# 19CS41E2 - EMBEDDED SYSTEMS

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| **Course Category:** | Professional Elective | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture – Tutorial – Practical:** | 3-0-0 |
| **Prerequisite:** | Require Embedded system basics and fundamentals of embedded system features. | **Sessional Evaluation:**  **Univ. Exam Evaluation:**  **Total Marks:** | 40  60  100 |
| **Objectives** | * To introduce the Building Blocks of Embedded System * To have knowledge about the basic working of a microcontroller system and its programming in assembly language. * To provide experience to integrate hardware and software for microcontroller applications systems. | | |

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| **Course Outcomes** | Upon the successful completion of the course, the students will be able to: | |
| CO1 | Know the importance of embedded computing, design process. |
| CO2 | Learn about the basics and architecture of 8051 microcontroller and interrupts and assembly language programming. |
| CO3 | Study the various logical and arithmetic operations in assembly language. |
| CO4 | Know the basics of Real time operating system. |
| CO5 | Learn the design of real time operating system basics. |
| CO6 | Study various debugging techniques. |
| **Course Content** | **UNIT-I**  **Embedded Computing**: Introduction, Complex Systems and Microprocessor, The Embedded  System Design Process, Formalisms for System Design, Design Examples.  **UNIT-II**  **The 8051 Architecture**: Introduction, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Serial data Input/output, Interrupts.  **Basic Assembly Language Programming Concepts**: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051.  **UNIT-III**  Data Transfer and Logical Instructions, Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions.  **Applications**: Interfacing with Keyboards, Displays,D/A and A/D Conversions, Multiple Interrupts, Serial Data Communication.  **UNIT-IV**  **Introduction to Real–Time Operating Systems**: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Events, Memory Management, Interrupt Routines in an RTOS Environment.  **UNIT-V**  **Basic Design Using a Real-Time Operating System**: Principles, Semaphores and Queues, Hard Real -Time Scheduling Considerations, Saving Memory and Power, An example RTOS like µC OS (Open Source).  **UNIT-VI**  **Embedded Software Development Tools**: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System.  **Debugging Techniques**: Testing on Host Machine, Using Laboratory Tools, An Example System | |
| **Text Books and References** | **TEXT BOOKS:**   1. Computers as Components-principles of embedded computer system design, Wayne Wolf, Elsevier. 2. The 8051 Microcontroller, Third Edition, Kenneth J. Ayala, Thomson. 3. An Embedded Software Primer, David E. Simon, Pearson Education.   **REFERENCE BOOKS:**   1. Embedding system building blocks, Labrosse, via CMP publishers. 2. Embedded Systems, Raj Kamal, TMH. 3. Micro Controllers, Ajay V Deshmukhi, TMH. 4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley. | |
| **E-Resources** | 1. <https://nptel.ac.in/courses> 2. <https://freevideolectures.com/university/iitm> | |