INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

MICROCONTROLLERS AND PROGRAMMABLE DIGITAL SIGNAL PROCESSING								
I Semester: ES								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
BESE02	**Core**	3	-	-	3	40	60	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Microcontrollers and Microprocessors, Digital Signal Processing.								

I. COURSE OVERVIEW:

This course is intended to provide fundamentals of ARM Cortex-M3 Processor and LPC17XXMicrocontroller architectures and their features. It includes the architectures of the Cortex-M3, instruction set summary, Programmable DSP processor. It is used in the applications of microcontrollers programming models and programmable digital signal processors

II. COURSES OBJECTIVES:

The students will try to learn

I. The programming models of ARM processors core-based System on Chip with several features / peripherals based on requirements of embedded applications.
II. Identify and characterize architecture of Programmable DSP Processors.
III. Design and develop small applications by utilizing the ARM processor core and DSP processor-based platform

III. COURSE OUTCOMES:

At the end of the course students should be able to:

CO 1   Illustrate the Internal architecture and memory operations of ARM Cortex M3 processor forinterfacing microprocessor applications

CO 2   Analyze Exceptions handler mechanism to minimize interrupt latency using Nested Vectored Interrupt Controller

CO 3   Construct the high level of integration in embedded applications using LPC 17XX Microcontroller

CO 4   Demonstrate various computational building blocks of programmable DSP architectures usinginterfacing of memory and I/O peripherals

CO 5   Identify the CPU architecture, peripherals, and development tools for the TMS320C6000 digitalsignal processors

CO 6   Develop the application for digital signal processing using code composer studio tool

IV. COURSE CONTENT:

MODULE - I: ARM CORTEX-M3 PROCESSOR (9)
ARM Cortex-M3 processor: Applications, Programming model – Registers, Operation modes, Exceptions and Interrupts, Reset Sequence Instruction Set, Unified Assembler Language, Memory Maps, Memory Access Attributes, Permissions, Bit-Band Operations, Unaligned and Exclusive Transfers, Pipeline, Bus Interfaces

MODULE –II: EXCEPTIONS AND INTERRUPT (9)
Exceptions, Types, Priority, Vector Tables, Interrupt Inputs and Pending behavior, Fault Exceptions, Supervisor and Pendable Service Call, Nested Vectored Interrupt Controller, Basic Configuration, SYSTICK Timer, Interrupt Sequences, Exits, Tail Chaining, Interrupt Latency

MODULE –III: LPC 17XX MICROCONTROLLER (9)
LPC 17xx microcontroller- Internal memory, GPIOs, Timers, ADC. UART and other serial interfaces, PWM, RTC, WDT.

MODULE –IV: PROGRAMMABLE DSP (P-DSP) PROCESSORS (9)
Programmable DSP (P-DSP) Processors: Harvard architecture, Multiport memory, architectural structure of P-DSP-MAC unit, Barrel shifters, Introduction to TI DSP processor family.

MODULE –V: VLIW ARCHITECTURE (9)
VLIW architecture and TMS320C6000 series, architecture study, data paths, cross paths, Introduction to Instruction level architecture of C6000 family, Assembly Instructions memory addressing, for arithmetic, logical operations code composer Studio for application development for digital signal processing, on chip peripherals, processor benchmarking.

V. TEXT BOOKS:
1. Joseph Yiu, "The Definitive Guide to ARM Cortex-M3", Elsevier, 3rd Edition, 2014.
2. Venkatraman B, Bhaskar M, "Digital Signal Processors: Architecture, Programming and
   Applications, TMH,
   2nd Edition, 2011.

VI. REFERENCE BOOKS:
1. Sloss Andrew N, Symes Dominic, Wright Chris, "ARM System Developer's Guide: Designing and
   Optimizing", Morgan Kaufman Publications, Steve furber, "ARM System-on-Chip Architecture", Pearson Education.
2. Frank Vahid and Tony Givargis, "Embedded System Design", Wiley Publications

VII. WEB REFERENCES:
1. http://nptel.ac.in/courses/106105036/
2. https://www.youtube.com/watch?v=rpdygqOI9mM
3. https://www.youtube.com/watch?v=hELr9-7aAG8

VIII. E-TEXT BOOKS:
1. https://university.ti.com
2. http://www.everythingvtu.wordpress.com

IX. MATERIALS ONLINE
1. Course template
2. Tutorial question bank
3. Assignments

4. Model question paper - I
5. Model question paper - II
6. Lecture notes
7. Power point presentations
8. Early Lecture Readiness Videos