GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRONICS & COMMUNICATION (SIGNAL PROCESSING AND VLSI TECHNOLOGY) (26)
DIGITAL SIGNAL PROCESSORS: ARCHITECTURE AND PROGRAMMING
SUBJECT CODE: 2712608
SEMESTER: I

Type of course: Advanced Processor Architecture and Programming

Prerequisite: Students should have an understanding of Microcontroller architecture as well as basic C and assembly language programming skills and basic understanding of discrete time signals and systems

Rationale: Students of ME in Signal Processing must require fundamental concepts of Digital Signal Processing and implementation of various applications on Advanced Processor. Students also must understand architecture of advanced Digital Signal Processor and how to program it for signal processing applications

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
3	0	2	4	70	30	20	10	20	0	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**DSP Development System:** • Introduction • Support tools • Code composer studio • Programming examples to test of DSK tools	5	12%
2	**Architecture and Instruction set of TMS320C6x Processor:** • Fixed point and floating point data representation • Introduction to TMS320c6x architecture • Functional units • Instruction set • Assembler directives • Timers • Interrupts • Multi-channel buffered serial port (McBSP) • Direct Memory Access (DMA) • Memory consideration (EMIF) Basic Programming examples using assembly and linear assembly and C.	22	52%
3	**Programming Examples:** • Programming examples using C and assembly code for : • Convolution, Correlation • Infinite impulse response • Finite impulse response	5	12%

	• Fast Fourier Transform and adaptive filters		
4	**Code Optimization:** • Introduction • Optimization steps • Procedure for code optimization.	4	10%
5	**DSP Applications:** • DTMF Signal detection • Beat detection • Recent trends in DSP system design Using FPGA.	6	14%

Reference Books:
1. Rulph Chassaing ,Donald Reay , Digital Signal Processing and Application with theTMS320C6713 and TMS320C6416 DSK, 2nd edition, wiley Publication.
2. B Venkataramani, M Bhaskar, Digital Signal Processors, Architecture, Programming andApplications, 2nd edition, TMH, New Delhi
3. User guide - Texas Instrumentation

Course Outcome:
After successfully completion of this course, students should able to –

1. Write, Debug and simulate assembly as well as C code for Digital Signal Processor on Code Composer Studio environment.
2. Describe the architecture and basic operation of fixed-point and floating-point DSPs.
3. Explain the importance of on-chip Hardware modules of DSPs.
4. Develop and realize computationally efficient algorithms on the DSP platform (e.g. FFT, convolution- correlation etc.).
5. Optimize DSP code (e.g. software pipelining).
6. Describe recent application on DSP platform.

List of Experiments:

1. To study the architecture of DSP chips – TMS 320 6713 a 32-bit floating point processor
2. Introduction of Code Composer Studio.
3. To write and verify assembly language program using C67x processor for data transfer operation.
4. To write and verify assembly language program using C67x processor for arithmetic operation.
5. To write and verify assembly language program using C67x processor for logical operation
6. To write and verify assembly language program using C67x processor which calls assembly language program for various operation.
7. To write and verify 'C' language program using C67x processor for various operation.
8. To write and verify 'C' callable assembly language program using C67x processor for various operation.
9. To write and verify linear assembly language program using C67x processor for various operation.
10. To study the working of TMS 320C 6713 DSP development kit.
11. To write 'C' program using C67x processor for various operation and verify it on DSP Kit.

Open Ended Problems:

1. Write a 'C' program using C67x processor to generate Harmonics of a Sinusoidal signal.
2. Write assembly language program using C67x processor to find convolution of two sequences.
3. Write a 'C' program using C67x processor to find convolution of two sequences.
4. Write a 'C' program using C67x processor to find correlation of two sequences.
5. Write a 'C' program using C67x processor to compute 8-point DFT.

Major Equipments:

1. TMS 320C 6713 DSP development kit.

List of Open Source Software:

Code composer studio environment or equivalent,

Learning website:

www.nptel.ac.in, www.ti.com