VCA-RE-101 — Equipment, Software, and Reading

Virtus Academy · Embedded Systems Reverse Engineering Stream
Every student maintains a personal hardware workstation. A small inventory of shared instruments is provided per two-student team, and a larger course-level inventory is held by the program. All host software is free; the instructor supplies a prepared Docker container. Hardware prices verified April 2026.

Compute Path (choose one)

Option A — Personal VM-capable laptop. macOS, Windows 10+, or Linux with ≥ 8 GB RAM and a VM that supports USB passthrough (VMware, VirtualBox, UTM, or Hyper-V). Chromebooks, tablets, and laptops below 8 GB are not supported on this path.
Option B — Raspberry Pi 5 (rent or buy from the program). Pi 5 8 GB kit with instructor-baked `fwlab` SD card, PSU, and case — about **$250** to purchase outright, or a flat rental per cohort (refundable on return). Students interact with the Pi via any SSH-capable device — laptop, tablet, Chromebook, or older machine — or via a lab-provided keyboard-and-monitor station at the bench during proctored sessions.

Equipment per Student (Personal Workstation)

Item	Purpose	Approx. cost
Bus Pirate v3.6a with probe cable (SparkFun)	SPI / I²C / UART protocol work	$41
8-channel USB logic analyzer, 24 MHz, FX2LP-based	Bus waveform capture	$12 — $27
Digital multimeter, auto-ranging (basic consumer model)	Voltage and continuity measurement	$25
SOIC-8 test clip (Amazon generic, 25-series compatible)	Non-destructive 8-pin flash access	$10
SOP-16 test clip (Amazon generic, 25-series compatible)	Non-destructive 16-pin flash access	$10
Solderless breadboard and jumper-wire kit	Ad-hoc prototyping	$17
ESD mat and wrist strap kit	Electrostatic-discharge protection	$25
Kit subtotal (excluding compute path)		**≈ $140**

Equipment per Two-Student Team (Shared)

Item	Purpose	Approx. cost
JTAGulator (EXPLIoT — official maintainer since July 2025)	Debug-interface discovery	$249
Attify Badge (Attify Store) or FT2232H breakout	High-speed SPI flash programming	$48
Raspberry Pi Zero W (Adafruit)	Lab 4 JTAG training target	$15

Equipment per Course (Instructor / Facility)

Item	Purpose	Approx. cost
Hot-air rework station (858D class)	Desolder demonstrations	$80
Decommissioned Motorola SURFboard SB6141 (eBay), one per student	Capstone platform	$15 — $22 each
Unknown-board targets for the midterm practical	Proctored exam stock	instructor-sourced
Winbond W25Q80BV 1 MByte SPI flash breakout (Adafruit)	Reference chip, Weeks 2–3	$2
SparkFun TMP102 Qwiic temperature sensor breakout	I²C reference chip	$10
Macronix MX25L6406E SOIC-16 (eBay 5-pack)	NOR flash reference	$5 / 5
Lab power supply and USB hubs with isolated power rails	Workstation infrastructure	instructor-sourced

Software and Texts

All software is free. **Host-side:** `flashrom`, `openocd`, `pulseview`, `sigrok-cli`, `wireshark` (with `usbmon`), `minicom`, `screen`, Ghidra. **`fwlab` container (instructor-supplied):** `binwalk`, `squashfs-tools`, `jefferson`, `ubi_reader`, `hexedit`, `radare2`, QEMU user-mode and full-system.