EC-509 - DIGITAL SYSTEM DESIGN

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Course Objectives:
- To learn about HDL
- Acquire the knowledge of designing sequential machines using ASM
- Asynchronous sequential machine design, races and hazards
- Synchronous design using PLD'S and GAL'S

Course Learning Outcomes:
- Able to use HDL for digital design
- Easily design involving synchronous/ asynchronous machine without hazards and races.
- Two level implementation of digital logic using PLD'S, GAL'S and FPGA.

UNIT - I   (12 hours)
VHDL

Design Flow, Program structure, Types and Constants, Structural Design Elements, Dataflow Design Elements, Behavioral Design Elements, Functions and Procedures, Libraries and Packages.

UNIT - II   (10 hours)
Design of Digital systems

ASM charts, Hardware description language and control sequence methods, Reduction of state tables, state assignments. Sequential circuit design: design of iterative circuits, design of sequential circuits using ROMs and PLAs, sequential circuit design using CPLD, FPGAs.

UNIT - III   (9 hours)
Asynchronous sequential machine

Fundamental mode model, flow table, state reduction, minimal closed covers, races, cycles and hazards.

UNIT - IV   (10 hours)
Programmable logic

ROM, PLA, PAL, PLD, PGA – Features, programming and applications using complex programmable logic devices Altera series – Max 5000/7000 series and Altera FLEX logic – 10000 series CPLD, AMD's – CPLD (Mach 1 to 5); Cypres FLASH 370 Device Technology, Lattice pLSI's Architectures – 3000 Series – Speed Performance and in system programmability.

UNIT - V   (9 hours)
FPGAs

Field Programmable Gate Arrays – Logic blocks, routing architecture, Design flow, Technology Mapping jfor FPGAs, Case studies – Xilinx XC4000 & ALTERA's FLEX 8000/10000 FPGAs: AT & T –ORCA's (Optimized Reconfigurable Cell Array): ACTEL's – ACT-1,2,3 and their speed performance

TEXT BOOKS:

1. John F Wakerly, "Digital Design Principles and Practices", Pearson Education, 2002
2. Donald G. Givone, "Digital principles and Design", Tata McGraw Hill 2002.

REFERENCES:

1. John M Yarbrough, "Digital Logic applications and Design", Thomson Learning, 2001]
2. Nripendra N Biswas, "Logic Design Theory", Prentice Hall of India, 2001
3. Charles H. Roth Jr., "Fundamentals of Logic design", Thomson Learning, 2004.
4. P.K.Chan & S. Mourad, "Digital Design Using Field Programmable Gate Array", jPrentice Hall (Pte), 1994.
5. S.Trimberger, Edr., "Field Programmable Gate Array Technology", Kluwer Academic Publicatgions, 1994.
6. J. Old Field, R.Dorf, "Field Programmable Gate Arrays", John Wiley & Sons, Newyork, 1995.
7. S.Brown, R.Francis, J.Rose, Z.Vransic, "Field Programmable GateArray", Kluwer Pubin, 1992