**Microprocessor and Microcontroller System Design**

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| **IRE 205** | Microprocessor and Microcontroller System Design | **Credit: 3** | **Credit Hour: 4 hr/week** |
| **Course Content:** Introduction to microprocessor and computer; Microprocessor and its architecture; Addressing modes; Data Movement Instruction; Arithmetic and logic instruction; Program control instruction; Using Assembly language with C/C++; Programming the microprocessor; Hardware specifications; Memory Interfacing; I/O interfacing; Interrupt; DMA. Introduction to microcontroller, Components of Microcontroller, Instructions And Instruction Set: instruction Format, Describing the Instruction Cycle: Use of Register Transfer Language (RTL), Instruction Classifications According to Number of Operands, Addressing Modes, Programme Control Instructions, I/O and Interrupts, Machine Language and Assembly Language: Directives: Pseudo - Instructions, Design of an Assembly Language Programme, Data Manipulation, Timers, Counters and Watchdog Timer: Uses and Types of Timers: Programmable Interval Timer (PIT), Microcontroller Timers/Counters: AVR Timers/Counters, Timer Applications, Digital -to -Analogue Converters (DACs), Analogue -to -Digital Conversion (ADC), AVR Analogue Peripherals, Digital -to -Analogue Conversion Interface and vice versa. | | | |

**Lecture Plan:**

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| **Week No.** | **Course Content** |
| **1.** | Introduction to Microprocessors and Microcontrollers: Processor Architecture and Microarchitecture; The Microprocessor: General-Purpose Registers, Arithmetic and Logic Unit (ALU), Control Unit, I/O Control Section (Bus Interface Unit), Internal Buses, System Clocks, Basic Microprocessor Organization |
| **2.** | 8086/8088 hardware specifications: pinouts and pin function, clock generator, bus timing, ready state and wait state. |
| **3.** | Basic I/O interface with 8086/8088: Introduction to I/O interface, I/O port address; decoding. Programmable peripheral interface, programmable interval timer. |
| **4.** | Interrupt: Basic interrupt processing, hardware interrupt, 8259A programmable interrupt controller DMA: Basic DMA operation, 8237 DMA controller, Shared bus operation. |
| **5.** | Processor Design Metrics, A System Approach to Microprocessor/ microcontroller System Design |
| **6.** | Real world Problems and solution Ideas using microcontroller/microprocessors |
| **7.** | Microcontrollers: Microcontroller Internal Structure, Microprocessor - Based and Microcontroller -Based Systems, Practical Microcontrollers: AVR ATmega8515 Microcontroller, Intel 8051 Microcontroller |
| **8.** | Instructions And Instruction Set: instruction Format, Describing the Instruction Cycle: Use of Register Transfer Language (RTL), Instruction Classifications According to Number of Operands, Addressing Modes, Programme Control Instructions, I/O and Interrupts |
| **9.** | Machine Language and Assembly Language: Directives: Pseudo - Instructions, Design of an Assembly Language Programme, Data Manipulation |
| **10.** | System Memory: Semiconductor Memory, Interfacing Memory to Processor, AVR Memory System, Intel Memory System |
| **11.** | Timers, Counters and Watchdog Timer: Uses and Types of Timers: Programmable Interval Timer (PIT), Microcontroller Timers/Counters: AVR Timers/Counters, Timer Applications |
| **12.** | Interface to Local Devices — Analogue Data and Analogue Input/Output Subsystems, Analogue Data and Analogue I/O Subsystems, |
| **13.** | Digital -to -Analogue Converters (DACs), Analogue -to -Digital Conversion (ADC), AVR Analogue Peripherals, Digital -to -Analogue Conversion Interface, Analogue -to – Digital Conversion. |
| **14.** | Multiprocessor Communications (Network — Based Interface): Serial Communications Channels, Asynchronous Serial Communication: UART, The EIA-232 Standard, InterIntegrated Circuits (I2C), Controller Area Network (CAN), Serial Communication Using SPI. |