SHRI VENKATESHWARA UNIVERSITY

Syllabus

M.TECH (VLSI) PART TIME

(Two Years Post Graduation Programme)

I SEMESTER
(w.e.f. 2019-20)

SCHOOL OF ENGINEERING & TECHNOLOGY

Evaluation for M.Tech (VLSI-Part time)

SEMESTER-I													
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	WVI-101	Microcontrollersand Programmable Digital Signal Processors	3	0	0	20	10	30		70		100	3
2	WVI-011	Digital Signal and Image Processing	3	0	0	20	10	30		70		100	3
3	WVI-111	Microcontrollersand Programmable Digital Signal Processors Lab	0	0	4				25		25	50	2
4	AUD-101	English for Research Paper Writing	0	0	0	20	10	30		70		100	0
		Total										350	8

Code	Course Name	L-T-P	Cr.
WVI-101	Microcontrollers and Programmable Digital Signal Processors	3-0-0	3

Course Outcomes: At the end of this course, students will be able to

- Compare and select ARM processor core based SoC with several features/peripherals based on requirements of embedded applications.
- Identify and characterize architecture of Programmable DSP Processors.
- Develop small applications by utilizing the ARM processor core and DSP processor based platform.

Syllabus Contents:

Unit 1: 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

Unit 2: Exceptions, Types, Priority, Vector Tables, Interrupt Inputs and Pending behaviour, Fault Exceptions, Supervisor and Pendable Service Call, Nested Vectored Interrupt Controller, Basic Configuration, SYSTICK Timer, Interrupt Sequences, Exits, Tail Chaining, Interrupt Latency.

Unit 3:LPC 17xx microcontroller- Internal memory, GPIOs, Timers, ADC, UART and other serial interfaces, PWM, RTC, WDT

Unit 4: Programmable DSP (P-DSP) Processors: Harvard architecture, Multi port memory, architectural structure of P-DSP- MAC unit, Barrel shifters, Introduction to TI DSP processor family.

Unit 5: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.

Unit 6: Code Composer Studio for application development for digital signal processing,On chip peripherals , Processor benchmarking.

References:

1. Joseph Yiu, “The definitive guide to ARM Cortex-M3”, Elsevier, 2nd Edition.
2. Venkatramani B. and Bhaskar M. “Digital Signal Processors: Architecture, Programming and Applications” , TMH , 2nd Edition
3. Sloss Andrew N, Symes Dominic, Wright Chris, “ARM System Developer's Guide: Designing and Optimizing”, Morgan Kaufman Publication

4. Steve furber, “ARM System-on-Chip Architecture”, Pearson Education
5. Frank Vahid and Tony Givargis, “Embedded System Design”, Wiley
6. Technical references and user manuals on www.arm.com, NXP Semiconductor www.nxp.com and Texas Instruments www.ti.com

Code	Course Name	L-T-P	Cr.
WVI-111	Microcontrollers and Programmable Digital Signal Processors Lab	0-0-4	2

Course Outcomes: At the end of the laboratory work, students will be able to:

- Install, configure and utilize tool sets for developing applications based on ARM processor core SoC and DSP processor.
- Develop prototype codes using commonly available on and off chip peripheralson the Cortex M3 and DSP development boards.

List of Assignments:

Part A) Experiments to be carried out on Cortex-M3 development boards and usingGNU tool chain

1. Blink an LED with software delay, delay generated using the SysTick timer.
2. System clock real time alteration using the PLL modules.
3. Control intensity of an LED using PWM implemented in software and hardware.
4. Control an LED using switch by polling method, by interrupt method and flashthe LED once every five switch presses.
5. UART Echo Test.
6. Take analog readings on rotation of rotary potentiometer connected to an ADC channel.
7. Temperature indication on an RGB LED.
8. Mimic light intensity sensed by the light sensor by varying the blinking rate of an LED.

9. Evaluate the various sleep modes by putting core in sleep and deep sleep modes.

10. System reset using watchdog timer in case something goes wrong.

11. Sample sound using a microphone and display sound levels on LEDs.

Part B) Experiments to be carried out on DSP C6713 evaluation kits and using Code Composer Studio (CCS)

1. To develop an assembly code and C code to compute Euclidian distance betweenany two Points

2. To develop assembly code and study the impact of parallel, serial and mixed execution

3. To develop assembly and C code for implementation of convolution operation

4. To design and implement filters in C to enhance the features of given input sequence/signal

Code	Course Name	L-T-P	Cr.
WVI-011	Digital Signal and Image Processing	3-0-0	3

Course Outcomes: At the end of this course, students will be able to

- Analyze discrete-time signals and systems in various domains
- Design and implement filters using fixed point arithmetic targeted for embedded platforms.
- Compare algorithmic and computational complexities in processing and coding digital images.

Syllabus Contents:

Unit 1: Review of Discrete Time signals and systems, Characterization in time and Zand Fourier – domain, Fast Fourier Transform algorithms – In-place computations, Butterfly computations, bit reversal's.

Unit 2: Digital Filter design: FIR - Windowing and Frequency Sampling, IIR – Impulseinvariance, bilinear Transformation.

Unit 3: Fixed point implementation of filters – challenges and techniques.

Unit 4: Digital Image Acquisition, Enhancement Restoration. Digital Image Coding and Compression – JPEG and JPEG 2000.

Unit 5: Color Image processing – Handling multiple planes, computational challenges.

Unit 6: VLSI architectures for implementation of Image Processing algorithms, Pipelining.

References:

- J.G. Proakis, Manolakis "Digital Signal Processing", Pearson, 4th Edition
- Gonzalez and Woods, "Digital Image Processing", PHI, 3rd Edition
- S. K. Mitra. "Digital Signal Processing – A Computer based Approach", TMH, 3rd Edition, 2006
- A. K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall
- KeshabParhi, "VLSI Digital Signal Processing Systems – Design andImplementation", Wiley India