# Department of Computer Science and Engineering
# National Institute of Technology Jamshedpur

**B. Tech. 2020-21**

**THIRD SEMESTER**

**Course Handout**

August 12, 2020

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| **Course No.** | : CS1301 |
| **Course Title** | : Digital System Design |
| **Course Instructor** | : Dr. Vinay Kumar (Email: vkumar.cse@nitjsr.ac.in) |

## 1. Course Description

This course covers the topics on Binary Number System & Boolean Algebra, BCD, ASCII, EBDIC, Gray codes and their conversions, Signed binary number representation with 1's and 2's complement methods, Binary arithmetic, Venn diagram, Boolean algebra, Representation in SOP and POS forms, Minimization of logic expressions by algebraic method, Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor), Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator, Sequential Circuits - Basic Flip-flop & Latch, Flip-flops -SR, JK, D, T and JK Master-slave Flip, Flops, Registers (SISO, SIPO, PIPO, PISO), Ring counter, Johnson counter, Basic concept of Synchronous and Asynchronous counters (detail design of circuits excluded), Design of Mod N Counter, A/D and D/A conversion techniques – Basic concepts (D/A:R-2-R only, A/D: successive approximation), Logic families- TTL, ECL, MOS and CMOS - basic concepts.

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## 2. Course Learning Outcomes (CLOs): At the end of the course the students will be able to:

- Convert from one number system to another.
- Work out problems related to Boolean algebra, minimization problems etc.
- Understand issues in designing high-speed complex digital systems.
- Understand hardware architectures of basic building blocks of digital systems.
- Design and optimize complex combinational and sequential logic.
- Covert Analog to Digital & Digital to Analog Circuits.
- Know about basic concepts of Digital Logic Families.

## 3. Textbook

1. M Morris Mano, Michael D. Ciletti. "Digital design: with an introduction to the verilog HDL, VHDL, and system Verilog." Sixth edition, Pearson Education, (2017).

## 4. Reference Books

1. Donald P. Leach, Albert Paul Malvino, Goutam Saha."Digital Principles and Applications." 8th edition, TMH, (2014).

**5. Lecture Modules**

| Serial No. | Topics | No. of Lectures |
|---|---|---|
| 1 | Binary Number System & Boolean Algebra. | 2 |
| 2 | BCD, ASCII, EBDIC, Gray codes and their conversions. | 2 |
| 3 | Binary arithmetic, Venn diagram, Boolean algebra. | 2 |
| 4 | Representation in SOP and POS forms. | 2 |
| 5 | Minimization of logic expressions by algebraic method. | 2 |
| 6 | Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor), Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator. | 10 |
| 7 | Sequential Circuits - Basic Flip-flop & Latch, Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops. | 8 |
| 8 | Registers (SISO, SIPO, PIPO, PISO), Ring counter, Johnson counter, Basic concept of Synchronous, and Asynchronous, Design of Mod N Counter. | 6 |
| 9 | A/D and D/A conversion techniques – Basic concepts (D/A: R-2-R only, A/D: successive approximation. | 4 |
| 10 | Logic families- TTL, ECL, MOS and CMOS - basic concepts. | 2 |

**6. Evaluation Scheme**

| S No. | Component | Duration | Weightage |
|---|---|---|---|
| 1 | Mid-Semester Test | 2 Hours | 30% |
| 2 | Assignments | As per the Assignments | 20% |
| 4 | End Semester Exam | 3 Hours | 50% |

**7. Make-up Policy**: No makeup will be given for Assignments. However, for Mid-Semester Test, Make-up will be granted strictly on prior permission and for genuine reasons only.

Course Instructor

CS1301