

Indian Institute of Technology Kharagpur
Department of Computer Science & Engineering
Autumn Semester 2006

Course: **Switching Circuits & Logic Design (CS23003)**

Credits : 4 - 0 - 3 : 6 Credits

Faculty : Ajit Pal

Lecture hours : Mon: 1-2; Tue: 5; Wed: 4. Room #: 108, CSE Building
Classes to start on July 24, 2006

Prerequisite: None

Evaluation:

Theory	60%
Mid-term	30%
End-term	50%
Term Assessment	20%
Lab	40%

Course Outline:

Switching Circuits: Logic families: TTL, nMOS, CMOS, dynamic CMOS and pass transistor logic (PTL) circuits. inverters and other logic gates. area, power and delay characteristics. concepts of fan-in, fan-out and noise margin.

Switching theory: Boolean algebra, logic gates, and switching functions, truth tables and switching expressions; Minimization of completely and incompletely specified switching functions- Karnaugh map and Quine-McCluskey method, multiple output minimization. Representation and manipulation of functions using BDD's. two-level and multilevel logic circuit synthesis.

Combinational logic circuits: Realization of Boolean functions using NAND/NOR gates, Decoders, multiplexers; logic design using ROMs, PLAs and FPGAs. Case studies.

Sequential circuits: Clocks, Flip-flops, Latches, counters and shift registers, Finite-state machine model, synthesis of synchronous sequential circuits, minimization and state assignment; asynchronous sequential circuit synthesis.

Algorithmic State Machines (ASM): Representation of sequential circuits using ASM charts, synthesis of output and next state functions, Data path control path partition-based design.

Textbooks:

[1] Digital Integrated Electronics, Taub, H and Schilling, D, McGraw-Hill

[2] Switching and Finite Automata Theory, Z. Kohavi, TMH.

[3] Contemporary Logic Design, Randy H. Katz and Gaetano Borriello, PHI

[4] Synthesis and Optimization of Digital Circuits, Giovanni De Micheli, TMH

Laboratory component:

Instructors : Dipankar Sarkar and Ajit Pal

Lab hours : Tuursday: 6-8; Hardware Laboratory, CSE Building

Lab to start on July 20, 2006

Pulse Circuits: Design and implement an astable multivibrator using transistors and 555 timer IC, Schmitt Trigger.

TTL and CMOS Gates: Study the characteristics of TTL and MOS gates.

Combinational logic circuits: Design and implementation of combinational circuits such as 2/4-bit ALU and 7-segment LED display driver.

Sequential Circuits and Finite State Machines: Design and implementation of sequential circuits such as pseudo-random sequence generator, lift controller.