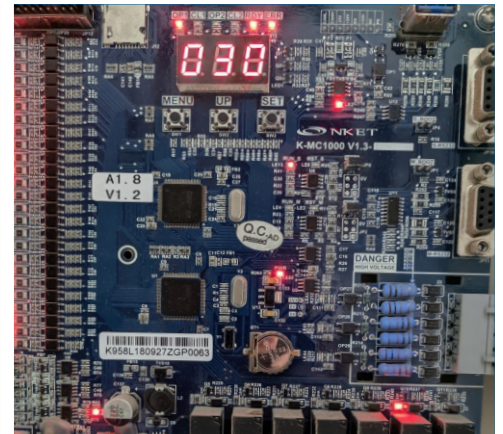
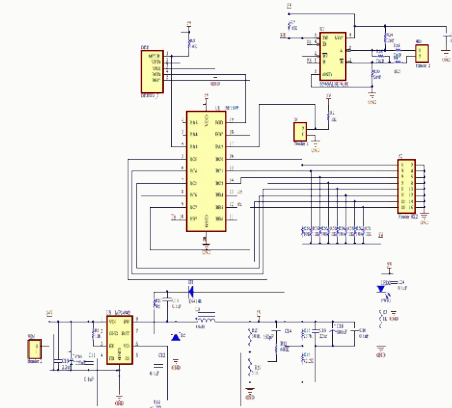
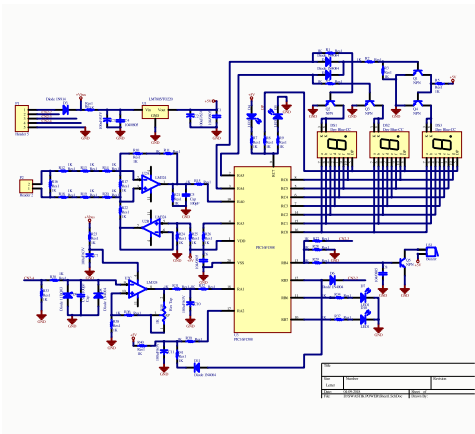
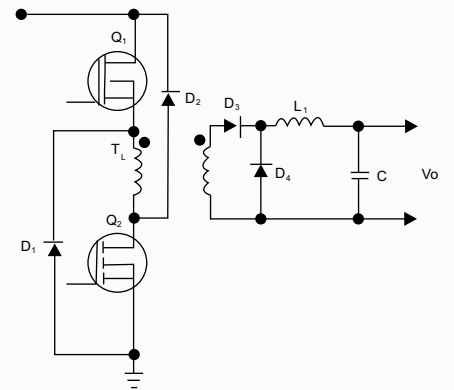
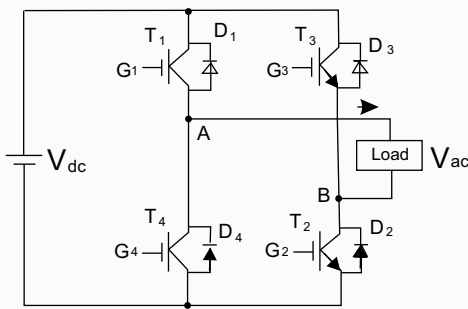
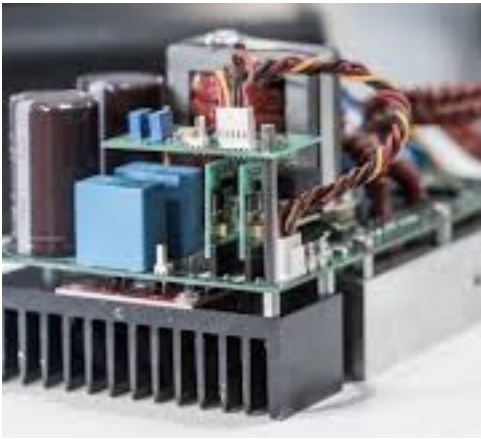


Fundamental and Hands-on Training Courses in Power Electronics and Embedded Controllers



Especially Designed Courses for Working Engineers and Students



Prashant V. Amare

Managing Director

Swastik Power Electronics India Pvt. Ltd.

Facilitators Profile

Prashant V. Amare is the founder-director of Swastik Power Electronics India Pvt. Ltd. an ISO 9001 : 2015 certified company. He has more than 30 years of experience in designing Power Electronics Products and over 20 years in Embedded controllers. So far he has designed more than 150 models of Inverters, 3 phase Inverters, Static UPS, Online UPS, Battery chargers, Solar PCUs, Welding machines, Voltage Stabilizers, ARDs and many more.

He had attended PCIM Germany, twice and over 100 conferences all over India. He was a consultant for Microtek international. He guides engineering students for their final year projects.

Science of Power Electronics

The study of controlling the flow of electrical energy with the help of electronic circuits, is defined as Power Electronics. Power Electronics is the amalgamation of electrical power systems and solid-state electronic devices. It is the discipline that involves the study, analysis, and design of circuits that convert electrical energy from one form to another.

Applications of Power Electronics

Some of the domestic and industry applications of Power Electronics are Elevators, Air Conditioners, Induction cookers, LED lights, Welding machines, Battery chargers, Power steering, Power Supplies, UPS systems, Electric Vehicles, Locomotives, Car Ignition, Solar inverters, Forklifts, Static Voltage stabilizers, Industrial Robots, Aircrafts, Industrial Atomization and many more.

What is Embedded Controller?

It is an integrated circuit which includes microprocessor, timers, memories, Analog to digital converters, Digital to analog converters, PWM modules, Communication modules and other peripherals. A software program is written on the computer. It is then compiled and loaded in the microcontroller. The microcontroller controls the power electronic converter as per the software loaded.

Application of Embedded Controllers

Some of the domestic and industry applications of Embedded controllers includes Washing Machines, Air conditioners, Automobile, Robotics, CNC Machines, VFDs, UPS, Inverters, and power electronic products.

Course Benefits

These courses are designed keeping the need of working engineers and students who are in the power electronics industry or wishes to build a career in the power electronics industry. Each course will cover in-depth and practical knowledge of the topic which will enhance participants knowledge and understanding of the topic. The direct benefits one can enjoy are as follows:

- Enhance your skills as a design engineer thereby create more employment options for yourself.
- To design product in the shortest time frame, become expert in the troubleshooting and problem-solving.
- To upgrade product in terms of quality and reliability.
- To start the AMC (Maintenance Contract) business opportunity for self.
- To create self-employment opportunity as a dealer in the power electronic products.
- You can start manufacturing of power electronics product.
- To start IOT (Internet On Things) business which is going to flourish in time to come.
- To understand the nuances of competition products.

TRAINING TOPICS FOR POWER ELECTRONICS

- 1) **Switching Devices** : Bipolar Power Transistors, MOSFETs, ESBTs and IGBTs. Power Devices Selection.
- 2) **Gate Drivers**: Isolated, Non-isolated, Low Side, High Side, Level Shift, Miller Effect, Negative Power Supply, UVLO, Bootstrap Power Supply, Rg_on, Rg_off, Zener Clamp, Miller clamp, Transformer Driver, Opto-coupler Driver and available ICs
- 3) **Protections**: Pulse by Pulse, De-saturation Detection, Blanking Time and Soft turn-off.
- 4) **PWM Types**: Standard, Phase Shift, Edge aligned, Center aligned, Space Vector and Available ICs.
- 5) **Converter Topologies**: Buck, Boost, Fly-back, Forward, Two Transistor Forward, Push Pull, Half Bridge and Full Bridge.
- 6) **Control**: Current mode, Voltage mode, Hysteresis mode and feedback network.
- 7) **Inrush Current Limit**: Necessity and Methods.
- 8) **Shoot-through**: Dead Time and Leading Edge Blanking.
- 9) **Transformers**: Flux Density, Staircase Saturation, Volt-Second Ratio, Turns Ratio, Skin effect, Litz wire and leakage Inductance.
- 10) **Inductors**: Types, Saturation, DCM, CCM, BCCM and Design Considerations.
- 11) **Transistor Losses**: Conduction and Switching. Vce_Sat, Rds_On and SOA.
- 12) **VFDs** : Working, Major Components, Dynamic Braking, Regeneration and applications.
- 13) **Power Factor Correction**: Necessity, method, Interleaved PFC, Bridgeless PFC and Available ICs.
- 14) Free Wheeling Currents.
- 15) Auxiliary (Housekeeping) Power Supply.
- 16) Effect of Reverse Recovery time and Use of Silicon Carbide Diodes.
- 17) Synchronous Rectifiers and Synchronous Buck Converter.
- 18) Spikes due to leakage inductance, Reflected Voltage and RCD Snubbers.
- 19) Stray Inductance, Snubbers and Laminated Bus Bars.
- 20) Hard Switching and Soft Switching (ZVS and ZCS).
- 21) **Voltage Regulators**: Linear, Switching, Voltage Range, Current capacity and Power Dissipation.
- 22) Triac & SCR firing, method, Phase control and Available ICs.
- 23) **Cooling**: Natural, Forced, Heat-sinks and types.
- 24) Relays, Contactors and how to drive them.
- 25) DC to AC Conversion.
- 26) Types of Resistors and Capacitors.
- 27) Driving Power LEDs and Dimming methods.
- 28) Thermal runaway in Parallel LED Strings.
- 29) Solar Power and MPPT.
- 30) **Connectors**: Types and selection.
- 29) CTs, Hall Effect Sensors and ICs with isolated current and voltage measurements.
- 31) Comparators, Op-amps and types of Amplifiers.
- 32) PCB layout designs and considerations.

HANDS-ON TRAINING FOR POWER ELECTRONICS

- 1) Fly-back Converter
- 2) Forward Converter
- 3) Buck Converter
- 4) Full bridge Converter
- 5) MOSFET Driver
- 6) IGBT Driver
- 7) Static Switch
- 8) Phase Control
- 9) LED Driver with PWM Dimming
- 10) Power Inverter

TRAINING TOPICS FOR EMBEDDED CONTROLLERS

- | | |
|----------------------------------|---|
| 1) Initialization | 9) Interrupts: ISR, Priority, Nested Interrupts |
| 2) Timers | 10) Multiplexing of Pins |
| 3) Analog to Digital Converters | 11) Driving 7 Segment LEDs |
| 4) Digital to Analog Converters | 12) Look-Up tables |
| 5) WDT | 13) Oscillators |
| 6) PWM Module | 14) EEPROM Read and Write |
| 7) Enhanced PWM Module | 15) Comparator Module |
| 8) Communication: UART, I2C, SPI | 16) Debouncing Techniques |

HANDS ON TRAINING FOR EMBEDDED CONTROLLER

- | | |
|---------------------------|-----------------------|
| 1) Driving 7 Segment LEDs | 6) RTC Interface |
| 2) Driving LCD | 7) Switch Debouncing |
| 3) ADC routine | 8) Comparator Module |
| 4) Loading PWM | 9) DAC: 1 bit & 5 bit |
| 5) Look-up Table Read | 10) UART |

OTHER SERVICES

- 1) Consultancy in Power Electronics and Embedded Controllers.
- 2) Product design
- 3) Production

DISHA DESIGNS & DEVELOPMENTS

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