Training Course on Power Electronics for Modern Applications

Professional Development Training Course Outline

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

Course Introduction

Introduction

Training Course on Power Electronics for Modern Applications is a cutting-edge program designed to empower professionals with the skills and knowledge needed to design, analyze, and implement power electronic systems in today's technology-driven industries. With a strong focus on energy efficiency, renewable energy integration, smart grid technologies, and electrification of transportation, this course bridges the gap between theory and real-world application. Participants will gain hands-on expertise in converters, inverters, power semiconductor devices, and control strategies that are essential in modern systems such as EVs, solar inverters, and industrial drives.

As industries rapidly adopt sustainable energy solutions, IoT-based energy management, and wide bandgap semiconductors like SiC and GaN, there is an increasing need for professionals trained in advanced power conversion technologies. This course blends fundamental principles with real-life case studies, simulation exercises, and industry best practices. By the end of the program, learners will be well-equipped to tackle high-efficiency power design challenges in aerospace, automotive, smart manufacturing, and renewable energy sectors.

Programme Curriculum

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Course Objectives

1. Understand the fundamentals of power electronics systems and applications.
2. Design and analyze DC-DC converters for various load conditions.
3. Implement PWM control strategies for inverters and converters.
4. Explore wide bandgap devices (SiC & GaN) for high-performance systems.
5. Understand thermal management and packaging for power devices.
6. Model and simulate power circuits using MATLAB/Simulink.
7. Design grid-tied and off-grid solar inverter systems.
8. Apply power electronics in electric vehicle (EV) drive trains.
9. Integrate power factor correction (PFC) and harmonic reduction.
10. Develop control strategies for motor drives and industrial automation.
11. Explore battery management systems (BMS) and charging infrastructure.
12. Design energy-efficient power supplies for IoT and embedded systems.
13. Analyze real-world case studies in smart grid and renewable integration.

Organizational Benefits

1. Develop in-house capability for energy-efficient hardware design.
2. Improve product performance with advanced power electronics.
3. Reduce energy consumption across operations.
4. Accelerate R&D for EVs, solar, and smart appliances.
5. Enhance system reliability through thermal and EMI design knowledge.
6. Minimize costs by optimizing power converter design.
7. Strengthen competitive edge in green technology markets.
8. Expand innovation in IoT-based and AI-integrated power solutions.
9. Build cross-functional knowledge across energy, automotive, and electronics teams.
10. Prepare your workforce for Industry 4.0 energy systems.

Target Participants

- Electrical and Electronics Engineers
- Power Systems Engineers
- Automotive Engineers (EV Design Teams)
- Renewable Energy Professionals
- Industrial Automation Engineers

- R&D Professionals in Power Hardware
- Academic Researchers and Instructors
- Graduate Students in Power Electronics

Course Outline

Module 1: Introduction to Power Electronics

- Scope and evolution of power electronics
- Applications in modern industry
- Types of converters and inverters
- Power semiconductor devices overview
- Case Study: Renewable energy-based power systems

Module 2: Power Semiconductor Devices

- Diodes, BJTs, MOSFETs, IGBTs
- SiC and GaN technologies
- Switching characteristics and losses
- Device selection and design criteria
- Case Study: SiC-based traction inverter

Module 3: DC-DC Converter Design

- Buck, Boost, Buck-Boost topologies
- Continuous and Discontinuous Mode
- Efficiency optimization
- Synchronous vs non-synchronous designs
- Case Study: Battery-powered drone converter

Module 4: DC-AC Inverter Systems

- Single-phase and three-phase inverters
- SPWM and SVPWM techniques
- Harmonic analysis
- Inverter control and protection
- Case Study: Residential solar inverter

Module 5: AC-DC Rectification and PFC

- Uncontrolled and controlled rectifiers
- Power factor correction circuits
- Harmonics mitigation
- Bridge converters
- Case Study: SMPS with PFC

Module 6: Control of Power Electronic Circuits

- Open loop vs closed loop control

- PID and digital control
- Current-mode and voltage-mode control
- Loop compensation techniques
- Case Study: Motor drive control strategy

Module 7: Thermal Management of Power Devices

- Heat generation and dissipation
- Heat sinks and thermal interface materials
- Thermal modeling and simulations
- Design for thermal reliability
- Case Study: High-power charger cooling design

Module 8: Simulation Using MATLAB/Simulink

- Circuit modeling fundamentals
- Running time-domain simulations
- Load variation and stress analysis
- Design verification with simulation
- Case Study: Simulated BLDC controller

Module 9: Electric Vehicle Power Systems

- EV architecture and powertrain
- DC-DC converters in EVs
- Traction inverters
- Battery management and charging
- Case Study: Onboard charger design

Module 10: Renewable Energy Integration

- Solar PV inverter design
- MPPT algorithms
- Wind power electronics systems
- Grid synchronization techniques
- Case Study: Hybrid solar-wind inverter

Module 11: Power Electronics in Smart Grid

- Role of power electronics in smart grid
- Energy storage interface design
- Voltage regulation and grid support
- Demand-side energy management
- Case Study: Microgrid converter integration

Module 12: Power Electronics for Industrial Drives

- Motor types and drive systems
- V/f and vector control

- Soft starters and braking
- EMI mitigation
- Case Study: Conveyor belt automation

Module 13: Battery Management and Charging

- Li-ion battery characteristics
- Charging algorithms and protection
- State of charge estimation
- BMS communication protocols
- Case Study: Fast DC charger

Module 14: Power Electronics for IoT and Embedded Systems

- Ultra-low power supply design
- Efficient converters for wearable tech
- Power supply sequencing
- Energy harvesting
- Case Study: IoT sensor node

Module 15: EMI/EMC and Protection Techniques

- EMI sources and filtering
- Layout for EMC compliance
- Surge and overcurrent protection
- Design for safety standards
- Case Study: Power converter for medical device

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

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