



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-IV | BEC32410: Embedded Systems -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 introduce the fundamental concepts, importance, and applications of embedded systems and processors in real-life, engineering, and industrial contexts compared to general-purpose systems.
2	To train students in developing and executing basic assembly and C programming routines using core microcontroller architecture principles.
3	To impart practical knowledge on interfacing key hardware peripherals and designing programs to solve prototype-level engineering problems.
4	To enable students to analyze, test, and troubleshoot real-world engineering and industrial challenges using embedded system solutions.
5	To expose students to modern RISC architectures, specifically ARM processors, and the fundamental operational concepts of Real-Time Operating Systems (RTOS).

Course Content

Unit I	History, Definition, and Classification of Embedded System, Design Metric & Its optimization, Embedded System Design Challenges, Processor selection Criteria, Building blocks of typical Embedded System – Core Types, Memory Architecture, Memory & Its Types, RISC and CISC.
Unit II	Introduction to ARM, features, architecture, instruction set features, Concepts of RTOS ARM processor and Architecture, register set, instruction set, programming, interrupts, stack, timers on-chip and off chip peripherals, interfacing and programming.
Unit III	Analyzing Inbuilt of ADC and DAC of ARM7TDMI Microcontroller, Applications based on PWM, Interfacing of Temperature Sensor, USART, Bluetooth, USB Drive, LCD display, GSM and GPS Module.
Unit IV	Protocol of Embedded System: - Bluetooth, USB Drive, I2C Bus, CAN Bus, IEEE 802.11, RS232, RS485, GPRS, IEEE 802.15, Modbus, Zigbee Architecture.
Unit V	Architecture of the kernel, Task scheduler, Semaphores, Mailbox, Message queues, Pipes, Events, Timers, Memory Management, Case study- Based on Communication Embedded System, Based on Automation Embedded Systems.

Text Books

T.1	Muhammad Ali Mazidi, Janice Gillispie Mazidi, and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", 2nd Edition, Pearson / Prentice Hall, 2005.
T.2	Raj Kamal, "Embedded Systems: Architecture, Programming and Design", 2nd Edition, McGraw-Hill Education (TMH), 2008.
T.3	K. M. Bhurchandi and A. K. Ray, "Advanced Microprocessors and Peripherals", 3rd Edition, McGraw-Hill Education India, 2012.

Reference Books

R.1	Lyla B. Das, "Embedded Systems: An Integrated Approach", 1st Edition, Pearson Education India, 2013.
R.2	Dr. K. V. K. K. Prasad, "Embedded / Real-Time Systems: Concepts, Design & Programming", Dreamtech Press, 2003.
R.3	Steve Heath, "Embedded Systems Design", 2nd Edition, Newnes, 2002.

Useful Links

1	https://nptel.ac.in/courses/117/106/117106112/
2	https://nptel.ac.in/courses/117/106/117106111/

CO	Course Outcomes	CL	Class Sessions
CO1	Examine importance of Embedded Systems in Real life, Engineering and Industrial applications and also to observe importance of embedded processors over general systems.	3	9
CO2	Implement basic programming instruction using concepts of microcontroller.	3	9
CO3	Analyze peripherals, interfacing and their programming to solve prototype problems.	4	9
CO4	Test Real life/ Engineering and Industry problems using Embedded Systems.	5	9
CO5	Explore the concepts of ARM (Advance RISK machine) and RTOS (Real Time Operating System).	4	9



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