VEDHYA TECHNOLOGIES®
Breakthrough innovations

EKALAVYA
The EC LAB

A convenient and cost-effective pocket HDL platform for every aspiring Engineer in

Embedded Electronic Design

Enables fundamental building blocks for applications in

Electronic Engineering

Mechatronics

Robotics

Industrial Automation

Edge Computing

Artificial Intelligence

Machine Learning

EKALAVYA
The EC LAB

Ekalavya is an open-source electronics HDL platform that provides seamless implementation with compatible Breakout boards and plugins using VHDL/Verilog.

Electronic Engineering students with this Pocket Lab and in combination with various breakout boards would have the opportunity to conduct a wide array of available experiments based on their current syllabus from the 1st to the 8th Semester. Those students having an additional appetite for up skilling themselves with hands on experiments/capabilities in areas of Edge computing for AI, ML, Mechatronics, Robotics and Industrial Automation to name a few, can choose the appropriate break out board which in combination with the main EC Lab unit will fuel their innovative spark, enable their project initiatives and overall empower them to be better industry prepared. Break-out boards can be considered as a Gateway to build edge computing modules.

From an AI or ML perspective the Ekalavya architecture:

>> Is designed to integrate in the near future into the TensorFlow and TensorFlow Lite framework providing superior ease of use over legacy and alternative platforms.

>> Is designed to serve as a Machine Learning development platform in the near future to deploy Convolutional Neural Networks (CNN) on FPGAs, it includes software scripts needed to convert TensorFlow files and accelerator FPGA IP.

It can be used to create ASIC and microcontrollers which find use in objects of daily use as well as complex scientific instruments. It fully supports Windows and Linux including Ubuntu

SALIENT FEATURES

>> Built-in IP support for wide range of Sensor for Quick development of Algorithms that can be implemented
>> Robust IP Library for building applications for AI or ML
>> Designed to work with applications across verticals through specific breakout boards covering utmost IO
>> User-friendly IDE that works on Windows and Linux

BENEFITS

>> Breaking down complex digital designs
>> Scalable and Affordable based on student's drive to learn
>> Simple and clear programming environment that supports creation of own microprocessor
>> Industry aspirants to get hands on in working on various experiments/capability options using the VHDL / Verilog environment

ONLINE COMMUNITY SUPPORT

Vedhya Technologies will have an online presence through blogs, social media and online community forum to share thoughts and collaborate on ideas. It will look to guide aspirants to provide any clarification on concepts, programming and Interface issues on both Verilog and VHDL. One needs to register the product on **www.vedhyatech.com** in order to get access to the various platform upgrades, new releases and interact with industry experts. The forum aims to share insights resulting out of continuous feedback and SME opinions on industry trends and innovations

## Ekalavya The EC Lab
Features:

Logic units(LUT4)	20736
Flip-Flop(FF)	15552
Shadow SRAM (S-SRAM)(bits)	41472
Block SRAM (B-SRAM)(bits)	828K
32bits SDR SDRAM	64M bits
Numbers of 18x18 Multiplier	48
Numbers of PLLs	2
I/O Bank	8

A few indicative experiments out of the many that can be carried out using various Break-out / Plug-in boards given below in conjunction with the EC Lab using HDL platform

1. GENERIC BREAK-OUT BOARD

- Logic Gates (NOR/AND/NAND/XOR/OR)
- Half Adder and Full Adder
- Shift Register
- FSM using Moore and Mealy
- Arithmetic Logic Unit
- UP/DOWN counters
- PWM to control DC/Stepper Motors
- Interfacing the Solid-State Relays
- Interface the DOT MATRIX RGB-LED Driver
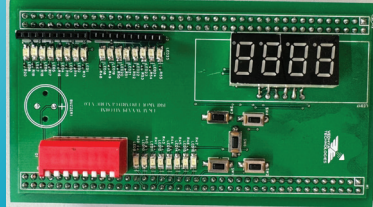
Features:
- 7 Segment 4 Digit LED Display
- 8 Discrete Input (2-60V)
- 8 Discrete outputs (2- 60V @100mA)
- 8 bit Di Switch
- 8 Discrete LED's
- 5 Key Switch
- 1 buzzer

2. DISCRETE I/O BREAK-OUT BOARD

- DC Motor Control
- Encoder Interface
- Customized PLC Block
- Driver Control Circuit for Stepper Motor
- Analog to Digital Converters
- Drive Pneumatic Valves
- Interface Sensor with Discrete / Analog input.
- Interface with Discrete /Analog control (Servo Motors)
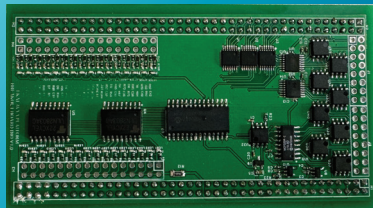
Features:
- 16 Discrete Inputs (2-60V)
- Can be configured to read frequency, Period, Duty also 16 Discrete outputs (max12V @1000mA)
- Can be configured to generate pulse, PWM also
- 8 Channels of analog input +- 10V, 12Bit
- 8 channels of Analog output +-10V, 12Bit, 10mA

3. DATA ACQUISITION PLUG-IN BOARD

- FIR Circuits
- Fixed Floating-point Addition and multiplication
- Low Pass and High Pass Filters
- FFT
- DDS (Digital Direct Synthesis)
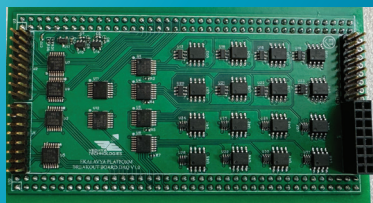
Features:
- 8 Channel 12bit Analog input 500kSPS Independent Sampling rate selection
- +/- 10V Max voltage input 4-20mA input
- 8 Channel 12bit Analog output
- 4.5uS refresh rate +/- 10V Max voltage input
- 8 Digital Input, 5V compatible
- Capture rate 100MHz
- Trigger selectable across Analog and Digital inputs
- 8 Digital output, 5V compatible A High speed Analog to
- Digital (3MSPS,16bit) converters Simultaneous acquisition of 8CH
- A high-speed DAC (12 bit) for reference generator, waveform generator, control signal

4. IMAGE PROCESSING / HMI PLUG-IN BOARD

- Customised Algorithms implementation
- HDMI/DVI Input Designs for Object detection
- Audio Input Designs for Speech and Sound Detection
- Camera Input Designs for Object Detection
- Menu Driver Graphical User Interface
- Implementation of virtual instruments
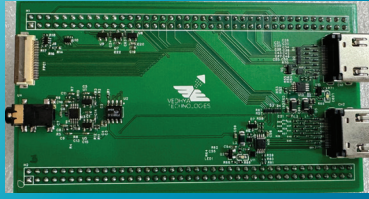
Features:
- Camera interface MIPI, CSI, LVDS 8 Channel
- HDMI 1 In port & 1out port
- LCD interface
- Dual channel audio (Stereo) I/O
- 128 X 64 graphical OLCD
- 5 key Joystick
- 1 buzzer
- Ethernet port
- HDMI output
- USB port
- UART/TTL

5. COMMUNICATION PLUG-IN BOARD

- UART application
- I2C application
- SPI application
- Socket programming application (Wired/Wireless)
- MODBUS protocol
- Cloud application
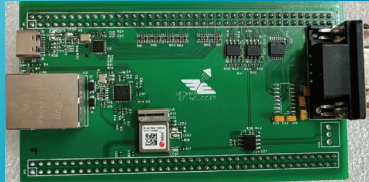
Features:
Communication covering Industry standard protocol
- RS232
- RS485
- Ethernet
- CAN,
- Wifi, BLE, NFC
- Configurable Protocol driver
- for MODBUS RTU/ASCII /
- TCP IP and other standards.

EC Lab with Plug-in board

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