Detailed Session Breakdown

📌 **Instructor: Yousef Khaled Omar**
📌 **Target Audience:** Beginners in Embedded Systems
📌 **Tools & Hardware:** STM32CubeIDE, STM32 development board, sensors, actuators
📌 **Duration:** 3-4 hours

◇ Session 1: Introduction to Embedded Systems

📌 **Goal:** Provide an overview of embedded systems, introduce ARM architecture, and set up STM32CubeIDE.

Topics Covered:

☑ What is Embedded Systems?

- Embedded system vs computing system
- Difference between microcontrollers and microprocessors
- Examples of embedded systems in real life (smartphones, cars, IoT)

☑ Understanding the General Microprocessor Architecture

- Introduction to microcontrollers Architecture (register file, Control Unit, ALU …)
- Fetch-Decode-Execute Cycle (How a microcontroller runs code)
- Instruction set (RISC Vs CISC)
- Processor Architecture (Von neuman vs Harvard)
- Memory organization in microcontrollers (RAM Vs ROM)
- memory layout (.bss .rodata stack…)
- RAM (SRAM Vs DRAM)
- ROM (Masked ROM, OTPROM, EPROM, EEROM and Flash)
- Tool chain (prepocess, compiler, assembler and linker)
- Flashing (Off circuit vs On circuit)
- Embedded Software Architecture (APP, HAL LIB AND LL)

☑ Understanding the ARM Architecture

- Introduction to ARM (ARM history, what ARM stands for)
- ARM Architecture (voltage regulator, PIO and communication prephrals)
- Intro to AMBA (AHB vs APB, Peripheral bridge)
- Power management (RCC vs Enable)

☑ Introduction to STM32CubeIDE

- Why STM32 is widely used in the industry
- Installing and setting up STM32CubeIDE
- Creating a new STM32 project
- Introduction to HAL (Hardware Abstraction Layer) and LL (Low Level) drivers

🎯 Practical:

- Running an built-in example in STM32cube