Foundation Course Embedded Level -1
Course Module

- Course Name: **Skill Foundation in Embedded** Level -1
- Who Can Join: Pursuing 2nd Year B. Tech and M. Tech & M. Sc -1st Year
- **The Institute has full right to select the modules as per the requirement of the industry and also depend on the duration of the batch without affecting the course fees.**
- **Certification test is mandatory to attend to award the certificate.**
- **Internship will offer only to the performers or those who completed the industry project.**
- **Fees of each module is**
  - **Hardware Digital Design @ Rs 2950**
  - **MCU & MPU @ Rs 2950**
  - **RC & Network @Rs 2950**
  - **C Programming @ Rs 2950**
  - **PCB Design @ Rs 2950**

Total Fees for Level 1@ Rs 14750

1. **Module 1- Hardware Digital Design - Hardware Design of various combinational & sequential Circuit and implementation on FPGA's.**
   - Project   1: Hardware Design of 4-bit Sign Calculator and LED Implementation on FPGA's.
     - ✓ Calculator Components like: Adder, Subtractor, Multiplier, Divider, Comparator, Mux, Demux, Encoder, Decoder, 2s Complement etc.
   - Project   2: Hardware Design of 4-way traffic light control system and SSD Implementation on FPGA's.
     - ✓ Traffic Light Components: Latch, SR Latch, JK latch, JK FF, DFF, TFF, counters (Synchronous, Asynchronous, UP- Down, Odd –Even, Mod, Johnson & Ripple, Shift Registers (SISO, SIPO, PISO & PIPO) & Frequency divider.
   - Project   3: Hardware Design of different Led Pattern & LED Implementation on FPGA's.
   - Project   4: Hardware Design of Digital Clock & SSD Implementation on FPGA's.
   - Project   5: Hardware Design of Stop watch & SSD Implementation on FPGA's.
   - Project   6: Schematics Design of Algebra and Geometry Formulas
   - Introduction to FPGA & CPLD & Application of FPGA & CPLD
   - Development Board: Nexys A7, Artix 7 series development board from Digilent inc.

2. **Module 2- Microcontroller & Microprocessor Overview, Difference, Programming and Interfaces Overview**
   - CPU Architecture
   - CISC vs RISC
   - Von-Neumann and Harvard
   - Microcontroller family introduction
   - Semiconductor memory
   - Instruction Set
   - Configuration with Peripherals
   - Microprocessor vs Microcontroller
   - CISC vs RISC
   - Overview of Architecture of 8051
   - Low-level Programming Concepts

- Middle Level Programming Concepts
- On-Chip Peripherals
- Ports: Input/output
- Timers & Counters
- Interrupts, UART
- External Interfaces
- Protocols

3. **Module 3- C Programming**
   - Abstract Data Types (ADT)
   - Data Structures and C
   - Arrays in C
   - Array as ADT
   - One Dimensional Array
   - Array as parameters
   - Two Dimensional Array
   - Structures in C
   - Unions in C
   - Structure as Parameters
   - Pointers in C
   - Allocation of storage and scope of variables
   - Recursive Definition and Processes
   - Factorial Function
   - Fibonacci Sequence,
   - Recursion in C
   - Hashing: Hash Function
     Project based on Interfaces: -
       - ✓ Timers Watchdog timer
       - ✓ Interrupts
       - ✓ RTC
       - ✓ PWM
       - ✓ LCD
       - ✓ Push Buttons
       - ✓ Memories
       - ✓ Latch Interconnections
       - ✓ LED Blinker
       - ✓ SSD Implementation
       - ✓ LCD Implementation

Development Boards: Renesas or STM

The Internship Project will be awarded from Aujus Technology based on above Interfaces, depending on the performance and ability to finish the project in time.

4. **Module 4- PCB Design**
   - Basic of Electronics Components Introduction to Embedded System and its applications
   - Design Parameters of Embedded System and its significance
   - Embedded System Design Flow.
   - Analog and Digital Design Basic, Analog Signal Processing, Current/ Voltage concepts
   - Resistors, Capacitors, Inductors, Circuit Theory, Diodes, Transistors, FET, Op-Amps (LM324/358, ULN 2803/2003)
   - Oscillators (555), Switches, Relays, 7 segment, 14/16 segment, Motors
   - Basic Electronics Components Testing
     - ✓ Breadboard
     - ✓ Multimeter
     - ✓ CRO

   Introduction to PCB, Work on Bread Board and Projects on Zero PCB
   - Introducing PCB Design and Philosophy.
   - PCB Design and Development Process.
   - Introduction to PCB Industry.
     - ✓ DESIGN Engineers.
     - ✓ LAYOUT Engineers.
     - ✓ TESTING Engineers.
   - Introduction to Bread Board.
     - ✓ Power Supply.
     - ✓ Fire Alarm.
     - ✓ Simple Water Level Alarm.
     - ✓ Infrared Motion Detector.
   - Introduction to Zero PCB
     - ✓ Power Supply on Zero PCB.
   - Introduction   of EAGLE (tool for PCB Designing.)
     - ✓ Introduction of Schematic design.
     - ✓ Introduction to selecting component from library
     - ✓ Introduction to Board design.

5. **Module 5**- RC & Network -Introduction of network elements and its properties.
   - Understanding the fundamental of KCL, KVL, Source Transformation, Resistance equivalent, Star to Delta and Delta to star transformation, and it's numerical.
   - Understanding of Theorems like Thevenin, Norton, Super-position and Maximum Transfer Theorem and it's numerical.
   - Understanding of RC circuit with different sources.
   - Introduction of Electronic Device circuit.

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