Budget Summary

Sl. No.	Sub-system	Estimated Cost (in Lakhs)
1	Computing facility	121
2	Networking facility	150
3	Embedded system development facility	94.50
4	Robotics development Facility	135
	Total Cost	**500.50**

Detailed Budget Estimate

The equipment to be purchased under this Centre have been classified in following categories

- Computing facilities
- Networking facilities
- Embedded system development facilities
- Robotics
- Miscellaneous

Cost of the project with equipment wise break-up and phasing of requirement of funds

1. Computing Facilities

Sl No.	Equipment	Generic specification	Total (approx)	Justification/Remarks
1	High End Server	Blade server with enclosures and storage (2X6 core processors, 1TB RAM, 20TB storage with necessary expandable enclosures) Quantity:1	75,00,000	Running complex simulations, performing analytics on streamed data and to be used as common resource under cloud.
2	Workstations	16 core processors (3.0 Ghz), 64GB RAM, 1TB storage, 2X1/10/20GbE Quantity:5 Unit price:400000	20,00,000	To be used as common resource pool under cloud to host various network related services and to run SDN controller software.
3	Desktop Computers	Core i7- 7th gen, 8 GB Ram, 1TB HDD, 20+ inch display. Quantity:40 unit price = 65,000	26,00,000	
		Sub-total	**121 Lakhs**	

2. Networking Facility

Sl. No.	Equipment	Specification		
1	Core switch	Openflow compliant, 24 ports, with 12 no. of 40GbE and 12 no. of 10 GbE with SFS. Quantity:02	50,00,000 (2X2500000)	To serve as the Institute level core network switch with redundancy and an experimental testbed for SDN based network control.
2	Edge switch	Openflow compliant 24 ports with	50,00,000	Institute level aggregation

		4 no. 10GbE and 20 no of GbE, all with SFS. Unit price: 5,00,000 Quantity: 10		switches for some academic blocks and to be used as part of SDN experimentation testbed.
3	Access switch	Openflow compliant 24 port with 04 no of GbE with SFS and 20 ports with 1 GbE. Unit price: 01 Lakh Quantity: 40	40,00,000	To provide access to Institute level users and to perform experiments on SDN based management.
4	Wireless access points/switch/routers	dual band MIMO wireless router with 4+ antenna 600+ Mbps. Unit price: 8000 Quantity: 150	10,00,000	SDN controlling testbed for mobile wireless devices and users.
5		**Sub-total**	**150 Lakhs**	

3. Embedded systems development facilities

Sl No.	Equipment	Specification	Total (approx.))	Justification
1	LiFi/VLC (6 nos.)	802.15.7 Protocol stack enabled device and/or components for prototype development	4,20,000 (each 70,000/-	5G enabling technologies
2	LoRA Module (2 nos.)	Frequency 865-867 Mhz(ISM) , Data Rate: 20Kbps or higher	2,50,000 (each 1,25,000/-)	enabling energy-aware long distance communication in challenged network scenarios
3	High computing SBC (Single Board Computer) with Accessories (10 units)	Single Board Computers UP (UP Squared) board with Apollo Lake Intel Celeron Dual Core N3350 up to 2.4GHz, on board 4GB DDR4, 32GB eMMC	2,00,000 (each 20,000/-)	Edge Computing devices in IoT
4	Microcontroller with accessories (30 units)	1GHz ARM® Cortex-A9, and an ARM Cortex-M4 I/O real-time co-processor that can run up to 200Mhz. RAM 1GB or higher	3,00,000 (each 10,000/-)	sensor integration
5	Power Monitor (2 units)	The High Voltage Power Monitor (HVPM)supports a main channel output voltage range of 0.8V to 13.5V and up to 6A continuous current.	2,00,000 (each 1,00,000/-)	Precise Energy estimation in mobile handhelds, micro-controller, sbcs, etc.
6	Variable Voltage source (4 units), CRO (2 units)	Variable Voltage source: DC Outputs 0 -30 V/ 2 A, 5 V/ 2 A & 0 ± 15 V Dual Tracking /1 Amp	4,00,000 (each voltage regulator25,000/-) (each CRO-1,50,000/-)	Regulated voltage to Microcontroller and Microcomputer
7.	Environment Sensor (10 units) Meteorological Sensor (2 units)	Carbon monoxide CO 1 – 1000ppm Nitrogen dioxide NO_2 0.05 – 10ppm CO_2: 0 - 10000ppm or higher SO_2:0～20ppm PM diameter0.3~1.0, 1.0~2.5、2.5~10（um） 03: 0-1000 ppm Ozone Meteorological Sensor(Humidity, Temp, Wind Direction, Rainfall)	14,00,000 Ech sensor costs (CO-10000/- NO_2-10000/- SO_2-20000/- PM-20000/- CO_2-20000/-O_3-20000/- Hum.+ Temp 5000/-) (Wind Direction, Rainfall - 2,00,000)	Fine Grained city scale pollutant data analysis using low-cost sensors
8.	Proximity Sensor with Accessories (Jumper wires, Power module) (20 units)	Small and light: 0.870" x 0.785" x 0.645" (4.3 g) Long range detection: 0 – 6.45 m (21.2 ft) No dead zone (detections	2,00,000 (each 10,000/-)	Sensing for different human activities

		from 0 to 6" are output as 6")		
9.	Smart phones Android enabled (20 units)	Android operating system with 2.0GHz Snapdragon 625 octa-core processor or higher, RAM: 3GB or higher, storage: 64 GB or higher,	4,00,000 (each 20,000/-)	for crowd sourced data acquisition using sensors for activity sensing
10.	Wearable sensors		3,50,000	
11.	Cognitive Radio		3,00,000	5G Implementations or Future Communication
12.	Medical Sensor	Tmote Sky, Blood glucose sensor; Temperature sensor; Movement sensor; Breathing sensor for respiration;Blood pressure sensor	2,00,000	Medical appllictions
13	Vivado xPro Design Studio		15,00,000	FPGA design synthesis, mapping, floor-planning, simulation etc.
14.	FPGA Kit	Virtex-7, Artix-7	10,00,000	FPGA
15	MDK-PLUS-F-ED10:	Software: MDK-ARM Microcontroller Development Kit – PLUS Edition,	7,00,000	
16	Embedded device debugger	ESA Keil MCB1760-ED Evaluation Board, ESA Segger J-Link EDU (JTAG Debug adapter/Flash Programmer)	200000	
17	FPGA Kit for PUF and IOT System (Intel Nino, Artix 7, Raspberry PI 0 W, PI3 board etc) and Sakura Board (2 unit)	1 unit.	9,50,000	Development of Prototype of security module for IoT systems.
18	EMOTIV Insight 5 Channel Mobile EEG	2	60000	
19	Eye Tracker	2	50000	
20	Software package (Integration tools and Licence)		120000	
21	Arduino Uno R3	3	4500	
22	Raspberry Pi 3 Model B	3	10500	
23	ESP 8266 Wifi	3	4500	
24	System Integration/ Connections and Development		30000	
25	RFID READER	4	60000	
26	RFID PROGRAMMER	1	20000	
27	RFID TAG	25	5000	
28	ARDUINO UNO R3	6	9000	
29	RASPBERRY PI 3 MODEL B	3	10500	
30	WIFI(ESP 8266)	6	8500	
31	3G MODULE FOR RASPBERRY PI	3	18000	
32	SHARED VPS (1 YEAR)	1	10000	
33	INTEGRATION TOOLS AND SOFTWARES	1	50000	
		Subtotal	**94.50 lakhs**	

4. Robotics Development Facilities

Sl. No.	Item	Purpose (for …)	Budget (In Lakhs)
1	Soldering stations, Fine welding stations		3.00
2	Wires, breadboards and other tools & accessories for working with electronic components		1.00
3	Basic electronic components, gates, transistors, regulators etc.		1.00
4	Motors, power hydraulic systems, gear systems		15.00
5	Robot bodies (with motors and batteries) – 2/3/4 wheeled, caterpillar, 4/6/8 legged, cubelets, legs, wheels, tracks, rollers etc.		12.00
6	Robots arms – motorized, geared, hydraulic, electromagnetic		10.00
7	Sensors, cameras and respective mounts		30.00
8	Wireless communication systems		5.00
9	Ranging and navigation systems		5.00
10	Microcontrollers, development boards (arduino, raspberry pi etc.), motor controllers etc.		6.00
11	Batteries and chargers		10.00
12	Electronic Voting Machines (2 Units)	Acting as the base platform for the smart-EVM;	5.00
13	Camera (4 Units)	For collecting the images of voters; For detecting the motion of the objects Face recognition	4.00
14	Electronic Components (Touch switches, LCD screen, Keypads, DDRAMs, LEDs) (2 Units	For fabrication of smart touch switches	1.00
15	Nao Robot (2 Units)	Acting as a mobile platform in the class	26.00
16	Smart Display unit / Smart LCD projector (2 Units)	Standard	1.00
		Sub-total	**135 Lakhs**

Phasing of requirement of funds (in lakhs of Rupees):

Sl no.	Name of the equipment	Year 1	Year 2	Year 3
1	Computing Facilities	75.00	46.00	-
2	Network Facilities	100.00	50.00	-
3	Embedded systems development facilities	64.50	15.00	15.00
4	Robotics Development Facilities	65.00	45.00	25.00
Total		**304.50**	**156.00**	**40.00**