effect on matching network bandwidth are also described. **Web**

225 LTE & LTE-Advanced: A Comprehensive Overview

This three-day course provides a comprehensive overview of the system architectures, principles involved, techniques applied, and performance achieved in UMTS's Long Term Evolution (LTE) and LTE-Advanced mobile broadband access (MBWA) systems. The typical types of packet switched data conveyed by this system is studied. Key enabling technologies are presented including: relevant digital modulation techniques, error detection/correction methods, and multiple access and NLOS techniques employed in Point-to Multipoint (PMP) systems. The non-line-of-sight (NLOS) mobile wireless fading path is reviewed. The LTE network architecture and supporting protocols are introduced in some detail. Key physical layer and MAC features are presented comprehensively. A downlink coverage analysis is given. The key parameters of LTE's UMTS predecessor, HSPA, as well as those of Mobile WiMAX, are compared to those of LTE. Finally, the next evolution of LTE, i.e., LTE-Advanced, is introduced.

Mar

016 Modern Digital Modulation Techniques

The goal of this course is to introduce the participant to those digital modulation methods and multiple access techniques presently in use in mobile wireless, broadband wireless, satellite and wireline (and power-line) communications, as well as to those techniques, which are being considered for future or next generation systems. **May**

216 Power Amplifier ABC's

This course aims to bring participants up to speed on the basics of RF power amplifier design and operation in the shortest possible amount of time. Considerable attention is devoted to defining, classifying, and improving the efficiency and linearity of power amplifiers. Numerous design examples are provided for participant exploration. **Web**

224 Power Conversion & Regulation Circuits for VLSI Systems

Developing power conversion/regulation solutions for VLSI systems and mixed-signal analog/RF System-on-Chip (SoC) types of loads require engineers with solid background in both traditional power converters design as well as analog/RF mixed-signal VLSI design. Power conversion/regulation circuits with such a VLSI and SoC focus are rarely covered in graduate or undergraduate power electronics courses. With the growing demand in semiconductor industries for expertise in this area, there is a serious shortage in engineers who have the necessary background combination to design efficient and cost-effective solutions for such loads. This course will introduce the fundamental principles of power conversion/regulation circuits such as Linear/switching regulators and battery chargers used in VLSI systems. This includes: Architectures, Performance metrics, characterization, stability and noise analysis, practical implementations, on-chip integration issues, and design considerations for portable, wireless, and RF SoCs. **May**

210 Practical Digital Wireless Signals - Measurements and Characteristics

This five day lecture and measurement based course is designed to provide all participants with a physically intuitive understanding of wireless communication signals and why they work the way they do. With the growing impact of wireless communications on the basic operation of society, the need for a more general understanding of the basis for this technology is more important than ever. **Mar**

180 Radio System Design - Theory and Practice

This course identifies the key system design parameters, showing how they compound in a given configuration and hence how they relate to the top-level specifications. The course builds from basic models and descriptions of system behaviour. Describing common receiver and transmitter architec-



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tures, understanding the key impairments to reliable communications and looking at system solutions to modulation, multiple access and air interface standards. Various tools are used to provide accurate initial estimates of component performance while others show the relative contribution of each circuit block to the total. These tools help isolate critical parameters allowing designers to focus on the key aspects. In this way, designers can focus on the key elements that have to be solved to meet a design requirement in a cost effective manner while making sure that all the parts, when put together, will work as expected. **May**

042 RF and High Speed PC Board Design Fundamentals

This three-day course enables practicing engineers and CAD technicians to develop design rules for RF and high-speed designs, choose an optimal design tool, and organize the design process to most efficiently execute the design that will insure circuit performance, and minimize costs and production time. **Mar**

059 RF Fundamentals

This course provides circuit-level designers with the essential concepts needed to work effectively with high frequency electronics. Participants gain analytical, graphical, and computer-aided techniques to analyze and optimize RF circuits in practical situations. The course addresses linear active circuit design, focusing on stability, bandwidth, and noise considerations. **Web**

135 RF Measurements: Principles & Demonstration

This 5-day lecture-based course explains essential RF measurements that must be made on modern wireless communications equipment - cellular, PCS and 3G phones, wireless LANs, GPS navigation systems, and DBS TV. The newest models of the necessary RF test equipment will be explained and demonstrated, including vector network analyzers, spectrum analyzers, digitally modulated signal generators and vector signal analyzers. Video projection techniques will be used so that all participants can see complete details of the measurement screens. **Apr**

222 RF Power Amplifier Techniques

Power amplifiers are crucially important in determining a communications system cost, efficiency, size, and weight. Designing high power / high efficiency amplifiers that satisfy the system requirements (bandwidth, linearity, spectral mask, etc.) is challenging. It involves difficult trade-offs, proper understanding of the theory, and careful attention to details. Additionally, designing, building, and testing power amplifiers usually pushes test equipment and lab components to their limits and frequently results in damage to the circuit or lab equipment. This course will examine the different aspects of this challenge with emphasis on hand-on exercises and practical tips to build power amplifiers successfully. **Aug**

208 Transceiver and Systems Design for Digital Communications

This seminar provides an intuitive approach to transceiver design for both commercial and military sectors, allowing a broad spectrum of readers to understand the topics clearly. It covers a wide range of data link communication design techniques, including link budgets, dynamic range and system analysis of receivers and transmitters used in data link communications, digital modulation and demodulation techniques of phase-shift keyed and frequency hopped spread spectrum systems using phase diagrams, multipath, gain control, an intuitive approach to probability, jamming reduction method using various adaptive processes, error detection and correction, global positioning systems (GPS) data link, satellite communications, direction-finding and interferometers, plus a section on broadband communications and home networking including Link 16, JTRS, military radios, and networking. Various techniques and designs are evaluated for modulating and sending digital data. Thus the student gains a firm understanding of the processes needed to effectively design wireless data link communication systems. **Mar**

027 Understanding Digital Signal Processing (DSP)

This three-day course is the beginner's best opportunity to efficiently learn DSP. Intuitive, nonmathematical explanations and well-chosen examples develop the student's fundamental understanding of DSP

theory. The practical aspects of signal processing techniques are stressed over discrete system theory. Participants will leave with a collection of tricks-of-the-trade used by DSP professionals to make their processing algorithms more efficient. **Feb**

227 Wireless LANs

This three-day course is an experiment-oriented course that integrates topics at the MAC layer (and above) of Wireless LANs (WLANs) and Wireless Personal Area Networks (WPANs). The course emphasizes hands-on learning through experiments and case studies. It will offer attendees the ability to conduct laboratory experiments and design projects that cover a broad spectrum of issues in WLANs and WPANs. The characteristics and operations of IEEE 802.11a/b/g/n WLANs will be described as well as that of Bluetooth WPANs. Laboratory experiments will be conducted to show the tradeoffs of the virtual carrier sensing mechanism, observe interference issues with other devices operating on the ISM band, describe Mobile Ad-hoc Network (MANET) operations and routing protocols, configure secure infrastructure and MANET WLANs, deploy hotspots, and use modeling, simulation, and emulation tools to evaluate WLANs (including system in the loop capabilities). Real infrastructure and MANET WLANs will be deployed and configured in class under different network scenarios. Different tools and techniques will be introduced to monitor, measure, and characterize their performance (and realize the tradeoffs). Known techniques to attack WLANs will be shown and proper security practices to avoid well-known threats will be discussed. All concepts will be summed up in an experiment that aims at deploying a secure hotspot. **Feb**

226 Wireless/Computer Network Security

This three-day course is an experiment-oriented course that focuses on security aspects in computer and telecommunication systems. The course will cover aspects related to security policies and mechanisms, access control mechanisms (role-based, DAC, MAC, and ORCON), data encryption standards (DES, AES, Blowfish, RC4, and PKI), key management and authentication mechanisms, digital signatures (x509), message authentication codes, malicious logic (viruses, trojan horses), IPSEC, firewalls, VPN, as well as the 5 phases of a computer security attack (attack reconnaissance, scanning, gaining access, maintaining access, and covering tracks). Experiments will be conducted to show cryptanalysis techniques, x509 certificate generation, how to configure and manipulate firewalls, and all phases of a cyber attack that end in taking control of victim machine. Experiments will also be prepared to show how to break IEEE 802.11 WEP keys, launch denial of service (DoS) attacks on IEEE 802.11 networks, and how to properly secure wireless LANs using the IEEE 802.11i standard. **May**

Register Online Now!



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