Syllabus

- History of Microelectronics
- IC Fabrication Process
- Basic Concepts in Digital Integrated Circuits
- Layout Design Rules
- Bipolar Logic Families and Layout
- MOS Logic Families and Layout
- Calculations of Power Dissipation, Speed, Noise,…
- Basic Arithmetic and Logic Building Blocks
- Semiconductor Memories
Aspects

– Propagation Delay
– Noise Margin
– Output Impedance
– Power Dissipation
– Fan in, Fan out
– Compatibility
– Supply Voltage
– No. of Functions
– Thermal Ranges
– Cost (Area)
References

– I) Circuit Analysis
– II) Layout Aspects
– III) Modeling MOS (Physic-Scaling)
– IV) Technology and Fabrication
– V) Bipolar and BiCMOS
References I (Circuit Analysis)

- **MOS/LSI Design and Application**

- **Analysis and Design of Digital Integrated Circuit**

- **Fundamentals of MOS Digital Integrated Circuit**

- **Digital MOS Integrated Circuit**

- **Digital Integrated Circuit Design**
  Ken Martin 2000.

- **Digital Integrated Circuits**
  Thomas A. Demassa and Zack Ciccone.
References II (Layout Aspects)

- **Principles of CMOS VLSI Design**

- **Introduction to VLSI Design**
  Fabricius 1990.
References III (Modeling MOS)

- Operation and Modeling of the MOS Transistor
- Microelectronic Devices
References IV (Tech.)

- VLSI Technology
References V( Bipolar-BiCMOS)

- Digital Bipolar Integrated Circuits

- Digital BiCMOS Integrated Circuits

- Digital Integrated Circuits
  Thomas A. Demassa and Zack Ciccone.
Sources

- IEEE Journal of Solid-State Circuits (JSSC)
- IEEE International Solid-State Circuits Conference (ISSCC)
- IEE Electronics Letters
- Required Papers (ee.iust.ac.ir)
- Recommended Papers (ee.iust.ac.ir)
- Digital Integrated Circuits
  Thomas A. Demassaa and Zack Ciccone.
- Digital Integrated Circuits
  Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic.
Software

– Hspice level 49
  ● Well known

– Ledit
  ● Layout
  ● DRC (Design Rule Check)
  ● Circuit Extraction
  ● LVS (Layout Versus Schematic)
  ● APR (Auto Placement and Routing)
Grading

- HW: 10-15% Only in print Format
- Project: 10-20% Only in print Format
- Final: 30-40%
- Seminar: 10-20% Power Point 8 Minutes
Seminar Topics

- High-performance low-power logic
- Leakage suppression
- Low voltage design
- Circuit optimization techniques
- Interconnect in deep-submicron
- Arithmetic circuits
- High-speed communication
- Timing of gigascale circuits
- Flip-flops/latches
- Memory circuits
- Other important circuit topics