ITE311	**Embedded Systems**	L	T	P	C
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Prerequisite	**ITE216**				
Objectives	• To teach the fundamentals of embedded system • To understand programs and tools for embedded system . • To impart knowledge about real time operating system • To elucidate knowledge of embedded system types and its interfacing mechanisms				
Outcomes	The students will be able to 1. Understand and use in embedded system and device drivers. 2. Use software engineering practices in embedded systems development and Inter process communication.				
Unit 1	**EMBEDDED MICROCONTROLLERS**				12
	Introduction: Contrast between an embedded system and other computer systems; the role of programming and its associated languages as applied to embedded systems; the purpose and role of embedded systems in computer engineering. ***Microcontrollers:*** Structure of a basic computer system: CPU, memory, I/O devices on a bus; CPU families used in microcontrollers: 4-bit, 8-bit, 16-32-bit; Basic I/O devices: timers/counters, GPIO, A/D, D/A; Polled I/O vs. interrupt-driven I/O; Interrupt structures: vectored and prioritized interrupts; DMA transfers; Memory management units; Memory hierarchies and caches.				
Unit 2	**EMBEDDED PROGRAMS AND TOOLS**				9
	The program translation process: compilation, assembly, linking; Representations of programs: data flow and control flow; Fundamental concepts of assembly language and linking: labels, address management; Compilation tasks: mapping variables to memory, managing data structures, translating control structures, and translating expressions; T**ool support:** Compilers and programming environments; Logic analyzers; RTOS tools; Power analysis; Software management tools; Project management tools				
Unit 3	**REAL-TIME OPERATING SYSTEMS**				9
	Real-time operating systems: Context switching mechanisms; Scheduling policies; Rate-monotonic scheduling: theory and practice; Priority inversion; other scheduling policies such as EDF; Message-passing vs. shared memory communication; Interprocess communication styles such as mailbox and RPC; **Low-power computing:** Sources of energy consumption: toggling, leakage; Instruction-level strategies for power management: function unit management; Memory system power consumption: caches, off-chip memory; Power consumption with multiple processes; System-level power management: deterministic, probabilistic methods.				
Unit 4	**NETWORKED EMBEDDED SYSTEMS**				11
	Why networked embedded systems; Example networked embedded systems: automobiles, factory automation systems; The OSI reference model; Types of network fabrics; Network performance analysis; Basic principles of the Internet protocol; Internet-enabled embedded systems; Controller Area Network; Embedded Ethernet Controller; Inter Integrated Circuits(I2C)				
Unit 5	**INTERFACING AND MIXED-SIGNAL SYSTEMS**				9
	Digital-to-analog conversion; Analog-to-digital conversion; How to partition analog/digital processing in interfaces; Digital processing and real-time considerations. ARM Controllers				
Text Books	1. 1. Wayner Wolf, Computers as components – Principles of embedded computing system design, Morgan Kaufman,2001 2. Rajkamal, "Embedded Systems-Application, Practice & Design", Tata McGraw Hill, 2003 3. Arnold S. Berger, "Embedded Systems Design", CMP Books, 1997				
References					
MoE	CAT, Quiz, Seminar, Assignment, Term-End Examination				
Recommended by the Board of Studies on					
Date of Approval by the Academic Council					