GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRONICS & COMMUNICATION (VLSI SYSTEM DESIGN) (42)

FOUNDATION OF VLSI CAD

SUBJECT CODE: 2714202

SEMESTER: I

Type of course: Algorithm Based Course

Prerequisite: Basics knowledge of VLSI Design and Graph Theory

Rationale: Students of ME in VLSI must understand the contents of this subject for the designing of various CAD Tools**.**

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
3	0	2	4	70	30	20	10	20	0	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Introduction:** VLSI Design, The VLSI Design Process, Layout Styles, Difficulties in Physical Design, Definitions and Notation	4	10
2	**Circuit Partitioning:** Introduction, Problem Definition, Cost Function and Constraints, Approaches to Partitioning Problem, Other Approaches and Recent Work.	6	14
3	**Floor planning:** Introduction, Problem Definition, Approaches to Floor planning, Other Approaches and Recent Work.	5	12
4	**Placement:** Introduction, Problem Definition, Cost Functions and Constraints, Approaches to Placement, Other Approaches and Recent Work.	6	14
5	**Grid Routing:** Introduction, Problem Definition, Cost Functions and Constraints, Maze Routing Algorithms, Line Search Algorithms, Other Issues, Other Approaches and Recent Work.	6	14
6	**Global Routing:** Introduction, Cost Functions and Constraints, Routing Regions, Sequential Global Routing, Integer Programming, Global Routing by Simulated Annealing, Hierarchical Global Routing, Other Approaches and Recent Work.	5	12
7	**Channel Routing:** Introduction, Problem Definition, Cost Functions and Constraints, Approaches to Channel Routing, Other Approaches and Recent Work.	5	12
8	**Layout Generation:** Introduction, Layout Generation, Standard-cell Generation, Optimization of Gate-matrix Layout, Programmable Logic Arrays, Other Approaches and Recent Work.	5	12

Reference Books:

1. VLSI Physical Design Automation, Theory and Practice, Sadiq M. Sait and Habib Youssef. By world scientific press.
2. Algorithm for VLSI physical design automation by Sherwani and navneed- by Springer /B S Publication (2008).
3. N. Sherwani, Algorithms for VLSI Physical Automation, Third Edition, Kluwer, 1998.
4. S. H. Gerez, Algorithms for VLSI Design Automation, Wiley, 1998.
5. A. Micozo, Digital Logic Testing and Simulation, Second edition, Wiley, 2003.
6. S. M. Sait and H. Yousuf, Iterative Computer Algorithm with Applications in Engineering, Wiley/IEEE, 2002.
7. C. Visweswariah and S. Duvall, Computer Aided Optimization of Digital Integrated Circuits, Wiley, 2002.
8. G. De Micheli, Synthesis and Optimization of Digital Circuits, Mcgraw-Hill International, 1994

Course Outcome:

After learning the course the students should be able to:

- Understand the basic concept of discrete mathematic.
- Understand the concept of different constraints, cost functions and optimization.
- Optimization of VLSI Design in using Circuit Partitioning, Floor planning and placement.
- Use of different algorithm in design of CAD tools for VLSI Design.
- Different styles of routing for optimization of Area.
- Understand various CAD Tools.

List of Experiments:

1. Introduction to Various CAD Design Tools and its comparisons.
2. Implementation of the Kernighan Lin Algorithm for circuit partitioning.
3. Implementation of the Fiduccia Mattheyses Algorithm for circuit partitioning.
4. Implementation of the Simulated Annealing Algorithm.
5. Implementation of the Genetic Algorithm.
6. Implementation of Yoshimura and Kuh algorithm.
7. Implementation of the Linear Ordering Cluster Growth Algorithm.
8. Implementation of the Unconstrained Algorithm for channel routing.
9. Implementation of the vertical constrained Algorithm for channel routing.
10. Implementation of the Min Cut Algorithm.
11. Case Study.

Open Ended Problems:

1. Write 'C' program and MATLAB code to generate various sequences.
2. Write 'C' program and MATLAB code to plot the magnitude response and phase response of a signal $x(n) = a^n u(n)$.
3. Write a 'C' Program to find out even and odd component of a function.
4. Write a 'C' program for a convolution of two sequences using 'For loop' and 'While Loop'.
5. Write 'C' code to generate various signals in CCS and display them on CRO through DSP Processor Kit TMS 320C6713

Major Equipments/Software : MATLAB Software or Sci lab open source software

List of Open Source Software/learning website:

1. http://wwwhome.ewi.utwente.nl/~gerezsh/cadvlsi/book.html

2. http://www.personal.kent.edu/~rmuhamma/GraphTheory/graphTheory.htm
3. http://compprog.wordpress.com/2007/11/09/minimal-spanning-trees-prims-algorithm/
4. http://www.people.vcu.edu/~gasmerom/MAT131/mst.html
5. http://www.personal.kent.edu/~rmuhamma/GraphTheory/MyGraphTheory/trees.htm
6. http://www.slideshare.net/purpleinkredshirt/introduction-to-graph-theory
7. http://lecturesppt.blogspot.in/2011/09/graphs-and-algorithms-pdf-ppt-slides.html
8. http://www.authorstream.com/Presentation/ankush85-159135-nphard-nphard171-175-education-ppt-powerpoint/
9. http://www.authorstream.com/Presentation/nitinmishra10-83453-complexity-algorithm-data-structure-algorithms-lecture-3-education-ppt-powerpoint/