Flipping the Classroom, the Laboratory and Social Media with First Year Engineering Students

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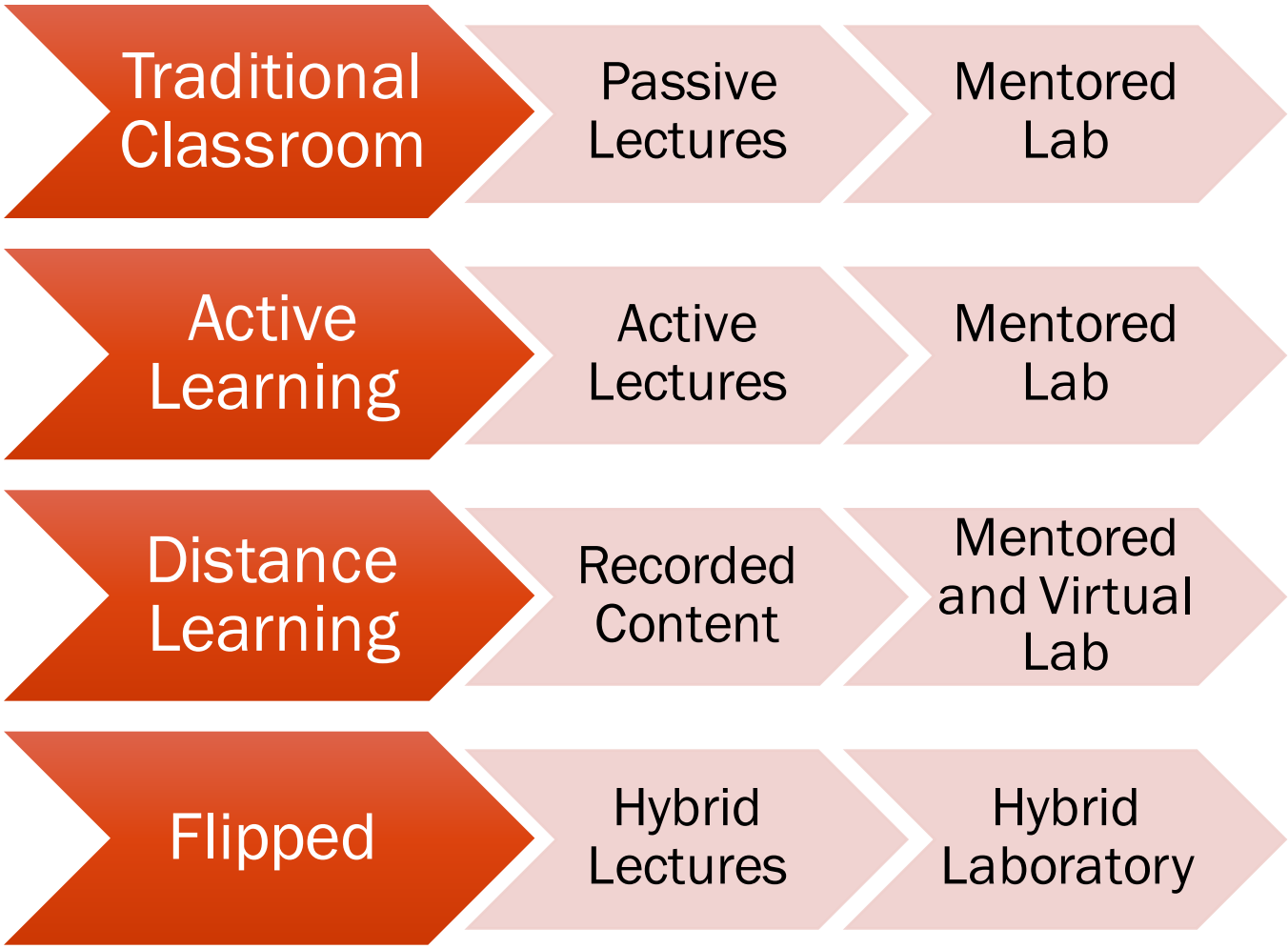
EDUCATIONAL APPROACHES



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EDUCATIONAL QUESTIONS

Flipped Classroom	• Do flipped classroom harm knowledge acquisition? • Do flipped classrooms diminish mentor authority?
Flipped Laboratory	• Does the ownership model improve design results? • Can remote equipment improve design creativity?
Social Media	• Does crowdsourcing harm or improve retention? • Can social media use result in design creativity?

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U.S. News and World Reports

15th Best University - Midwest
5th Most Innovative - Midwest

Quick Facts

- Residential campus
- 2950 students
- 12 engineering degrees
- Average class size of 20
- 96% placement rate

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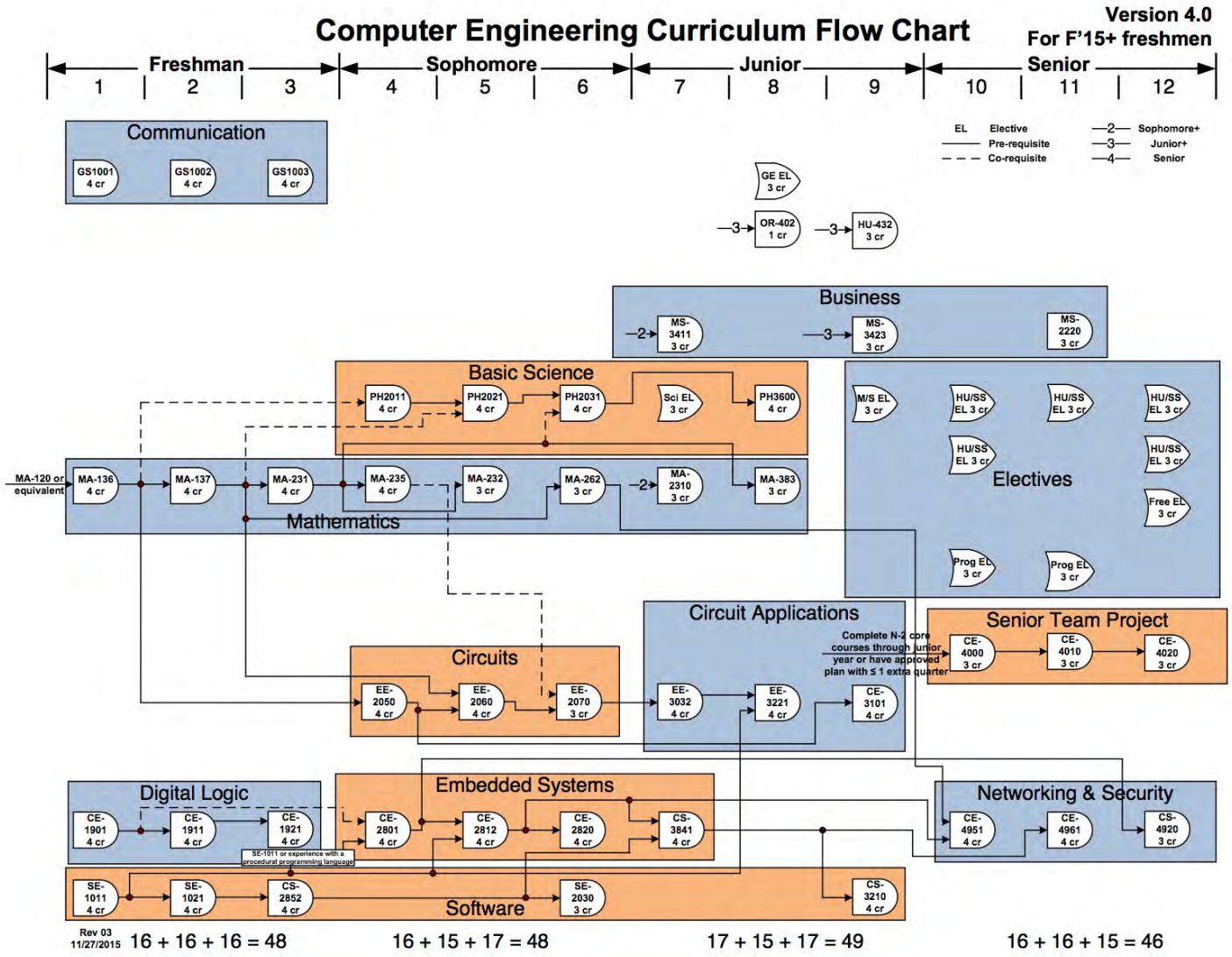
EECS

Quick Facts

- Biomedical Engineering
- Computer Engineering
- Electrical Engineering
- Software Engineering
- 800 students

- 600 lab hours over 4 years

COMPUTER ENGINEERING



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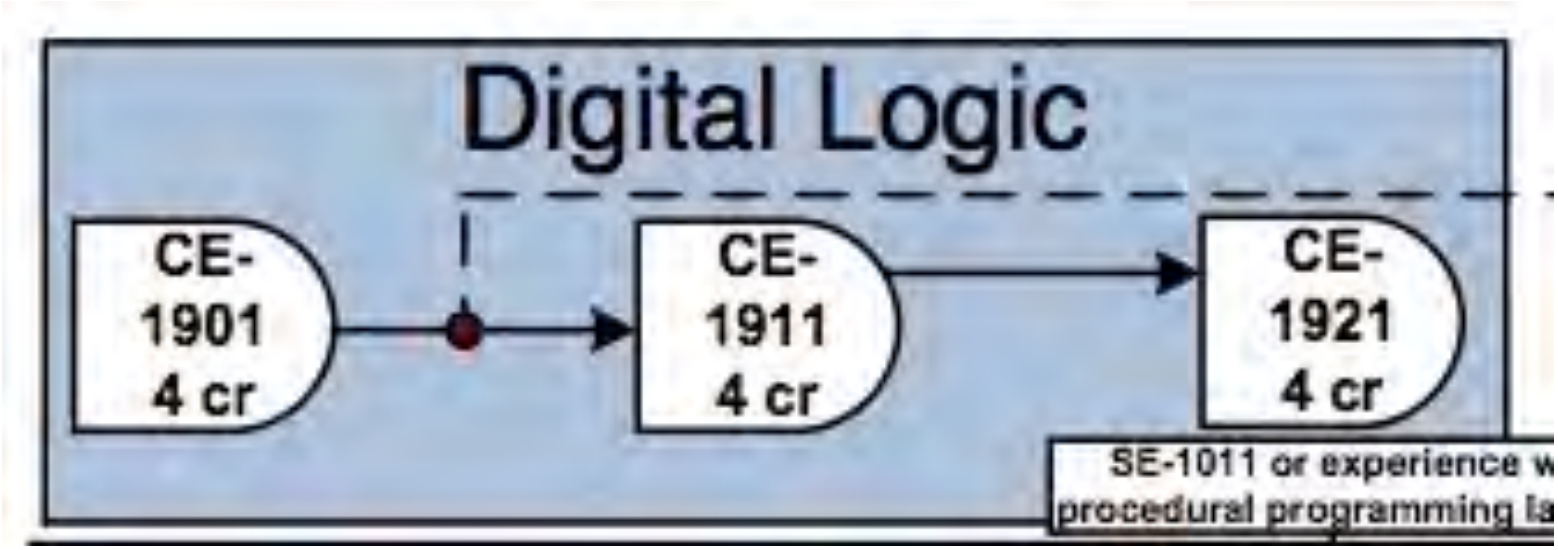
FIRST YEAR COURSES



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FIRST YEAR COURSES

CE1901	CE1911	CE1921
• Combinational • Logic Gates • Gate Circuit • Timing • VHDL	• Sequential • FSMs • Datapaths • VHDL	• Architecture • Organization • Assembly Lang. • Microprocessors

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INSTRUCTIONAL SCAFFOLDING

CE1901

- Hybrid Classroom - Flipped + Traditional
- Traditional Mentored Laboratory

CE1911

- Hybrid Classroom - Flipped + Traditional
- Flipped Laboratory

CE1921

- Flipped Classroom
- Flipped Laboratory
- Remote Equipment

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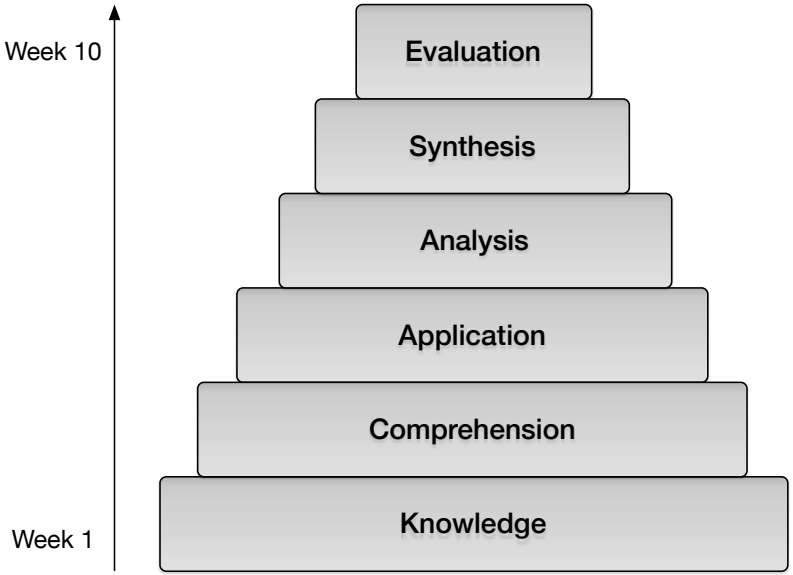
FLIPPED CLASSROOM

- Lecture video
- Active learning
- Guided Mentorship
- Constructivism



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FLIPPED LABORATORY

Ownership Model	CE1911
• Week Project • Experiential • Constructivist	• EFI Control • Traffic Control • Vend Control • Seatbelt Control • PWM Control • Data Control

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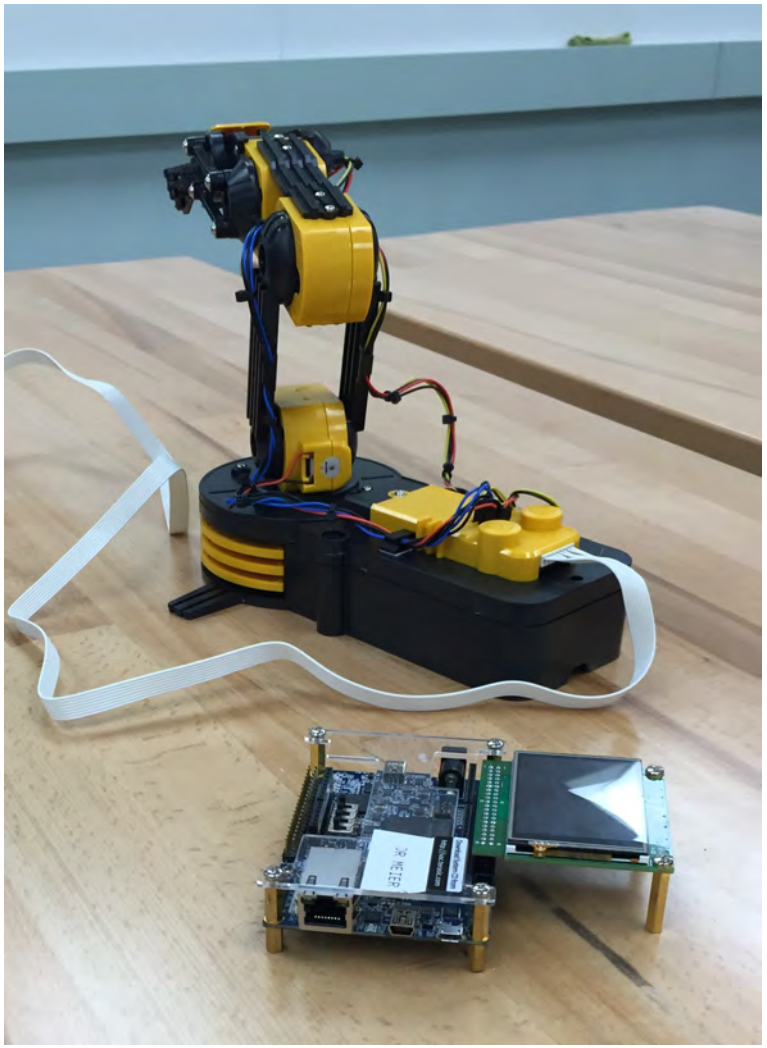
REMOTE EQUIPMENT



ROBOTIC ARM

- Modified a $45 kit
- Four motors
- DC ↔ Stepper
- DE0 Nano SOC+LT24

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REMOTE EQUIPMENT

Software Support

- Linux (Angstrom)
- SSH server
- Robot API
- ARM Assembly

LEVERAGING SOCIAL MEDIA

DAY	LEVEL	TWEET
1	K	#FACT PWM duty cycle controls speed of DC motor and position of stepper motor.
2	K	#FACT ARM assembly provides direct access to CPU and IO registers. Assembly programmers are close to the hardware.
4	C	#DESCRIBE how ARM assembly uses move instructions to control data flow.
8	S	#DESIGN an ARM main program that creates a two parameter stack frame and calls a subroutine named RELEASE-GRIP
16	S	#DESIGN an ARM main program that uses the robot API to move block in grasper six inches right. Robot on 5-10 pm.

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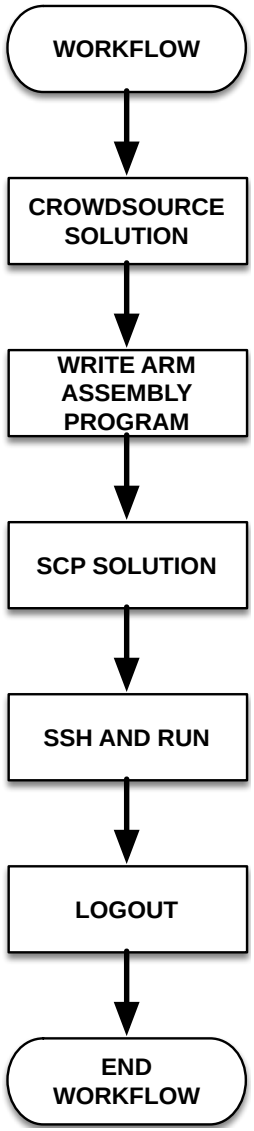
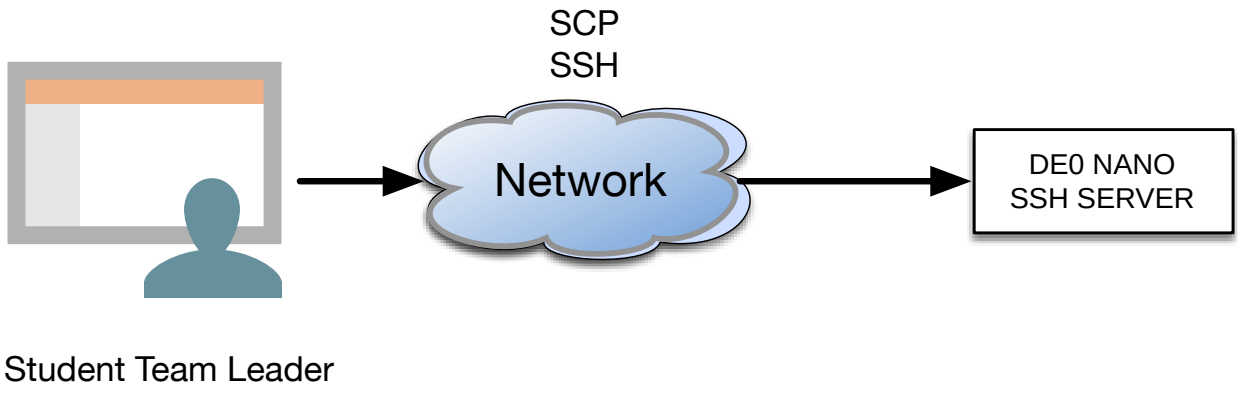
REMOTE EQUIPMENT



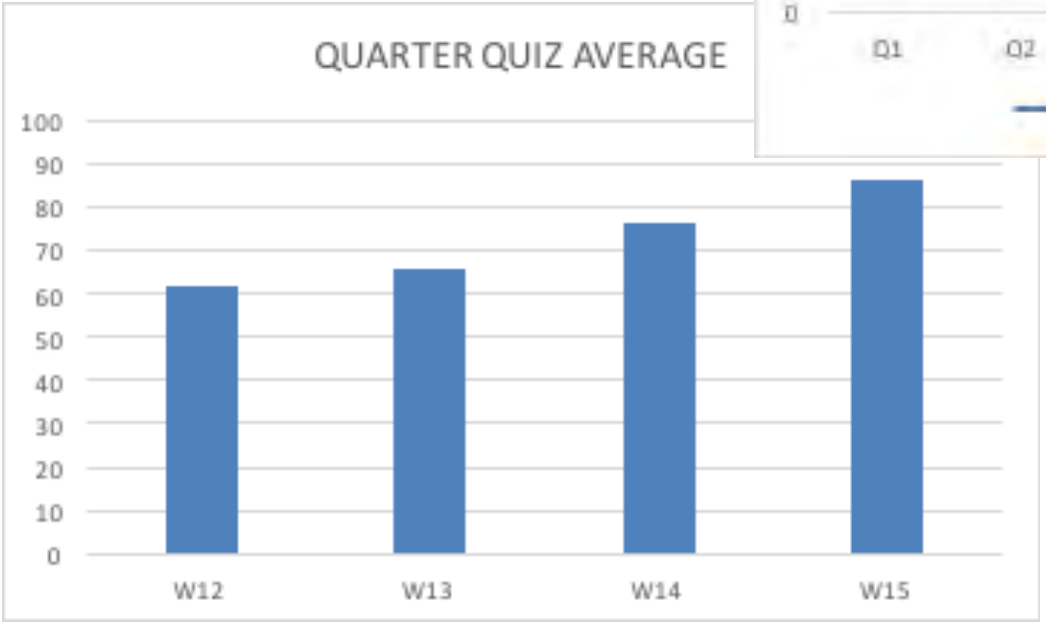
- Move robot ARM
- Grasp objects
- Move objects
- Draw shape



EDUCATIONAL EFFECT

CE1911 WINTER 2015 QUIZ QW3 GRADE RUBRIC NAME: _____

PROBLEM 1: MOORE FINITE STATE MACHINE MODEL	B	YES	NO
Constructs next state logic block, memory register block, and output logic block.	S		
Uses input, feedback, and output signals.	A		
Labels CLK, RST, inputs, and outputs with appropriate names.	K		
Organizes inputs, outputs, and feedback correctly in Moore Machine format.	S		
PROBLEM 2: STATE MACHINE BUBBLE DIAGRAM			
Constructs a five state machine with states S0, S1, S2, S3, and S4.	S		
Uses outputs that reflect the state name (000, 001, 010, 011, and 100).	A		
Adds a reset into state S0.	A		
Adds the self-lock loop in state S4.	A		



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STUDENT COMMENTS

- “Love doing my labs at home. I explore more.”
- “Videos make it easy to review something I miss.”
- “Sometimes I don’t watch the videos but I learn through classroom practice.”
- “The social media thing is different.”
- “The robot task was fun!”
- “Wow. That was really hands-on.”
- “I can’t believe what I can build after just 20 weeks.”

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THANK YOU

Questions?