

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**  
**INNOVATIONS IN TEACHING LEARNING PRACTICES**

**Year/Sem** : III & VI  
**Dept of Course handled** : ECE  
**Course Code** : EC8095  
**Course Name** : VLSI CHIP DESIGN

S. No.	Name of the Activity	Details	Mapped COs, POs & PSOs	
			CO	POs & PSOs
1	ROLE PLAY	Role-Play Activity for VLSI Design: "Silicon Startup Challenge"	CO	CO1
			PO	PO1, PO6, PO7, PO8, PO9, PO10
			PSO	PSO1, PSO2, PSO3
2	Project based learning	Power Optimization in VLSI – Low-Power 4-bit ALU Design	CO	CO4
			PO	PO3, PO4, PO5
			PSO	PSO1, PSO2, PSO3
3	Debate	<ul style="list-style-type: none"> <li>• ASIC VS FPGA</li> <li>• COMBINATIONAL CIRCUIT AND SEQUENTIAL CIRCUIT DESIGN</li> </ul>	CO	CO2, CO3, CO5
			PO	PO1, PO6, PO7, PO8, PO9, PO10
			PSO	PSO1

**PROOF1**

Role	Responsibilities
Chip Architect	Defined IC specifications, power, speed, and area constraints.
RTL Designer	Wrote Verilog/VHDL code for digital logic.
Verification Engineer	Created testbenches and verified functionality using simulation tools.
Physical Design Engineer	Designed CMOS layout and performed DRC & LVS checks.
Power/Performance Engineer	Analyzed power consumption and optimized design using low-power techniques.
Marketing & Business Analyst	Prepared a business model and investor pitch.

**PROOF 2**

### CODE

```
module ALU_4bit (  
    input [3:0] A, B,  
    input [1:0] ALU_Sel, // Select lines for ALU operation  
    input clk, enable, // Clock and clock gating enable  
    output reg [3:0] ALU_Out  
);  
  
    // Clock gating implementation  
    wire gated_clk;  
    assign gated_clk = clk & enable; // Clock enabled only when required  
  
    always @(posedge gated_clk) begin  
        case(ALU_Sel)  
            2'b00: ALU_Out = A + B; // Addition  
            2'b01: ALU_Out = A - B; // Subtraction  
            2'b10: ALU_Out = A & B; // AND operation  
            2'b11: ALU_Out = A | B; // OR operation  
            default: ALU_Out = 4'b0000;  
        endcase  
    end  
endmodule
```

### REPORT :

Total Power Consumption: 2.45 mW - Dynamic Power: 1.95 mW - Leakage Power: 0.50 mW

