

## INTERNET OF THINGS TRAINER (MODEL XPO-IOT) (Family of Training Systems)



### Salient Features

- Under guidance from Prof. IGTUW, Delhi.
- The kit is based on open source hardware, software & development tools to provide solutions by integrating application development with open-source OS (Linux and Android) to prototype the project ideas and experiments.
- I<sup>2</sup>C, SPI, I<sup>2</sup>S etc. interfaces available to access sensors and application boards.
- Choice of communication ports Ethernet/RJ-45 and WiFi available to communicate with PC or a campus network.
- SD/ MicroSD card interface provided.
- Aesthetically engineered Plastic molded 2 enclosure design to protect & preserve small footprint SBC in 1<sup>st</sup> and Communication Mux Board in 2<sup>nd</sup> enclosure.
- Supported with Student Workbook and Instruction Guide

### Technical Specifications: 1) Main Board (MB), 2) Communication mux Board (CB)

<b>I/O INTERFACES</b>	Devices Supported on Main Board (1 <sup>st</sup> Enclosure)
Sensors	Using I <sup>2</sup> C:- Light & Infrared (TSL2561), Altimeter (MPL3115), Magnetometer (MAG3110), 3-Axis Accelerometer (MMA8491), Gyroscope (FXAS21002C), RTC (DS1337), Non contact IR Temperature (MLX90614), Gesture (APDS9960) .GPIO based I/F: - Temp and Humidity (DHT11), PIR (HC-SR501), Ultrasound (HC-SR04), LDR, IR.
Peripherals (Optional)	Mic (Audio In), Speakers (Audio Out), PS2 Keyboard, UART to USB (Virtual COM port) ckt block using CP2102, GPIO based TXT LCD, Buzzer, CSI based Camera (optional) etc.
<b>COMMUNICATION</b>	Devices Supported on optional communication board (2 <sup>nd</sup> enclosure)
Using Communication Multiplexer (CB) Board	GPIO Controlled 1:8 UART MUX Ckt. with manually settable interfaced using 20 pin FRC to MB UART based application modules (optionally): 1. Bluetooth(ESD1102V), 2. ZigBee(XBEE XB24-Z&WIT), 3. Wi-Fi(RN171), 4. GSM(SIM900), 5. GPS(L80), 6. IR Transceiver, 7. Camera (Optional)
SBC Ports	Ethernet RJ45, USB (OTG & Host), HDMI, SD/MMC Socket, Audio 3.5mm jack
<b>DISPLAY</b>	HDMI based 5" TFT colour LCD. (Optionally) compatible Monitors/TV
<b>APPL<sup>N</sup> BOARDS</b>	MB supports 26 pin FRC for optional interfaces like ST/DC, ADDA III etc.
<b>POWER SUPPLY</b>	External: - 5V/2.5A SMPS with RCA plug, 5V to SBC provided using micro USB socket. On-Board power supplies:- 3.3V, 3.1V - 4V settable, 1.25V to 2.5V variable.
<b>Mech. Dim.</b>	Size:- 215(L)x165(W)x75(H) (in mm). Weight:- 900gm (1.5 kg with Manuals)
<b>COURSES SUPPORTED</b>	Mobile Computing, Embedded Systems, Wireless Communications, Design & Development of Mobile Devices, Smart Device Programming, Socket Programming, Internet of Things, Embedded S/W Programming languages such as Python, C, Shell Script. & Real-time OS and Databases Etc.
<b>Accessories (optional)</b>	HDMI Cable, HDMI to VGA convertor, USB Cable – micro to A type or standard cable.

**CHOICE OF SINGLE BOARD COMPUTER:** - SBC wise Specifications. Select One (**MOQ applies**). Boards like Arduino or TI Crypto support neither O/S nor they have sufficient RAM. The kit is housed in two enclosures, 1<sup>st</sup> has SBC mounted on Main Board with Sensors and the other has Communication Multiplexer 1:8 UART board along with 6 modules

Sr. No.	Parameters	Raspberry PI (Default)		OLIMEX	Banana PI	Humming board	BeagleBone	Zynq Board
1	Model Name	Rasp Pi 2 Model B	Rasp Pi 3 Model B	A20-OLinuXino-LIME2	Banana PI	HummingBoard-i2eX	Beaglebone Black	ZYBO
2	Processor IC	BCM2836, 32 bit ARM Cortex-A7 Quad Core 1-GHz	BCM2837, 64 bit ARM Cortex-A53 Quad Core 1.2-GHz	A20 ARM Cortex-A7 Dual Core 1-GHz	A20 ARM Cortex-A7 Dual Core 1GHz	i.MX6 Dual core ARM Cortex A9 1.2GHz	TI Sitara ARM Cortex-A8 1GHz	Zynq XC7Z010 ARM Cortex-A9, 650MHz, 28k logic cells, 240kB block RAM, 80 DSP slices
3	OS (Default)	Raspbian		Android 4.2.2	Linux	Android	Angstrom	Linux
	OS (Optional)	Android, Noobs. Windows IoT	Android, Noobs.	Debian	Android (4.2.2, 4.4), Raspbian	Debian	Android, Win CE 6,7, 13, Debian,	N/A
4	RAM (DDR3)	1 GB		1GB	1GB	1GB	512MB	512MB
5	ROM (Serial Flash/MMC)	32GB MMC		4GB Flash	32GB MMC	32GB MMC	4GB eMMC	128 Mb SPI Flash/32GB MMC
6	USB	3 Host, 1 OTG		2-Host, 1 OTG	2 Host, 1OTG uUSB	2 Host	2 Host	1 OTG
7	Ethernet/WiFi	ETHERNET/RJ45	ETHERNET/RJ45+WiFi	ETHERNET/RJ-45	ETHERNET/RJ45	ETHERNET/RJ45	ETHERNET/RJ45	ETHERNET/RJ45
8	GPIO & Connector	26 GPIO/40 pin FRC		131 GPIO/ 3X40 (0.05" step)	20 GPIO/26 FRC, 4pin reliamate	17 GPIO / 26 pin FRC	21 GPIO/ 2x46pin berg (F)	48 GPIO/ 6 DIL
9	uSD/SD Card Socket	uSD port		uSD port	uSD port	uSD port	uSD port	uSD port
10	HDMI Port	1		1	1	1	1 Micro HDMI	1
11	LCD Display	TFT (HDMI), TEXT(GPIO)		TFT(HDMI), TEXT(GPIO)	TFT (HDMI), TEXT(GPIO)	TFT(HDMI), TEXT(GPIO)	TFT (HDMI), TEXT(GPIO)	TFT (HDMI), TEXT(GPIO)
12	DSI (Disp) I/F	15 pin FFC		N/A	N/A	1	N/A	N/A
13	CSI (Cam) I/F	15 pin FFC		N/A	1	1	N/A	N/A
14	UART I/F	1		3	2	1	4	1
15	I2C I/F	1		1	1	1	2	1
16	SPI I/F	1		3	1	1	2	1
17	I <sup>2</sup> S I/F	1		N/A	N/A	N/A	N/A	1
18	Bluetooth	N/A	v4.1	N/A	N/A	N/A	N/A	N/A
19	Power Supply	5V Through USB Cable		5V Though RCA Jack	5V Through USB Cable	5V Through USB Cable	5V Through USB Cable /RCA Jack	5V Through USB Cable /RCA Jack