



TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108
Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



Department of Electronics and Communication Engineering

Program: B. Tech Electronics and Communication Engineering

Semester-VI **BEC33611: ARM based Development-Minor**

Teaching Scheme		Examination Scheme (Th)		Examination Scheme (P)	
Theory (Th)	3 Hrs./week	CT-I	15 Marks	-	-
Practical (P)	-	CT-II	15 Marks	-	-
Total Credits	3 (Th) = 3	CA	10 Marks	-	-
Duration of ESE: 3 Hrs.		ESE	60 Marks	-	-
		Total Marks	100 Marks	-	-

Pre-Requisites:

Course Objectives:

1	To understand the fundamentals of ARM processor architecture, its features, registers, and instruction sets.
2	To learn ARM assembly language and Embedded C programming for embedded system development.
3	To understand ARM memory organization, interrupt handling, and exception mechanisms.
4	To study peripheral interfacing and communication protocols such as GPIO, UART, SPI, and I ² C.
5	To develop, debug, and test ARM-based embedded applications using suitable development tools and platforms.

Course Content

Unit I	Basic Microcontrollers & ARM Core Microcontroller Basics: Microprocessor vs. Microcontroller, RISC principles, embedded basics. ARM Architecture: Cortex-M family overview, registers, operating modes, ARM vs. Thumb state. Tools: ARM IDEs (Keil, STM32CubeIDE) and build workflow.
Unit II	ARM Programming Basics Instructions: Basic ARM instruction formats, data operations, addressing modes. Control Flow: Branching, conditional execution, stack, subroutines. Embedded C: C programming structure for ARM and compilation steps.
Unit III	ARM Memory System and Interrupts Memory System: Address mapping, memory-mapped I/O, RAM, Flash basics. Interrupts: Exceptions, vector table, NVIC configuration. Timers: SysTick timer, basic delay generation, DMA concept.
Unit IV	ARM Peripheral Interfacing and Communication I/O & Analog: GPIO programming (LEDs, switches), PWM, ADC/DAC sensor reading. Serial Protocols: Basic setup for UART, SPI, and I ² C. Drivers: Simple peripheral drivers and RTOS overview.
Unit V	Debugging & Applications System Design: ARM development boards (STM32) and firmware workflow. Debugging: JTAG/SWD interfaces, breakpoints, watchpoints. Applications: Low-power modes and IoT/automation case studies.

Text Books	
T.1	Yifeng Zhu, “Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C”, 4th Edition, E-Man Press LLC, 2018.
T.2	Joseph Yiu, “The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors”, 3rd Edition, Newnes, 2013.
Reference Books	
R.1	Joseph Yiu, “The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors”, 3rd Edition, Newnes, 2013.
R.2	Steve Furber, “ARM System-on-Chip Architecture”, 2nd Edition, Addison-Wesley, 2000.
R.3	Andrew N. Sloss, Dominic Symes, and Chris Wright, “ARM System Developer’s Guide: Designing and Optimizing System Software”, Morgan Kaufmann, 2004.
Useful Links	
1	http://www.digimat.in/nptel/courses/video/117106111/L01.html
2	https://www.arm.com/resources/education/online-courses

CO	Course Outcomes	CL	Class Sessions
CO1	Explain ARM processor architecture, registers, operating modes, and instruction sets.	2	9
CO2	Develop programs using ARM assembly language and Embedded C.	3	9
CO3	Analyze ARM memory organization, interrupt handling, and exception mechanisms.	4	9
CO4	Interface ARM-based microcontrollers with peripherals and communication protocols such as GPIO, UART, SPI, and I ² C.	3	9
CO5	Develop , debug, and test basic ARM-based embedded applications using suitable development tools.	3	9



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