EMBEDDED C

I Semester: ECE(ES)								
Course Code	**Category**	\multicolumn{3}{c}{**Hours / Week**}	**Credits**	\multicolumn{3}{c}{**Maximum Marks**}
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
BESC07	**ELECTIVE**	3	0	0	3	30	70	100
Contact Classes: 45	**Tutorial Classes: Nil**	\multicolumn{4}{c}{**Practical Classes: Nil**}	\multicolumn{3}{c}{**Total Classes:45**}
Prerequisites: There are no prerequisites to take this course.								

I. COURSE OVERVIEW:

Embedded C is an extension to the standard C Programming Language. It focuses on the knowledge and skills required to define the functionality of the embedded systems. It includes multiple memory addressing; fixed-point arithmetic programming embedded systems in C. Embedded C is used in the development of microcontroller and embedded project applications.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The importance of embedded C and microcontrollers to design real time timers with various constraints.
II. The hardware/software signaling mechanism to implement effective communication between embedded software and hardware.
III. The significance of embedded C programming in real time microcontroller applications

III. COURSEOUTCOMES:

After successful completion of the course, students should be able to:

CO1	**Summarize** the concepts of embedded C and develop the embedded C programming examples with Keil IDE and interfacing modules	Understand
CO2	**Apply** the basic concepts of embedded system to develop the quality based Intruder Alarm System	Apply
CO 3	**Explore** the fundamentals of timers , formatted data frames and its controls to generate delays for embedded applications	Understand
CO 4	**Make use** of debugging techniques in embedded software to know step-by-step software execution process	Apply
CO 5	**Develop** the embedded programming in C and assembly level language for real time embedded applications.	Apply
CO 6	**Explore** the working of switches for reading and writing of data in to the required ports	Understand

IV. SYLLABUS:

MODULE – I: PROGRAMMING EMBEDDED SYSTEMS IN C (9)
Introduction ,What is an embedded system, Which processor should you use, Which programming language should you use, Which operating system should you use, How do you develop embedded software, Conclusions. Introducing the 8051 Microcontroller Family: Introduction, What's in a name, The external interface of the Standard 8051, Reset requirements ,Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption, Conclusions.

MODULE – II: SWITCHES (12)
Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for

pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats, Conclusions.
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MODULE – III: ADDING STRUCTURE TO THE CODE (12)
Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H),

Example: Restructuring the 'Hello Embedded World' example, Example: Restructuring the goat-counting example, Further examples, Conclusions

MODULE – IV: MEETING REAL-TIME CONSTRAINTS (12)
Introduction, Creating 'hardware delays' using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2?, The need for 'timeout' mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout, Conclusions.

MODULE – V: CASE STUDY: INTRUDER ALARM SYSTEM (12)
Introduction, The software architecture, Key software components used in this example, running the program, the software, Conclusions.

V. TEXT BOOKS:
 1. Michael J. Pont, "Embedded C", A Pearson Education.

VI. REFERENCE BOOKS:
 1. Nigel Gardner, "PIC micro MCU C-An introduction to programming, The Microchip PIC in CCS C".

VII. WEB REFERENCES:
 1. http://www.nptelvideos.in/2012/11/embedded-systems.html
 2. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Delhi/Embedded%20Systems%20(Video).html
 3. http://www.sciencedirect.com/science/book/9780750677929
 4. https://books.google.co.in/books/about/Embedded_systems.html?id=tgLm2g8KnH0C

VIII. E-TEXT BOOKS:
 1. http://www.ecpe.nu.ac.th/ponpisut/22323006-Embedded-c-Tutorial-8051.pdf
 2. https://www.eng.auburn.edu/~nelson/courses/elec3040_3050/C%20programming%20for%20embedded%20system%20applications.pdf
 3. https://www.bogotobogo.com/cplusplus/files/embed/OReilly_Programming_Embedded_Systems_Second_edition_ebook.pdf