EMBEDDED ARTIFICIAL INTELLIGENCE DESIGN

Day 1: STM32 Fundamentals

Hours	Concept Building	Hands on Labs
09:30 am-11:00 am	**Introduction to Embedded AI Systems Design**: sensors technology, fundamentals of AI & Machine Learning, IoT applications, industry case studies	Lab1: Installation of Embedded AI Development toolchain
11:15 am-12:45 pm	**Getting started with ARM Cortex M4 architecture**: STM32 Nucleo overview, clock system	Lab2: Using STM32 GPIO- on board LED & Button
12:45 am -1:45pm	Lunch Break	Lunch Break
1:45pm -03:15 pm	**STM32 GPIO interrupts**: polling v/s. interrupts	Lab3: Using GPIO interrupts to configure user button press
03:30pm-04:30pm	Tasks & Assignments	Tasks & Assignments

Day 2: Design of Sensor Driver Interface & Machine Learning

Hours	Concept Building	Hands on Labs
09:30 am-11:00 am	**Sensor Technology**: types of sensors, analog v/s. digital sensing, sensor signal conditioning Getting started with STM32 12-bit ADC configuration	Lab4: Interface audio sensor to STM32 Nucleo board
11:15 am-12:45 pm	**Design of Sensor Data Logger**: implementation of sensor driver library for datalogging applications, serial communication protocol	Lab5: Design of audio sensor driver interface and datalogging using serial communication
12:45 am -1:45pm	Lunch Break	Lunch Break
1:45pm -03:15 pm	**STM32 NanoEdge AI Studio:** Project parameter selection, sensor signals for library selection, benchmark & optimization, emulator based training & inference on sensor dataset, library compilation **ML Classification Applications**: overview of classification techniques, problem statements & solutions	Lab6: Design of a machine learning based classification application using NanoEdge AI Studio
03:30pm-04:30pm	Tasks & Assignments	Tasks & Assignments

Day 3: Embedded Machine Learning Applications Design

Hours	Concept Building	Hands on Labs
09:30 am-11:00 am	**I2C Communication Protocol**: operation, frame format, master slave protocol **ML Based Vibration Pattern Analysis**	Lab7: Design of machine learning based vibration pattern analysis using NanoEdge AI Studio
11:15 am-12:45 pm	Overview of core APIs of the ML static library generated by NanoEdge AI	Lab8: Design & Development of Embedded AI software to enable real time training & inference of vibration sensor data inside the STM32 microcontroller
12:45 am -1:45pm	Lunch Break	Lunch Break
1:45pm -03:15 pm	**Audio Based ML Classification Application**	Lab9: Design of an ML based audio classification to identify different sounds
03:30pm-04:30pm	Tasks & Assignments	**Project Demo**

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Day 2: Embedded Machine Learning Applications Design

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03:30pm-04:30pm	Tasks & Assignments	**Project Demo**