CPLD AND FPGA ARCHITECTURE

I Semester: ECE(ES)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BESC08	**ELECTIVE**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	1	0	4	30	70	100
Contact Classes: 45	**Tutorial Classes: 15**	**Practical Classes: Nil**				**Total Classes:60**		

I.COURSE OVERVIEW:

Programmable logic has become more and more common as a core technology used to build electronic systems. By integrating soft-core or hardcore processors, these devices have become complete systems on a chip, steadily displacing general purpose processors and ASICs.This course will give you the foundation for FPGA design in embedded systems along with practical design skills.

II.COURSE OBJECTIVES:

The students will try to learn:

I. The operational principles, characteristics of semiconductor devices and circuits.
II. The principles of operating semiconductor devices for rectification, amplification, conditioning and voltage regularization of signals.
III. The analytical skills needed to model analog and digital integrated circuits (IC) at discrete and micro circuit level
IV. The foundations of basic electronic circuits necessary for building complex electronic hardware.

III. COURSEOUTCOMES:

After successful completion of the course, students should be able to:

CO1	**Understand** the features and architectures of industrial CPLDs with different families.	Understand
CO2	**Understand** the features and architectures of industrial FPGAs with different families.	Understand
CO3	**Make use of** the programming techniques used in FPGA design methodology.	Apply
CO4	**Design** and implement complex real time digital circuits.	Create
CO5	**Analyze** system level design and their application for combinational and sequential Circuits.	Analyze
CO 6	**Explore** the types of programmable logic, SPLDs and CPLDs, their basic structure.	Understand

IV. SYLLABUS:

MODULE – I: INTRODUCTION TO PROGRAMMABLE LOGIC DEVICES:

Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

MODULE – II:FELID PROGRAMMABLE GATE ARRAYS:

Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, and Programmable I/O blocks in FPGAs, Dedicated Specialized

Components of FPGAs, and Applications of FPGAs.

MODULE – III: SRAM PROGRAMMABLE FPGAS:
Introduction, Programming Technology, Device Architecture, the Xilinx XC2000, XC3000 and XC4000 Architectures.

MODULE – IV: ANTI-FUGE PROGRAMMED FPGAs:
Introduction, Programming Technology, Device Architecture

The Actel ACT1, ACT2 and ACT3 Architectures.

MODULE – V: DESIGN APPLICATIONS:
General Design Issues, Counter Examples, A Fast Video Controller, and A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

V. TEXT BOOKS:

1. Stephen M. Trim Berger, “Field Programmable Gate Array Technology,” Springer International Edition.
2. Charles H. Roth Jr, Lizy Kurian John, “Digital Systems Design,” Cengage Learning.

VI. REFERENCE BOOKS:

1. John V. Oldfield, Richard C. Dorf, “Field Programmable Gate Arrays,” Wiley India.
2. Pak K. Chan/Samiha Mourad, “Digital Design Using Field Programmable Gate Arrays,” Pearson Low Price Edition.
3. Ian Grout, “Digital Systems Design with FPGAs and CPLDs”, Elsevier, Newnes.
4. Wayne Wolf, “FPGA based System Design”, Prentice Hall Modern Semiconductor Design Series.

VII. E-TEXT BOOKS:

1.https://www.gacbe.ac.in/images/E%20books/Grout%20%20Digital%20(Elsevier,%202008).pdf
2.http://www.ee.ic.ac.uk/pcheung/teaching/ee2_digital/fpga%20&%20cpld%20tutorial.pdf