
EE206: Digital Circuits

<http://www.ee.iitb.ac.in/~sumantra/courses/digital/digital.html>

Schedule for classes:**Credits:** 8

Mon: 08:30 - 09:30, Tue: 10:30 - 11:30, Wed: 11:30 - 12:30, Fri: 09:30 - 10:30

EEG 001

Textbooks:

1. F. J. Hill, G. R. Peterson. *Computer Aided Logical Design with Emphasis on VLSI, Fourth Edition*. John Wiley and Sons, 1993.
2. M. M. Mano. *Digital Logic and Computer Design*. Prentice-Hall, 1979.

Reference Books:

1. J. Millman, A. Grabel. *Microelectronics*. McGraw-Hill Book Co., 1987.
2. J. Millman, C. C. Halkias. *Integrated Electronics: Analog and Digital Circuits and Systems*. McGraw-Hill Kogakusha, 1972.
3. J. Millman, H. Taub. *Pulse, Digital and Switching Waveforms*. McGraw-Hill Book Co., 1965.
4. A. S. Sedra, K. C. Smith. *Microelectronic Circuits*. Oxford University Press, 1988.
5. J. P. Hayes. *Digital System Design and Microprocessors*. McGraw-Hill Book Co., 1985.
6. R. J. Tocci. *Digital Systems: Principles and Applications, Fourth Edition*. PHI, 1988.
7. R. J. Tocci, N. S. Widmer. *Digital Systems*. PHI, 2001.
8. F. J. Hill, G. R. Peterson. *Digital Systems: Hardware Organization and Design*. John Wiley and Sons, 1978.
9. M. D. Ercegovac, T. Lang. *Digital Systems and Hardware/Firmware Algorithms*. John Wiley and Sons, 1985.
10. M. D. Ercegovac, T. Lang, J. H. Moreno. *Introduction to Digital Systems*. John Wiley and Sons, 2000.
11. Z. Kohavi. *Switching and Finite Automata Theory*. McGraw-Hill Book Co., 1970.
12. H. Taub, D. Schilling. *Digital Integrated Electronics*. McGraw-Hill Book Co., 1977.
13. A. P. Malvino, D. Leach. *Digital Principles and Applications*. Tata McGraw-Hill.
14. J. E. Hopcroft, J. D. Ullman. *Introduction to Automata Theory, Languages and Computation*. Narosa Publishing House, 1987.
15. K. L. P. Mishra, N. Chandrasekaran. *Theory of Computer Science*. Prentice-Hall of India Private Ltd., 1993.
16. A. V. Aho, R. Sethi, J. D. Ullman. *Compilers: Principles, Techniques, and Tools*. Addison-Wesley Publishing Co., 1986.

Assignments ... A combination of theoretical work as well as programming work. Both will be scrutinized in detail for original work and thoroughness. For programming assignments, there will be credit for good coding. Spaghetti coding will be penalized. Program correctness or good programming alone will not fetch you full credit ... also required are results of extensive experimentation with varying various program parameters, and explaining the results thus obtained. Assignments will have to be submitted on or before the due date and time. Late submissions will not be considered at all. Unfair means will result in assigning no marks, the number said to have been discovered by the ancient Indians, *to both parties (un)concerned*.

Examinations and Grading Information:

Mid-Sem: 35

Assignments: 30

End-Sem: 35

Attendance Requirements: As per Institute rules for Dual Degree and B.Tech students. Illness policy: illness to be certified by the IITB Hospital *Attendance in Examinations is Compulsory*.

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Proposed Course Outline

I. Introduction

1. Getting Started: *Maths + Electrical Engg + Comp Sc = ?*
Digital ? Why on earth ?

II. Basics

2. Dealing with Zeros and Ones: *Bits of Mathematics ...*
Playing around with number systems
3. Introduction to Boolean Algebra
From Mathematics to an Abstraction: Logic Gates
4. From Abstraction to Implementation: *Bringing in Electrical Engineering ...*
Digital Integrated Circuits
Diodes and Transistors: Analog Electronics Hangover ...
Logic Families - using Diodes and Transistors to build logic gates: *Kabhi ON, Kabhi OFF*

III. Boolean Algebra

5. Boolean Algebra: *The Gory Details ...*

IV. Combinational Logic: MSI and LSI

6. Basic Building Blocks: *Taking the abstraction one level further ...*
Adders: *Beware ...*
Subtractors
Multilevel Circuits
Comparators
Decoders
Multiplexers
ROMs
PLAs

V. Sequential Logic

7. Introduction: *Doing it with the Clock ...*
8. Flip Flops
9. State Machines
10. Counters: *Ek Do Teen ...*
11. Registers
12. RAM Design: *Memorable and Unforgettable ...*
13. Programming Hardware

VI. Computing

14. Introduction to Automata Theory: *Bringing in Computer Science Fundae ...*