NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

This course outline template acts as a guide for writing your course outline. As every course is different, please feel free to amend the template/ format to suit your requirements.

COURSE OUTLINE TEMPLATE			
Course Title	**BASICS OF VLSI**		
Course Code/Session	**EC653 July Session 2023**	**No. of Credits**	**3**
Department	**ECE**	**Faculty**	**Dr. R. K. Kavitha**
Pre-requisites Course Code	**None**		
Course Coordinator(s) (if, applicable)			
Other Course Teacher(s)/Tutor(s) E-mail	**rkkavitha@nitt.edu**	**Telephone No.**	**0431-2503322**
Course Type	☑ **Core course**	☐ **Elective course**	

COURSE OVERVIEW

This course will Introduce fundamental concepts and various aspects of VLSI

COURSE OBJECTIVES

- To provide rigorous foundation in MOS and CMOS digital circuits
- To train the students in transistor budgets, clock speeds and the growing challenges of power consumption and productivity

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
After successful completion of the course the students are able to	
CO1: Implement the logic circuits using MOS and CMOS technology.	PO1,2 -H PO3,4,5,6-L
CO2: Analyze various circuit configurations and their applications	PO1,2-H PO3-M PO4,5,6 -L
CO3: Analyse the merits of circuits according to the technology and applications change.	PO1,2-H PO3-M PO 4,5,6-L
CO4: Design low power CMOS VLSI circuits.	PO 1,2-H PO 3-M PO 4,5,6 -L
CO5: Understand the rapid advances in CMOS Technology	PO 1,2-H PO 3,4,5-M PO6-L

H-High M- Medium L=Low

COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	**Week**	**Topic**	**Mode of Delivery**
1.	3rd &4th week of August	Family of digital ICs. Speed / power performance of various IC techniques.	Chalk and Board PPT presentation
2.	1st week of September	MOS transistor structure Nmos & pmos switch concept Compound gates, Pass transistors & Transmission gates Tristate inverters. Multiplexers Latches & Flip flops	
3.	2nd week of September	Gate layout & Stick diagrams VLSI design flow	
4.	3rd week of September	Ideal I-V characteristics of the MOS transistor C-V characteristics. MOS capacitance models	
5.	4th week of September	Non-ideal I-V effects (velocity saturation, Sub threshold conduction...) CMOS inverter DC characteristics curve Ratioed inverters transfer function Pass transistor DC characteristics	
6.	1st/2nd week of October	Switch level RC delay models NAND & NOR gates delay estimation Linear delay model Delay in multistage logic networks	
7.	3rd & 4th week of October	Power dissipation. (Static & dynamic) Resistance & capacitance estimation Delay in distributed RC circuits. (L, T & π models)	
8.	1st /2nd week of November	Design margins. Hard & soft errors Estimating the logical effort & parasitic delay in Compound gates Hi skew & low skew gates	
9.	2nd week of November	Ratioed circuits (Pseudo- nmos) Pre-charge & Evaluation mode of operation of dynamic circuits Domino logic, Multiple output domino logic	
10.	3rd week of November	Differential logic circuits (DCVS, DSL & DCVSPG) Race problems in dynamic logic circuits	

11.	4th week of November	Problem solving Bi-CMOS inverter Comparison of circuit families Problem solving	
12.	1st week of December	Integrated resistors & capacitors Integrated resistors & capacitors, Layout design rules Demo on DRC and LVS	Students seminar using PPT
13.	2nd week of December	Comparison of circuit families Problem solving Seminar on Active and passive inductance Demo on processing techniques Conclusion Planar processes, Design rule checkers & circuit extraction n-well & p-well process	Students seminar using PPT

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Written test (Assessment 1) (Descriptive type)	As per the Academic Calender	1 Hour	20 marks (1 ½ units - Unit1 and ½ of Unit 2)
2.	Written test (Assessment 2) (Descriptive type)	As per the Academic Calender	1 Hour	20 marks (1 ½ units - ½ of Unit 2+ Unit 4)
3.	Assignement1/Seminar			10 marks
4.	Written Exam (Descriptive type)	As per the Academic Calender	3 Hours	50 marks (5 units)
	Compensation Assesssment (Only for Assessment 1&2)	November first week (For **genuine reasons** only)	1 Hour	20 marks (3 units)

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

Text Books:

- *N.H.E.Weste, D. Harris, "CMOS VLSI Design (3/e)", Pearson, 2005.*
- *J.Rabey, M. Pedram, " Digital Integrated circuits (2/e)", PHI, 2003.*

Reference Books:

- *Pucknell & Eshraghian, "Basic VLSI Design", (3/e), PHI, 1996.*
- *Logical Effort: Designing Fast CMOS Circuits,* Morgan Kaufmann; First edition ,1999)
- *Recent literature in Basics of VLSI.*

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

Course feedback is assessed through

1. Class committee meeting
2. Performance in the assessments
3. Course exit survey form

Course Attainment is calculated through

1. Direct tools (Exams and seminars)

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

1. The students through class representative may give their feedback at any time which will be duly addressed.
2. Feedback from the students through MIS and class committee meetings.

ADDITIONAL COURSE INFORMATION

Any queries send a mail to rkkavitha@nitt.edu

FOR SENATE'S CONSIDERATION

Course Faculty _____ 24/8/23 **CC-Chairperson** R. Thilagavathy 24/08/2023 **HOD** _____ 25/8/2023