FPGA & Reconfigurable Computing
EC703D
Contacts: 3L
Credits: 3

Module –I: Introduction to Reconfigurable Computing (RC) [5L**]**
History, State-of-the-Art and Future Trends, Computing requirements as Power, Area and VLSI scaling, Mapping of Algorithmanalysis and speed-up, RC architectures- Fine Grain and Coarse Grain, Hybrid and Embedded Architectures, Supercomputers.

Module-II: Reconfigurable Logic Devices: [6L**]**
FPGA and its internal architecture, computing elements, LUT, BRAM, interconnects, I/O Blocks, programming of FPGA andinterfacing case study, ALU design, designing with embedded processors, introduction to Power PC and ARM processors.

Module III: Hardware Description Language for RC: [6L**]**
Design cycle, algorithms, Hardware Description Language, VHDL, different design styles: data flow, structural and behavioral and practical logic circuit implementation example on FPGA, debugging, writing test bench, High level synthesis and Low level synthesis.

Module IV: RC Configuration: [4L]
Application segmentation and Resource partitioning, spatial and temporal configuration, systolic architectures and algorithms, Bit serial, on the fly, multiplexing vs. run-time reconfiguration

Module V: RC Implementation: [6L**]**
Virtual Hardware Components (VHC) design process, high level synthesis of VHC and optimization, VHC data-path and control unit design, simulation and verification of VHC, determination of reconfigurable scheme and associated loading mechanisms (temporal and spatial partitioning) for RC.

Module VI: RC applications: [5L**]**
RC for DSP, DSP application building blocks, RC for Image processing, Bioinformatics and Network Security

Text Books:
1. M. Gokhale and P. Graham; Reconfigurable Computing: Accelerating Computation with FPGAs, Springer, 2005
2. C. Maxfield ; The design Warrior’s Guide to FPGAs: Devices, Tools and Flows, Newnes, 2004
3. C. Bobda, Introduction to Reconfigurable Computing : Architectures, Algorithm and Applications, Springer, 2005

Reference Books:
1. W. Wolf , FPGA Based Systems Design, PHI, 2004
2. P. Lysagt and W. Rosenstiel, New Algorithms, Architectures and Applications for Reconfigurable Computing, Springer, 2005