EMBEDDED SYSTEMS SYLLABUS COPY

Engineered for skill enhancement.

PROGRAM HIGHLIGHTS

Accredited Certificates:
✓ Program approved ISO Certification
Internships:
✓ Industry-relevant opportunities provided
Placement Assistance:
✓ Career guidance from industry experts
Basic to Advanced Level Training:
✓ Learn from experienced embedded systems professionals
Live & Recorded Lectures:
✓ Flexible learning at your convenience
Real-Time Projects:
✓ Hands-on minor & major projects

ABOUT US

- **OUR MISSION :**

    NxtSync is a pioneering EdTech company committed to bridging the gap between theoretical learning and practical application. Our mission is to empower students with cutting-edge embedded systems skills, providing them with a robust foundation in hardware and software integration for the future of IoT and automation.

- **OUR VISION--UPSKILL**: Empowering minds for the future.

- **INNOVATE**: Fostering creativity and breakthroughs .

- **EXCEL**: Preparing industry-ready professionals.

WHY DIGITAL MARKETING?

- Integral to modern technology in IoT, robotics, automotive, and consumer electronics.

- Highly demand-driven across industries such as healthcare, automation, and defense.

- Integration of hardware and software for developing real-time applications.

- Career opportunities in embedded software development, hardware design, and system integration.

- Deep understanding of low-level programming, system optimization, and firmware development.

LEARNING PATH

- Introduction to Embedded Systems

- Embedded System Architecture & Components

- Microcontrollers and Microprocessors

- Embedded C Programming

- Interfacing with Sensors & Actuators

- Real-Time Operating Systems (RTOS)

- Communication Protocols & Networking

- Embedded System Design & Development

- IoT in Embedded Systems

DETAILED MODULE BREAKDOWN

Module 1: Introduction to Embedded Systems

- Fundamentals of Embedded Systems

- History & Evolution of Embedded Systems

- Applications in Consumer Electronics, Automotive, Healthcare, and IoT

- Embedded System Design Proces

Module 2: Embedded System Architecture & Components

- Overview of Embedded System Architecture

- Microprocessors, Microcontrollers, and DSPs

- Hardware Components: Memory, I/O, and Timers

- System Power Management and Optimization

Module 3: Microcontrollers and Microprocessors
- Introduction to Popular Microcontrollers (e.g., ARM, PIC, AVR)
- Architecture & Programming of Microcontrollers
- Interrupts and Timers in Microcontrollers
- Input/Output Handling and Port Mapping

Module 4: Embedded C Programming
- C Programming for Embedded Systems
- Memory Management and Optimization
- Developing Firmware for Embedded Devices
- Handling Low-Level I/O Operations and Interrupts
- Debugging & Error Handling Techniques

Module 5: Interfacing with Sensors & Actuators
- Working with Analog and Digital Sensors
- Interfacing Temperature, Pressure, and Light Sensors
- Motor Control & Actuator Interfacing
- ADC/DAC Conversion and Signal Processing
- Designing Sensor Networks

Module 6: Real-Time Operating Systems (RTOS)
- Understanding RTOS Concepts
- Task Scheduling and Multitasking
- RTOS Architecture & Task Synchronization
- Semaphore, Mutex, and Queue Management
- Case Study: FreeRTOS and Embedded Linux

Module 7: Communication Protocols & Networking
- Communication Protocols: SPI, I2C, UART, CAN
- Wireless Communication: Bluetooth, Zigbee, Wi-Fi, LoRa
- Network Protocols: TCP/IP, MQTT for IoT
- Real-Time Data Transmission & Networking in Embedded Systems

Module 8: Embedded System Design & Development
- System Design Methodology: Top-down vs. Bottom-up
- Schematic Design, PCB Design & Fabrication
- Simulation Tools: Proteus, Keil, MPLAB
- Embedded Software Development Cycle
- Firmware Updates and Bootloaders

Module 9: IoT in Embedded Systems
- Introduction to IoT Architecture & Devices
- IoT Protocols and Security Concerns
- Cloud Computing Integration in IoT
- Building Smart Applications with Embedded Systems
- IoT in Smart Homes, Healthcare, and Industrial Automation

Module 10: Capstone Projects & Industry Research
- Hands-on Real-Time Embedded System Projects
- Industry Collaboration & Research-Based Projects
- Firmware & Hardware Development Portfolio Building
- Prototyping & Testing Embedded Devices
- Performance Analysis & Optimization

ASSIGNMENT'S &ASSESSMENTS

- ➢ Weekly hands-on assignments
- ➢ Mid-term Embedded System mini-projects
- ➢ Final capstone embedded system project
- ➢ Live presentations & discussions

NXT SYNC

TOOLS & FRAMEWORKS USED

- **Microcontroller Development Tools:**
  Keil, MPLAB X, Arduino IDE, IAR Embedded Workbench
- **Embedded Software Debugging Tools:**
  GDB, JTAG, Oscilloscopes, Logic Analyzers
- **IoT & Communication Protocol Tools:**
  MQTT, Node-RED, MQTT.fx, Wireshark
- **Embedded System Simulation & Design Tools:**
  Proteus, Fritzing, Altium Designer, Eagle
- **RTOS Tools & Platforms:**
  FreeRTOS, Embedded Linux, RTEMS
- **Prototyping & Development Boards:**
  Raspberry Pi, Arduino, BeagleBone, STM32

RECOMMENDED READING

Digital Marketing:

•**"Embedded Systems: Introduction to ARM® Cortex™-M Microcontrollers"** by Jonathan W. Valvano

•**"The C Programming Language"** by Brian W. Kernighan & Dennis M. Ritchie

•**"Real-Time Concepts for Embedded Systems"** by Qing Li & Caroline Yao

•**"Programming Embedded Systems"** by Michael Barr & Anthony Massa

•**"Designing Embedded Systems and the Internet of Things (IoT) with the ARM mbed"** by Perry Xiao

WHY CHOOSE NXTSYNC?

❖ Industry-Aligned Embedded Systems Curriculum
❖ Hands-on Real-World Projects & Simulations
❖ Expert Mentorship & Career Guidance
❖ Flexible Learning Schedule with Live and Recorded Lectures
❖ ISO-Certified Embedded Systems Training Program

Start Your Embedded Systems Journey with NxtSync Today!

THANK YOU