

## **Topics covered for DSP course**

### **DSP Fundamentals:**

Introduction, signals & sampling, DT-LTI systems & analysis by convolution, freq analysis of DT systems, DT-LSI systems & analysis by Z transform, Digital filter design, DFT computation by FFT algorithm  
Statistical signal processing, Standard signal processing algorithm

### **Digital Image Processing:**

Introduction to Digital Image Processing, Image capturing, Data characterization and processing, Image enhancement & Feature extraction, Image transformations & Wavelet transforms, Image segmentation  
Introduction to VC++, Programming in VC++ for Image processing algorithms

### **BlackFin Architecture:**

About DSP, Von Neumann & Harvard architecture, fixed and floating point arithmetic, number representations & standards

Blackfin fixed point processor:

Overview of BlackFin architecture, features, computational units

Core components, Bus organization, Memory organization, Peripheral communication

### **BlackFin Program development:**

BF fixed point processor: Overview of BF architecture, instruction set, programming model and basics of program writing, BF-EZ kit-lite, VDSP 4.0/4.5, Overview of C Programming Language, C coding techniques, Embedding Assembly code in C program. Debugging and Optimization of C, Code optimization techniques, DSP and C Run-time library functions, C source debugger

### **Practical on BlackFin:**

Building & Running of Simple C Code in VDSP++, simple Blackfin Assembly code

Introduction of BLACKFIN EZ-Kit and Running of Simple C Code through EZ-Kit (LED Blinking in Blackfin EZ-KIT LITE), 16-bit, 32-bit and 48-bit addition of two numbers in Blackfin assembly,

Array addition in Blackfin assembly, Multiplication of two nos. in Blackfin assembly

Linear & circular convolution, waveform generation, interface C & assy, FIR & IIR filters, DFT, FFT, Peripheral communications SPI, UART, SPORT, Video IN/OUT

### **System Design:**

Typical DSP components, system design Peripherals port: PCI, USB, SPORT and UART

Peripheral devices: SRAM, SDRAM, Flash LCD programming

### **TigerSHARC Processor TS201:**

Introduction to TigerSHARC, architecture, Instruction set and sample programs

### **Practical on TigerSHARC:**

Addition of numbers, array, sum of product, multiplication, convolution, waveform generation, interface C & assembly, FIR & IIR filters, FFT

### **VLSI in DSP Domain:**

Basic Digital design and Introduction to VLSI, Introduction to VHDL and development of Code for the logic blocks and Test bench, FPGA architecture

### **Practical on VLSI coding:**

Introduction to Model-sim and ISE6.3, Basic Gates(simulation) Encoder, Decoder, Multiplexer, Demultiplexer, Half Adder, Full Adder, Priority Encoder, Binary to Gray, Gray to Binary Converters, Binary to Excess-3 conversion, Modeling of D-FF, T-FF, UP/DOWN counters, Shift registers, Gray Counter, Sequence Detector (Moore/ Melay), FPGA internal Memory Handling (SPRAM/ DPRAM), Synchronous & Asynchronous FIFO Implementation(DPRAM core, FIR Filter implementation, DSP equation implementation

**DSP application case studies:**

DSP application case studies: Applications in audio-video, telecommunication, automotive, process control, etc