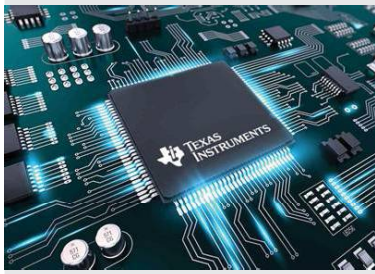
22EC301 MICROCONTROLLERS



Source-https://www.ti.com/microcontrollers-mcus-rocessors/microcontrollers/overview.html

Hours Per Week :

L	T	P	C
2	2	2	4

PREREQUISITE KNOWLEDGE: Basics of digital electronics, computer architecture and organization, Microprocessors and Microcontrollers.

COURSE DESCRIPTION AND OBJECTIVES:

This course introduces the architectural features, internal registers, operating modes, organization, hardware components, peripherals and instruction sets of ARM7-TDMI and ARM LPC2148.

MODULE-1

UNIT-1 **6L+6T+6P=18 Hours**

ARM 7 TDMI:

ARM Architecture and Programming Model: ARM design philosophy, Programmers model: Registers, status register, modes of operation; Organization diagram, Instruction pipeline; Instruction set: Conditional execution, Data processing instructions, Branch instructions, Load-Store instructions, PSR instructions.

UNIT-2 **10L+10T+10P=30 Hours**

LPC2148 CONTROLLER:

LPC 2148 Controller Architecture: Features, Architecture, Functional pin description, On-chip Flash memory, On chip SRAM, General purpose I/O.

PRACTICES:

- Introduction to Keil uVision 4 software.
- 8-bit, 16-bit, 32 bit Arithmetic and Logical operations.
- Searching a number, Find and replace the number in a given array.
- Find the smallest/largest number, Arrange the given numbers in sorting order.
- Block transfer using load/store instructions.
- Blinking of LEDs in port 0 or port 1 in LPC2148.
- Read the input from one port and display into output port using LPC2148.

MODULE-2

UNIT-1 **8L+8T+8P=24 Hours**

LPC-2148 PERIPHERALS:

LPC 2148 Peripherals-1: PLL, ADC, Timers and counters, Real-time clock, pulse width modulator.

UNIT-2 **8L+8T+8P=24 Hours**

LPC-2148 PERIPHERALS:

LPC 2148 Peripherals-2: UART, USB, I2C bus controller, Vector interrupt controller.

SKILLS:

- ✓ *Identify suitable hardware components for a specific application.*
- ✓ *Design a micro-controller-based system using LPC 2148.*
- ✓ *Develop the environment for interfacing peripherals with ARM processors.*
- ✓ *Develop Embedded-C or Assembly language programs using LPC 2148.*

PRACTICES:

- Blinking of LEDs with specific time delay using on-chip Timer of LPC2148.
- Generation of PWM signals using LPC2148.
- Demonstrate the on-chip components of LPC2148.
- Minor project based on the interest of students with LPC2148.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understand and analyze the architectures and functional components of ARM7 and LPC2148.	Analyze	1,2	1, 2, 4, 5, 9, 10, 12
2	Apply the knowledge of addressing modes and instructions to develop ARM assembly programs.	Apply	1	1, 2, 5, 9, 10
3	Categorize various on-chip peripherals of ARM LPC2148.	Analyze	1, 2	1, 2, 5, 9, 10
4	Experiment to interface various peripherals to ARM LPC2148.	Analyze	2	1, 2, 3, 4, 5, 9, 10, 12
5	Assess the techniques, skills, and modern engineering tools necessary for programming applications using ARM LPC2148.	Evaluate	1, 2	1, 2, 3, 4, 5, 9, 10, 12

TEXT BOOKS:

1. Steve Furber, “ARM System on Chip Architecture”, 2nd edition, Pearson education, 2014.
2. Andrew N Sloss, Dominic Symes and Chris Wright, “ARM system developer’s guide”, Morgan Kaufmann Publication, Elsevier, 2004.

REFERENCE BOOKS:

1. William Hohe and Christopher Hinds, “ARM Assembly Language: Fundamentals and Techniques”, 2nd edition, CRC Press, 2015.
2. “LPC214x User Manual (UM10139)”, Volume 1, Philips Semiconductors, 2015. (https://www.nxp.com/docs/en/user-guide/UM10139.pdf)
3. https://www.engineersgarage.com/arm-projects/how-to-start-programming-arm7-based-lpc2148-microcontroller.
4. https://circuitdigest.com/search/node?keys=lpc2148.
5. http://www.electronicwings.com/arm7.
6. https://onlinecourses.nptel.ac.in/noc20_cs15/preview