DIGITAL CIRCUITS

Week-1, Lecture-1
Introduction

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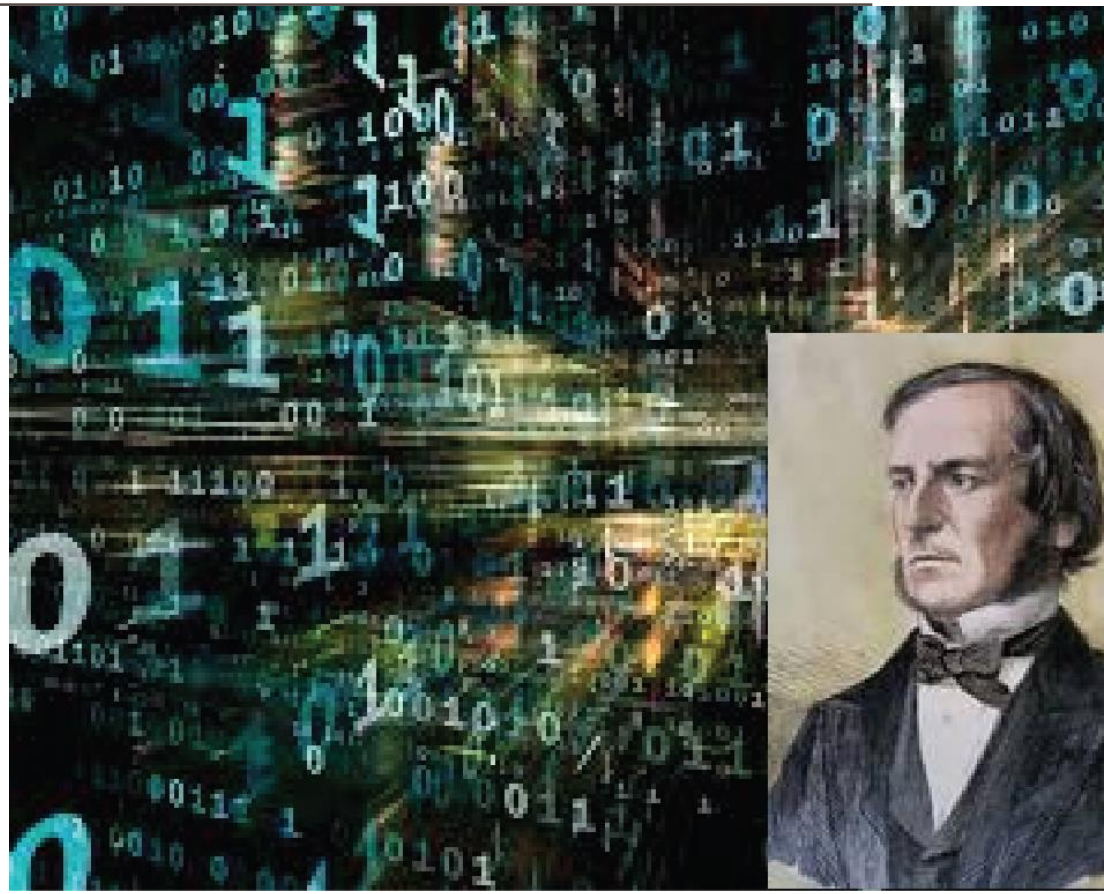
1st August, 2018

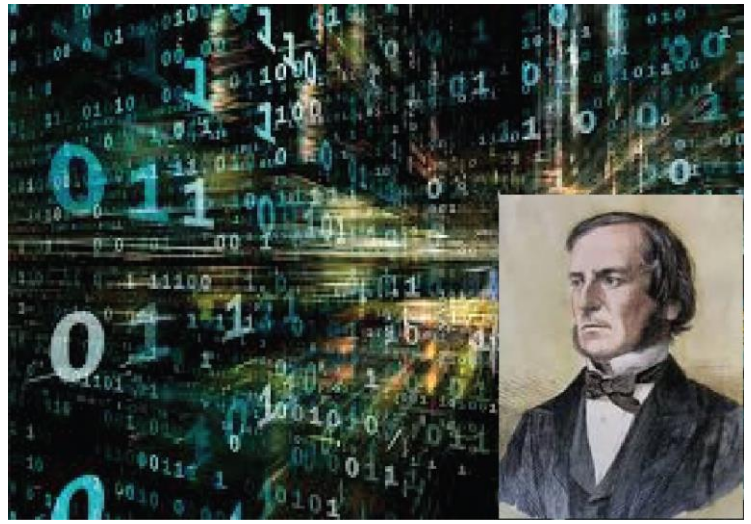


About the Course

Digital Circuits: Objectives

Learning Digital Logic Design

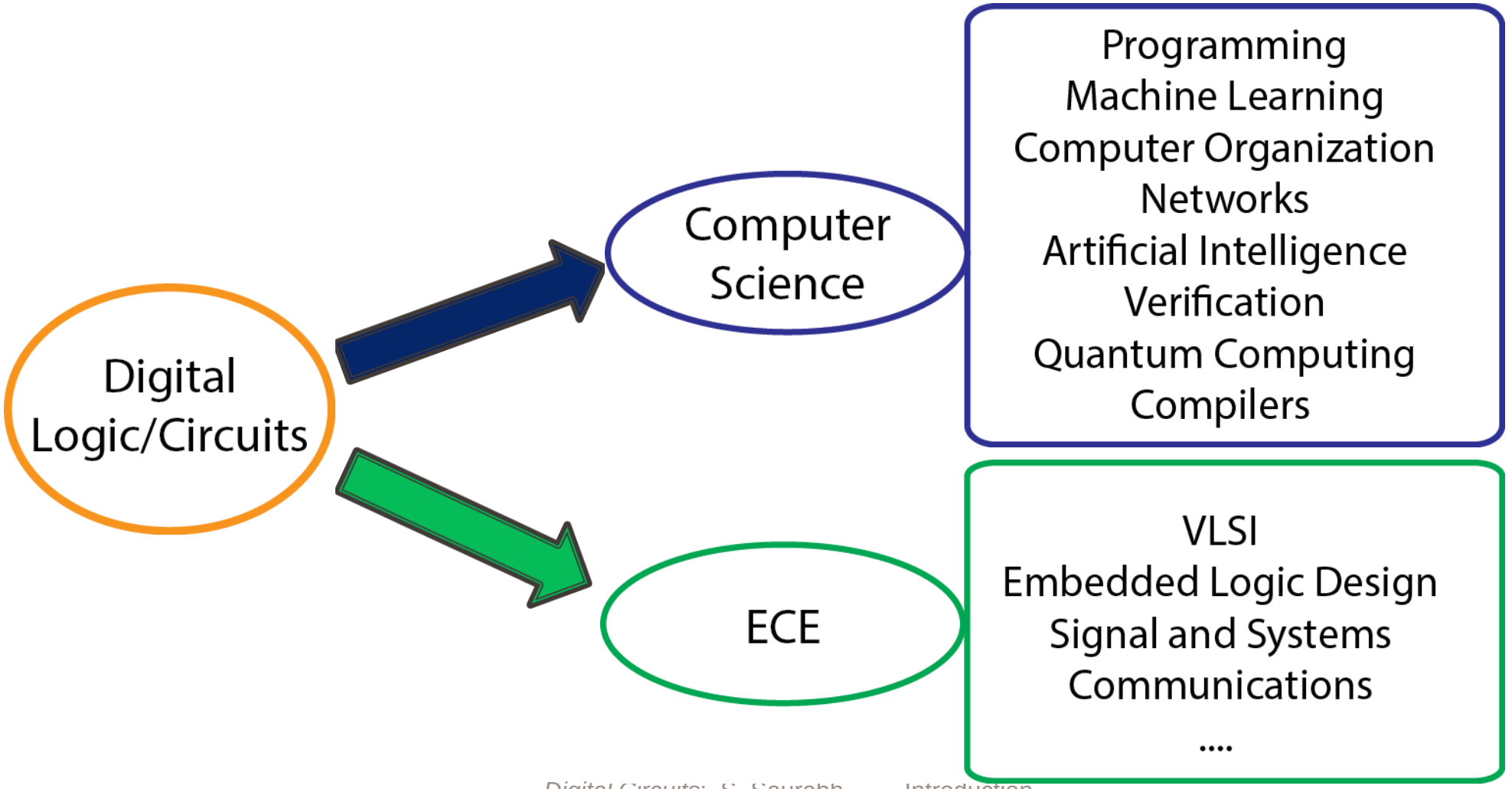
- Get introduced to Signal Representation, Boolean Algebra, Logic Gates and Design with Logic Gates.
- Be familiar with designing Combinational and Sequential Circuits
- Get introduced to the concept of Pipelining



Digital Circuits: Expected Outcome

- Translate a decision-making process into digital logic
- Understand Number System and circuits realizing Arithmetic operations
- Design simple digital circuits based on combinational logic and sequential logic
- Design Asynchronous and Synchronous counters and Shift Registers.
- Understand the concept of State Machines.
- Understand the concept of Pipelining

Digital Circuits : Where to apply the learning?

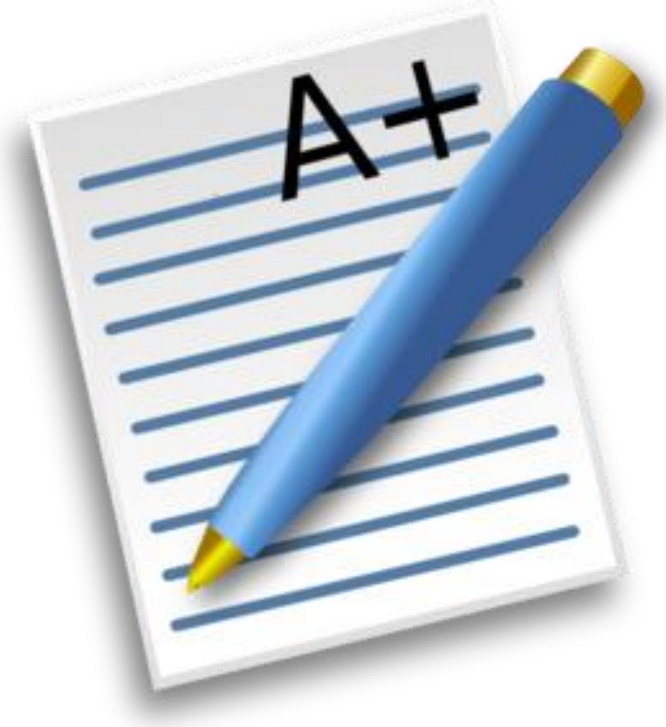


Digital Circuit: Course Content

Week No.	Topic
Week 1	Analog and Digital Representation of Information, Data vs. Signal, Information Processing Steps: Logic and Arithmetic (2hrs)
Week 1-2	Binary variables; Basic logic operations – AND, OR, NOT; Basic gates; Essentials of Boolean algebra; De Morgan's laws; Truth Table; Boolean functions; (4hrs)Transforming a logical problem statement into a Boolean expression.(4 hrs)
Week 3- 4	Positional number systems – Binary, Decimal, Octal, Hexadecimal; Signed number representations; Arithmetic operations.(4 hrs)
Week 4, 5, 6 and 7	Realisation of Boolean functions using gates; Karnaugh map; Minimisation of Boolean functions; Multiplexer-based realisation of K-maps; Combinational circuit design using multiplexers and gates. ALU (11 hrs)
Week 7, 8, 9 and 10	Latches and Flip-flops; Ripple counters; Sequence generator using flip-flops; State Table and State Diagram; Synchronous counters; Shift Registers; Ring and MLS counters.(10 hrs)
Week 11-13	Pipelining: Pipelining with Edge Triggered Flip Flop, Pulse Triggered Flip Flop and Latches. Introduce the concepts of Skew and Jitter (9 hrs)

Digital Circuits: Evaluation Criteria

Type of Evaluation	Contribution in Grade
Mid-semester Exam	20 %
Final Exam	40 %
Assignments	10 %
Labs	15 %
Quiz (Best (N-1) out of N)	15 %



Responsibilities

- Lecture: Instructor
- Tutorial: Instructor+Teaching Assistants (TAs)
- Quizzes/Theory Exams: Instructor
- Assignments: TAs
- Labs: Teaching Fellows (TFs)

Plagiarism !!!

- Plagiarism: offence of taking undue credit for someone else's work.
- We follow Zero tolerance policy against plagiarism!
- https://www.iiitd.ac.in/sites/default/files/docs/education/AcademicDishonesty.pdf
    1) One grade reduction for first instance and report to academic department
    2) F grade for second instance

Exam

Open Book

- Only Book and notes written in their own handwriting (no XEROX, printouts)
- No sharing of book/notes allowed
- No laptop/mobiles/communication/storage devices allowed.

✓ Focus on application of concepts

✓ Tutorials are for solving problems

✓ New problems with application of concepts are expected in exams

Evaluation

- Assignments: 10%
- Quiz: 15% (Best N-1 out of N)

- If there is a large disparity in the marks obtained by a student in an Assignment and the Quiz following the Assignment submission, steps will be taken to check the understanding of the student with respect to the submitted assignment.
  - This may be done through a viva or another quiz (announced with a notice of less than a day) for students with large disparity in the marks obtained in an Assignment and the Quiz following the Assignment submission.
  - If such students continue to perform below par in the exploratory test, the marks in both the Assignment and the Quiz following will be made zero.
- Students with two such zeros in Assignment and Quiz will not be permitted to sit for the end-sem examination.

Digital Circuits: Books

- *Digital Design with an Introduction to the Verilog HDL* – M. Morris Mano & Michael D. Ciletti, Ed-5, Pearson (Prentice-Hall).
- *Fundamentals of Digital Logic with Verilog Design* - S. Brown, Z. Vranesic, Ed-3, McGraw-Hill
- References will be provided during lectures also.

- Online Resources

1. https://www.youtube.com/playlist?list=PLDFF5A99731ECFC6C
2. https://www.youtube.com/playlist?list=PLB52B8F4E464CEEF7
3. https://www.youtube.com/playlist?list=PL803563859BF7ED8C
4. https://www.youtube.com/channel/UCbI7mdq1mJidoe8pcRAnTbw/videos.

Usebackpack

Register yourself on https://www.usebackpack.com/

- Lecture will be shared
- Homework/Tutorials/Grade
- Announcements
- …

Policies

Digital Circuits: Policies (1)

- Be punctual to class
- Come to the class before the scheduled time
- Up to 5 minutes late is tolerated, beyond that please do not come

- **Food, Cell phones, Laptops, IPODs, MP3 players or other portable electronic devices of any kind NOT allowed in classroom**

Digital Circuits: Expectations

- Revise last day lecture before coming
  - Revision will be done at the start of every lecture for 5 minutes
  - One student at random will be asked to revise the topics covered in the last lecture
  - You are allowed to use your own notes in the revision
  - **A good review (preferably without notes) from the student will be AWARDED !!!**

- Ask questions and be active participants
- Give feedback

Digital Circuits: Attendance Policy

- **Lectures: Attendance** not mandatory

- **Tutorials:**
  - If attendance before mid-sem is less than 75%, you will get zero marks in one of the quizzes and it will be considered as compulsory quiz.
  - If attendance after mid-sem is less than 75%, you will get zero marks in one of the quizzes and it will be considered as compulsory quiz.

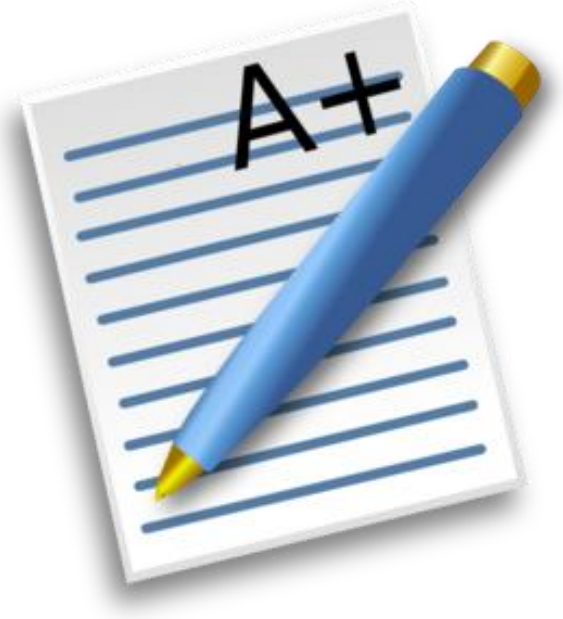
- **Labs:** All experiments must be completed before each lab-exam. Otherwise, you will not be allowed to appear for lab exams.

Digital Circuits: Questions/Doubt/Office Hours

- Class: Many may have the same questions
- Just After Class
  - Will be available for some time after the class
- Before the start of the next lecture
- Office-hours
  - Monday 2:30-3:30 pm, B-608 (New Academic Building)

Digital Circuits: Why grades are important?

- For branch change
- For good internship, placements in “good” companies, good research project, scholarship/TA’ship during BTech
- For recommendation letters: admission and scholarship for MS/PhD



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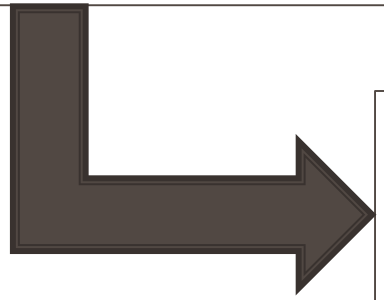


Introduction

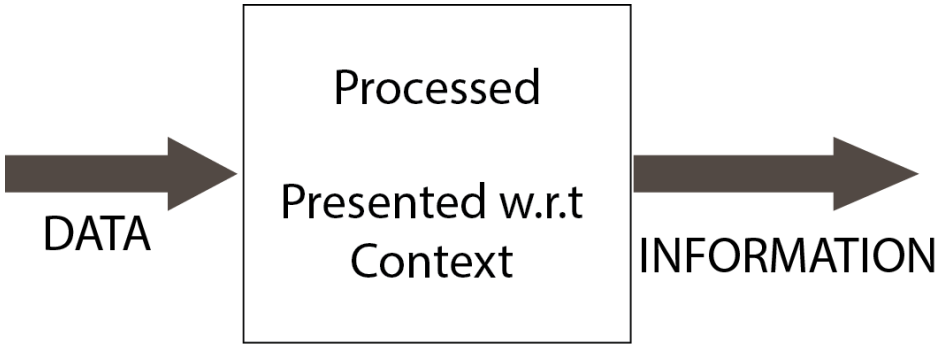
Information

What is ***information***?

- Data that has been processed and made meaningful or useful
- Information can be used to take decision
- Information is related to ***data***

What is ***data***?

- Data are simply raw facts



DATA	INFORMATION
Temperature all over the world for last 100 years	Global Temperature is rising
{4, 6, 10, 5}	Runs given in 4 different overs by some player: {4, 6, 10, 5}