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Maximize Lecture Capture: Classroom Technology

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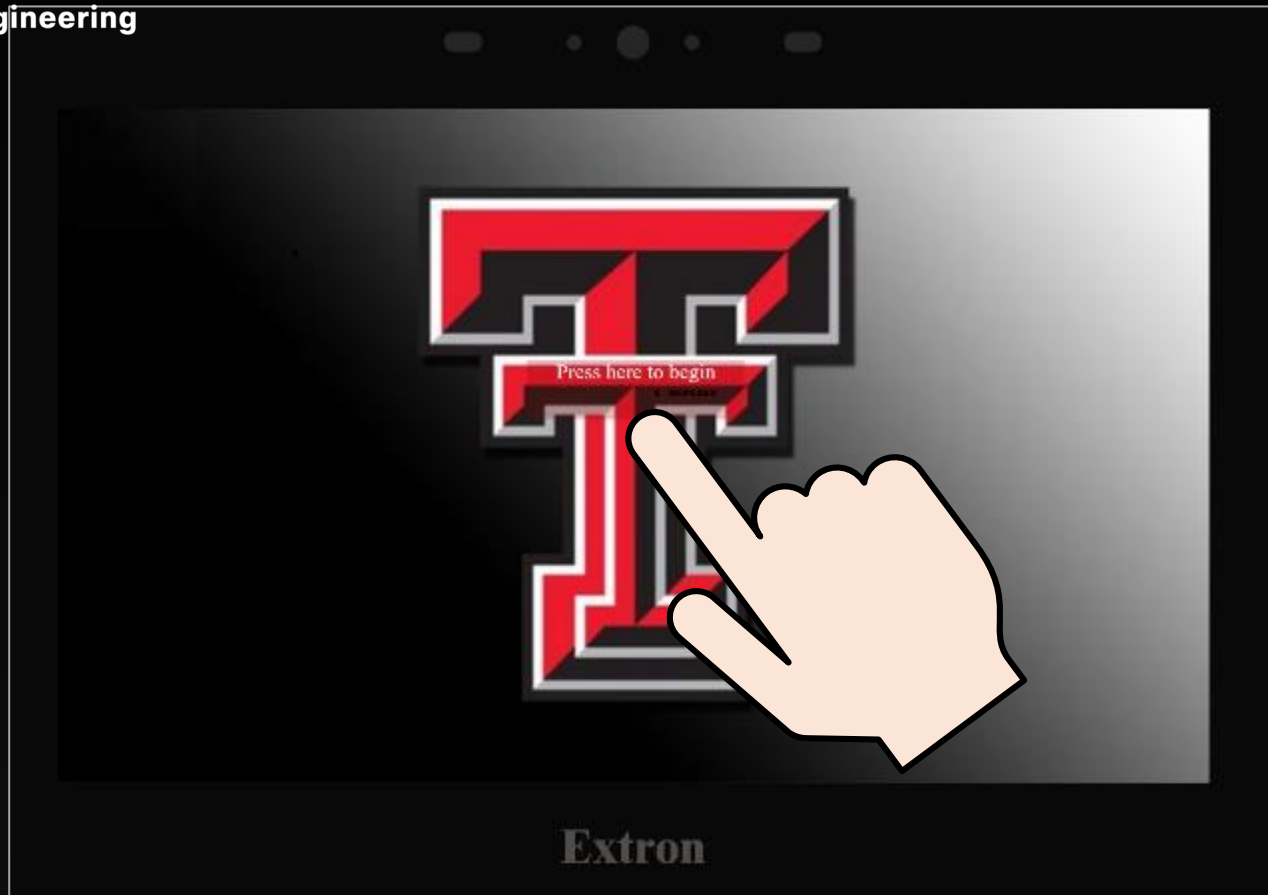


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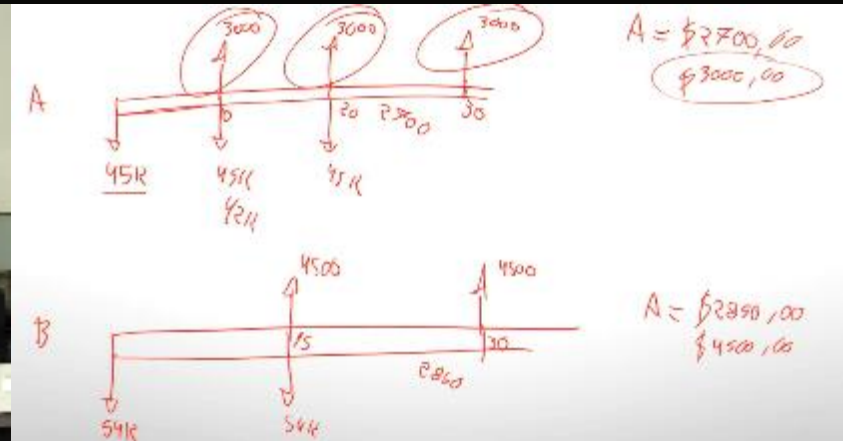
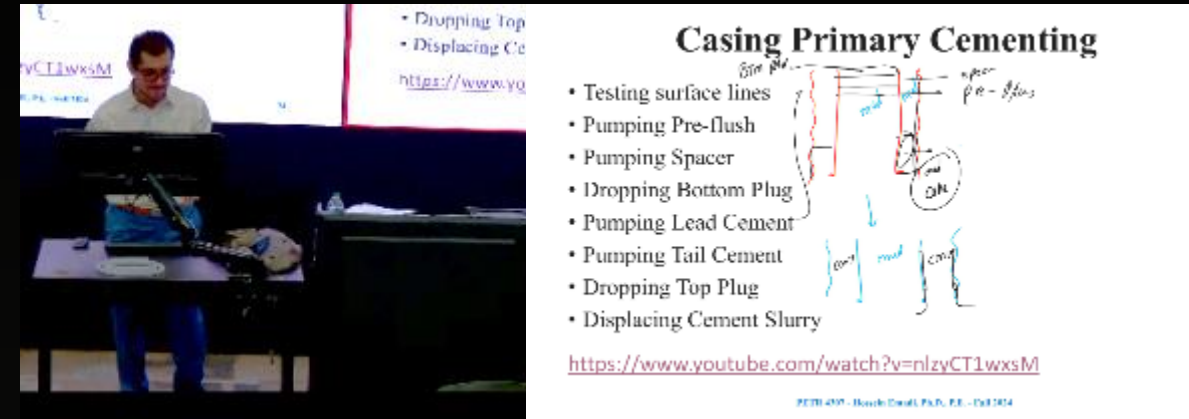
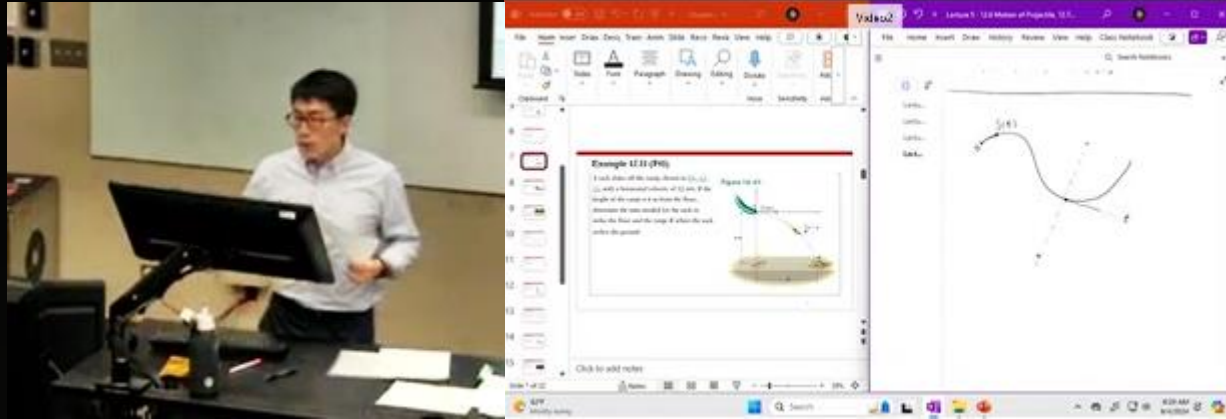


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Slide in

Solution

1. Steady-state solution.

$$-mr\dot{\theta}^2 \sin \theta_{eq} \cos \theta_{eq} + mg \sin \theta_{eq} = 0$$
$$\sin \theta = 0 \text{ or } \cos \theta = g/(r\dot{\theta}^2)$$

There is only one answer between 0 and 90°, and it is 66.9°. You must change this to radians. That is, $\theta_{eq} = 1.159$.

2. Identify the nonlinear term and find its Taylor polynomial.

$$f(\theta) = -\frac{2.5}{10} \sin \theta \cos \theta + \frac{10}{10} \sin \theta$$
$$f'(\theta) = f'(\theta_{eq}) = f'(\theta = 1.159) = 0 + 21.55(\theta - 1.159)$$

3. Replace the nonlinear term in the differential equation with the Taylor polynomial.

$$mr\ddot{\theta} + f(\theta) = 0$$
$$mr\ddot{\theta} + 21.55(\theta - 1.159) = 0$$


Equipment You'll Find in the Pocket of a Forensic Engineer

- Pocket lens (bores)
- Tape measure
- Digital Caliper
- Compass
- Magnet
- Small hardware tester



```
def main():
    number = 1

    for i in range(1, 11):
        a = ['Rach', 'Summer', 'Merty', 'Squarchy', 'Jerry', 'Birdperson']
        for j in a:
            print(j)
```

In this example, `iterable` is the list `a`, and `var` is the variable `i`. Each time through the loop, `i` takes on a value from the iterable. All the data types you have encountered so far that are collection or container types are iterable.

This loop can be described entirely in terms of the concepts you have just learned about. To carry out the loop, Python:

1. Calls `iter()` to obtain an iterator for `a`
2. Calls `next()` repeatedly to obtain each item from the iterator in turn
3. Terminates the loop when `next()` raises the `StopIteration` exception

The loop body is executed once for each item `next()` returns, with loop variable `i` set to the given item.

```
# Printing each element (strings) in a list using a for loop
```

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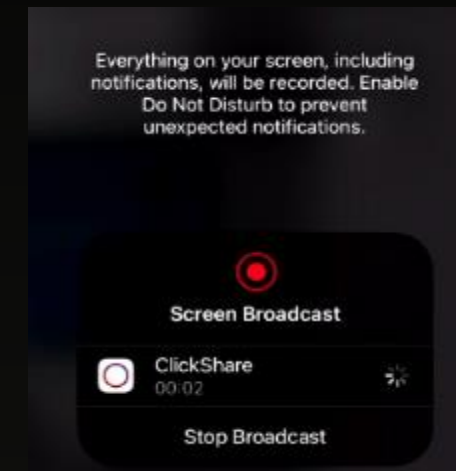
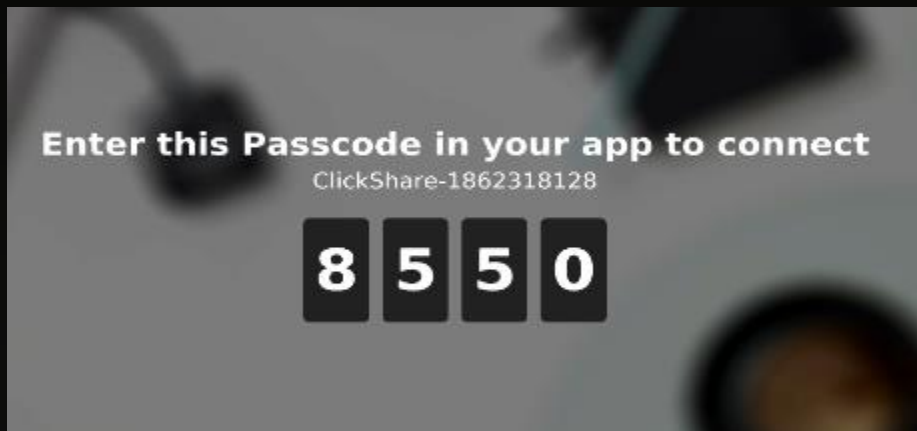


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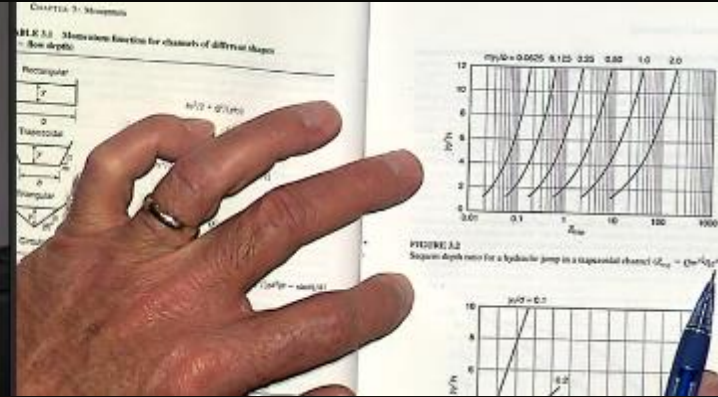


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Phase Equilibrium

For each phase:

$$d(n_t g)^\alpha = (n_t v)^\alpha dP - (n_t s)^\alpha dT + \sum_i \mu_i^\alpha dn_i^\alpha \quad \text{--- ①}$$
$$d(n_t g)^\beta = (n_t v)^\beta dP - (n_t s)^\beta dT + \sum_i \mu_i^\beta dn_i^\beta \quad \text{--- ②}$$

① + ② \Rightarrow

$$d(n_t g)^\alpha + d(n_t g)^\beta = (n_t v) dP - (n_t s) dT$$

Total System: Closed

$$d(n_t g) = (n_t v) dP - (n_t s) dT$$

Diagram: A rectangular container divided into two horizontal sections. The top section is labeled "Phase α " and the bottom section is labeled "Phase β ". The container walls are indicated by dashed lines.

Handwritten notes in red:

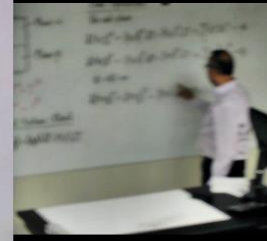
$$T^\alpha = T^\beta$$
$$P^\alpha = P^\beta$$


Diagram: A vector \vec{r} is shown in a 2D coordinate system. The vector is the resultant of two other vectors, \vec{p} and \vec{q} , as indicated by the equation $\vec{r} = \vec{p} + \vec{q}$. The angle between \vec{p} and the horizontal is 20° . The angle between \vec{q} and the vertical is 105° .

Handwritten calculations:

$$\vec{p} = 40\text{N} \quad \text{① } 60\cos 45^\circ \hat{i} + 60\sin 45^\circ \hat{j}$$
$$= 40 \angle 20^\circ \quad \text{② } 40\cos 20^\circ \hat{i} + 40\sin 20^\circ \hat{j}$$
$$\vec{r} = \vec{p} + \vec{q}$$

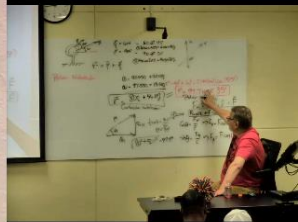
Cartesian notation:

$$\vec{r} = 80\hat{i} + 56.11\hat{j}$$

Polar notation:

$$r^2 = 40^2 + 60^2 - 2(40)(60)(\cos 155^\circ)$$
$$\vec{r} = 97.7\text{N} \angle 35^\circ$$

Trigonometric relationships:

$$\tan \theta = \frac{56.11}{80} \Rightarrow \theta = 35^\circ$$
$$\sqrt{80^2 + 56.11^2} = 97.7$$
$$\cos \theta = \frac{F_x}{F} \Rightarrow F_x = F \cos \theta$$
$$\sin \theta = \frac{F_y}{F} \Rightarrow F_y = F \sin \theta$$


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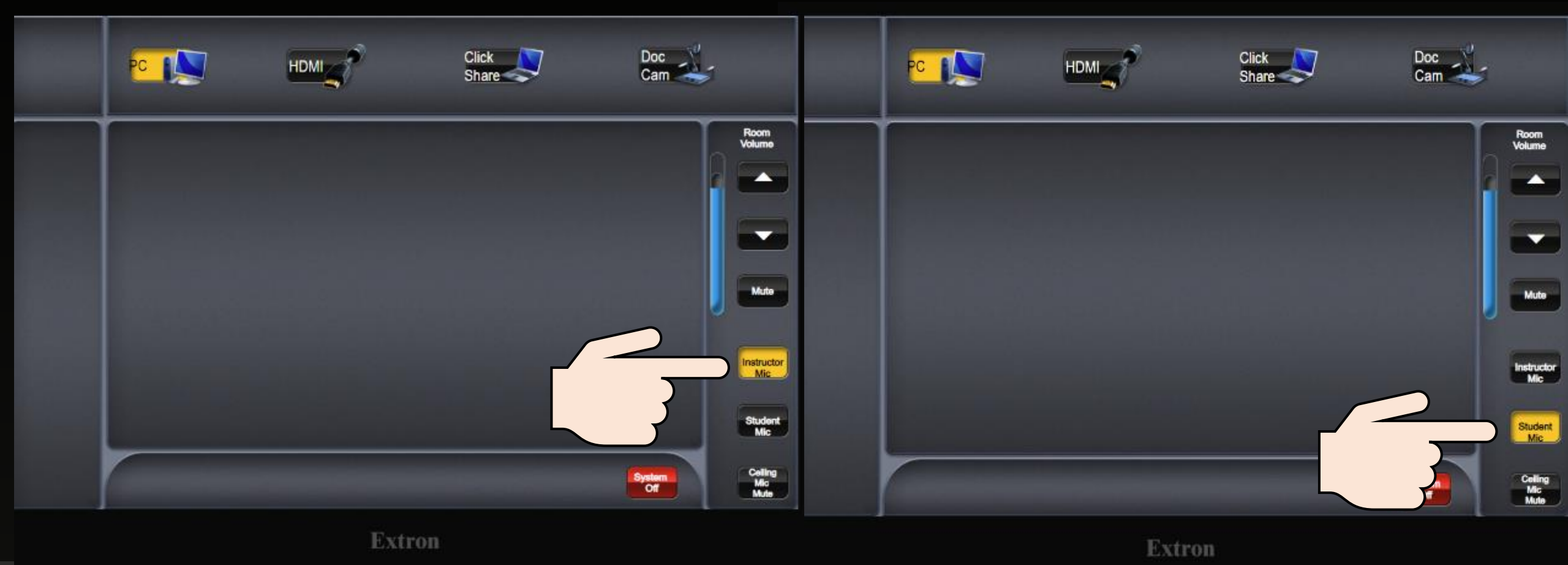


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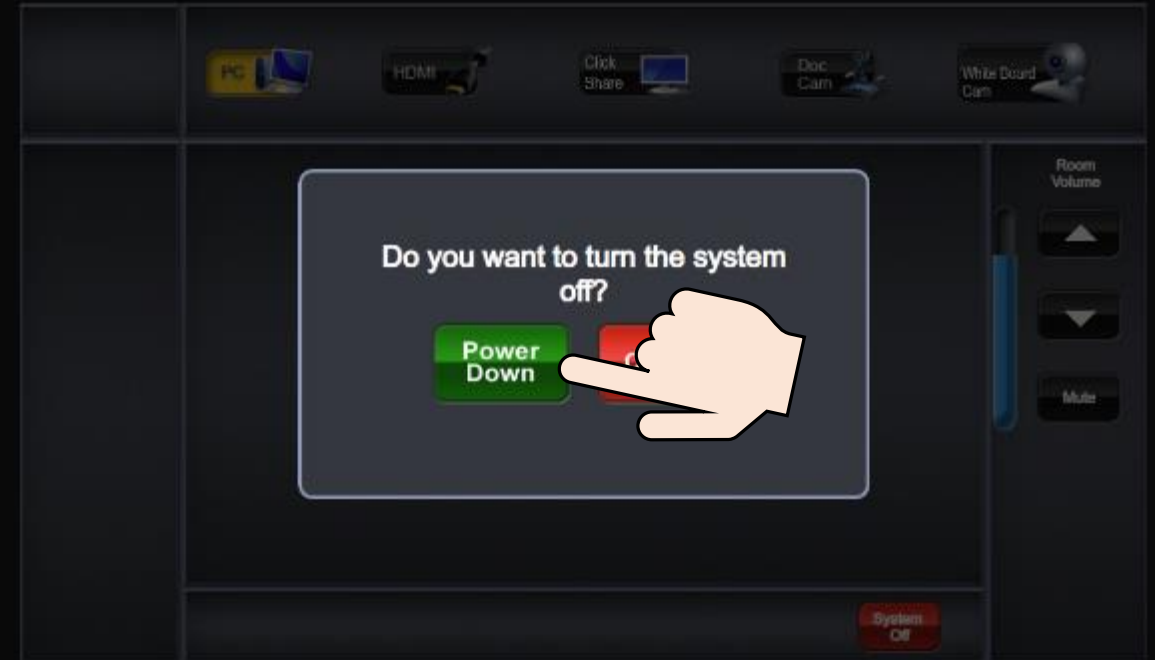
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