



National Institute of Technology Meghalaya
An Institute of National Importance

CURRICULUM

Programme	Bachelor of Technology in Electronics and Communication Engineering	Year of Regulation	2018-19
Department	Electronics and Communication Engineering	Semester	V

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EC 311	Embedded Systems	3	1	0	4	50	50	100	200

Course Objectives	To make the students to understand and program embedded systems using modern embedded ARM processors	Of Course Outcomes	CO1	Design embedded systems with appropriate hardware and software components
	To build embedded platforms, interfaces, peripherals, processors and operating systems associated with embedded systems		CO2	Analyze, program and use a typical ARM processor and its peripherals
	Design high-level drivers usage for the integration of sensors		CO3	Interface various real-time sensors using different communication protocols
	Develop a comprehensive view of the software framework being developed around embedded SOCs.		CO4	Categorize and classify operating system tasks with particular emphasis on real-time system
	Develop real time operating systems on embedded system based applications		CO5	Apply the study of embedded technology to product design

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1	CO1	2	2	3	3	-	-	-	-	-	-	-	-	2	1	-	-
2	CO2	3	2	-	3	-	-	-	-	-	-	-	-	2	1	-	-
3	CO3	3	3	2	-	-	-	-	-	-	-	-	-	2	1	-	-
4	CO4	3	2	1	2	-	-	-	-	-	-	-	-	2	1	-	-
5	CO5	-	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-

SYLLABUS

No.	Content	Hours	COs
I	Introduction to Embedded Computing: Characteristics of Embedding Computing Applications, Concept of Real-time Systems, Challenges in Embedded System Design, Design Process. Embedded System Architecture: Instruction Set Architecture of ARM	10	CO1
II	Embedded Computing Platform: Bus Protocols, Bus Organization, Memory Devices and their Characteristics, Memory-mapped I/O, I/O Devices, I/O mapped I/O, Timers and Counters, Watchdog Timers, Interrupt Controllers, Interrupt programming, GPIO control, Sensors, Actuators, A/D and D/A Converters, Need of low power for embedded systems, Mixed Signals Processing	14	CO2, CO3
III	Programming Embedded Systems: Basic Features of an Operating System, Kernel Features, Real-time Kernels, Processes and Threads, Context Switching, Scheduling, Shared Memory Communication, Message-Based Communication, Real-time Memory Management, Dynamic Allocation, Device Drivers, Real-time Transactions and Files, Realtime OS (VxWorks, RT-Linux, Psos).	14	CO3, CO4
IV	Network Based Embedded Applications: Embedded Networking Fundamentals, Layers and Protocols, Distributed Embedded Architectures, Internet-Enabled Systems, IoT overview and architecture, Interfacing Protocols (like UART, SPI, I2C, GPIB, FIREWIRE, USB,). Various wireless protocols and its applications: NFC, Zig Bee, Bluetooth, Bluetooth Low Energy, Wi-Fi. CAN. Overview of wireless sensor networks and design examples. Case studies: Programming in Embedded C, Embedded system design using Arduino, ATOM processors, Galileo, STM, Tiva based embedded system applications.	10	CO2, CO3, CO5
Total Hours		48	

Essential Readings

- Alexander G. Dean "Embedded Systems Fundamentals with Arm Cortex M Based Microcontrollers: A Practical Approach" ARM Education media Publishers , Ist edition, 2017
- Rob Toulson and Tim wilmshrrst "Fast and Effective Embedded Systems Design: Applying the ARM mbed "Newnes Publishers , IInd edition, 2017
- Wayne Wolf, "Computers as Components- Principles of Embedded Computing System Design", Morgan Kaufmann Publishers, IInd edition, 2008
- Dogan Ibrahim"ARM-based Microcontroller Projects Using mbed", Newnes Publishers Ist edition, 2019

Supplementary Readings

- Lyla B. Das, "Embedded Systems –An Integrated Approach", Pearson Publishers, Ist edition, 2013
- Marwedel Peter, "Embedded System Design, Springer Publishers, Ist edition , 2006.
- Barry Crowley, "Modern Embedded Computing", Morgan Kaufmann Publishers, Ist edition, 2012