

Hybrid IoT–Edge Systems: From Sensor Integration to Edge Analytics & Cloud Dashboards

FDP Content

DAY 2 — CLOUD INTEGRATION (BLYNK & THINGSPEAK)		
Session Title	Contents / Learning Focus	Methodology & Materials Required
Session 1: Introduction to Cloud Platforms	Cloud concepts, API keys, HTTP requests, IoT dashboards, data formats (JSON/CSV)	Slides, Internet connection
Session 2: Blynk Cloud – Hands-on	Device creation, dashboard design, virtual pins, sending sensor data	ESP32, Blynk App, WiFi
Session 3: ThingSpeak Cloud – Hands-on	ThingSpeak channels, sending data via HTTP GET, plotting data, triggers	ESP32, Internet, ThingSpeak account
Session 4: Cloud Project Integration	Build one dashboard using Blynk & ThingSpeak combined	ESP32 + sensors + WiFi

DAY 3 — EDGE COMPUTING ON ESP32		
Session Title	Contents / Learning Focus	Methodology & Materials Required
Session 1: Edge Computing Introduction	Edge vs IoT vs Cloud; latency, bandwidth savings, real-world edge scenarios	Presentation, examples
Session 2: ESP32 Edge Processing	Local thresholding, filtering signals, event-based alerts	ESP32, vibration/temp sensors
Session 3: Practical Edge Logic	Implement noise reduction, decision logic, sending alerts only on events	Hands-on coding
Session 4: Edge Application Build	Industrial Anomaly Detection using vibration & temp	ESP32 + Vibration sensor + Breadboard

DAY 4 — JETSON NANO: REAL-TIME EDGE AI		
Session Title	Contents / Learning Focus	Methodology & Materials Required
Session 1: Jetson Nano Setup	JetPack OS, CUDA basics, Python environment setup, camera test	Jetson Nano, 5V power, HDMI monitor, USB/CSI camera
Session 2: YOLO / SSD Object Detection	Running real-time inference, FPS measurement, switching between models	Pretrained models, Python scripts, Jetson camera

DAY 4 — JETSON NANO: REAL-TIME EDGE AI		
Session Title	Contents / Learning Focus	Methodology & Materials Required
Session 3: ROI Based Video Analytics	Vehicle/person detection, line-crossing logic, counting algorithms	Jetson Nano + camera, OpenCV
Session 4: Jetson Application Demo	Build Real-Time Object Detection System for traffic	Live demo + Python code execution

DAY 5 — HYBRID APPLICATIONS (DETAILED)		
Session Title	Contents / Learning Focus	Methodology & Materials Required
Session 1: Smart Traffic Analytics (Hybrid)	Jetson vehicle detection, ESP32 pollution/noise, ThingSpeak traffic dashboard	Jetson Nano, ESP32, DHT11, MQ135, camera
Session 2: Industrial Equipment Health	Vibration/temperature sensing, Jetson visual check, edge alerts, cloud logs	ESP32, vibration sensor, camera, ThingSpeak
Session 3: Smart Home Energy Management	Power monitoring (ACS712), relay control, occupancy detection using Jetson	ESP32, ACS712, relay, Jetson + camera
Session 4: Architecture Review + Q&A	Compare 3 hybrid applications, deployment models	Slides + Live Demo

DAY 6 — ADVANCED PRACTICAL SESSIONS + DEMOS		
Session Title	Contents / Learning Focus	Methodology & Materials Required
Session 1: System Integration Concepts	How to combine ESP32 + Jetson + Cloud; troubleshooting; data flow best practices	Diagrams, platform walkthrough
Session 2: Live Demonstrations	Full demo of all 3 hybrid applications with dashboards	Jetson Nano, ESP32 setups, Blynk, ThingSpeak
Session 3: Assessment & Doubt Clearing	practical evaluation, hands-on corrections	live debugging
Session 4: Closing Session	Summary, feedback, certificates	No hardware