

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech. in Electrical Engineering
Semester:	VII
Course Code:	2EEDE59
Course Title:	Digital Signal Processors for Electrical Systems
Course Type:	(<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course / <input checked="" type="checkbox"/> Department Elective / <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/ <input type="checkbox"/> Open Elective <input type="checkbox"/> Any other)
Year of Introduction:	2021 – 22

Credit Scheme

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

At the end of the course, students will be able to-

1. comprehend the architecture and memory needs of digital signal processors
2. develop programming logic as per the application needs
3. perform basic coding in DSP using instruction sets
4. apply the knowledge of interfacing systems for real time electrical applications

Syllabus:

Total Teaching hours: 30

Unit	Syllabus	Teaching hours
Unit-I	Introduction to Programmable DSPs Numeric representation & arithmetic operations, fixed point versus floating point representation, fixed point data paths & floating point data paths, multiple access memory, multi-ported memory.	08
Unit-II	Architectures of Signal Processor Introduction, Bus structure, central arithmetic logic unit, auxiliary register ALU, status register, index register, parallel logic unit, program flow, memory mapping, CPU interrupts, VLIW architecture.	06
Unit-III	TMS320C2XX Programming Assembly language syntax, addressing modes, load/store, addition/subtraction, multiplication, program control instruction, sample programs.	06
Unit-IV	Initializing TMS320C2XX DSP for Electrical Systems Overview of compilers and emulators, using code composer studio, creating and customizing program and data memory, creating header files, initializing timers and initialization of internal ADC, scaling of ADC signals, generation of signals and waveforms, generation of PWM signals for power electronic converters, case studies.	06
Unit-V	Embedded Code Generation using software tools Development of mathematical models and control algorithm for real time electrical system applications using software tools.	04

Self-Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

This shall consist of at least 08 laboratory experiments / simulations based on the syllabus.

Suggested Readings/ References:

1. Texas Instruments, TMS320C2xx DSP CPU and Instruction Set Reference Guide.
2. H. Toliyat, - DSP based Electromechanical Motion Control, CRC Press.
3. Phil Lapsley - Processor Fundamentals: Architecture and Features, Wiley India.
4. George Terzakis - Introduction to C Programming with the TMS320LF2407A DSP Controller, Create space Independent Publisher
5. S. K. Mitra - Digital Signal Processing: A Computer Based Approach, Tata McGraw-Hill.
6. Online tutorial and reference notes on Hardware – in – Loop systems
7. Recent research papers and literature

Suggested List of Experiments:

1. Demonstration of TMSC2XXXX DSP and its Peripherals
2. To implement arithmetic operations on TMSC2XXXX DSP
3. To implement logical Operations on TMSC2XXXX DSP
4. Introduction to CCS and PP emulator for TMSC2XXXX DSP
5. To generate fixed and variable duty cycle PWM on TMSC2XXXX DSP
6. To perform initialization and configuration of ADC and DAC on TMSC2XXXX DSP
7. To control single-phase inverter using TMSC2XXXX DSP
8. To perform embedded code generation for power electronic converter using DSP

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2021-22 and onwards