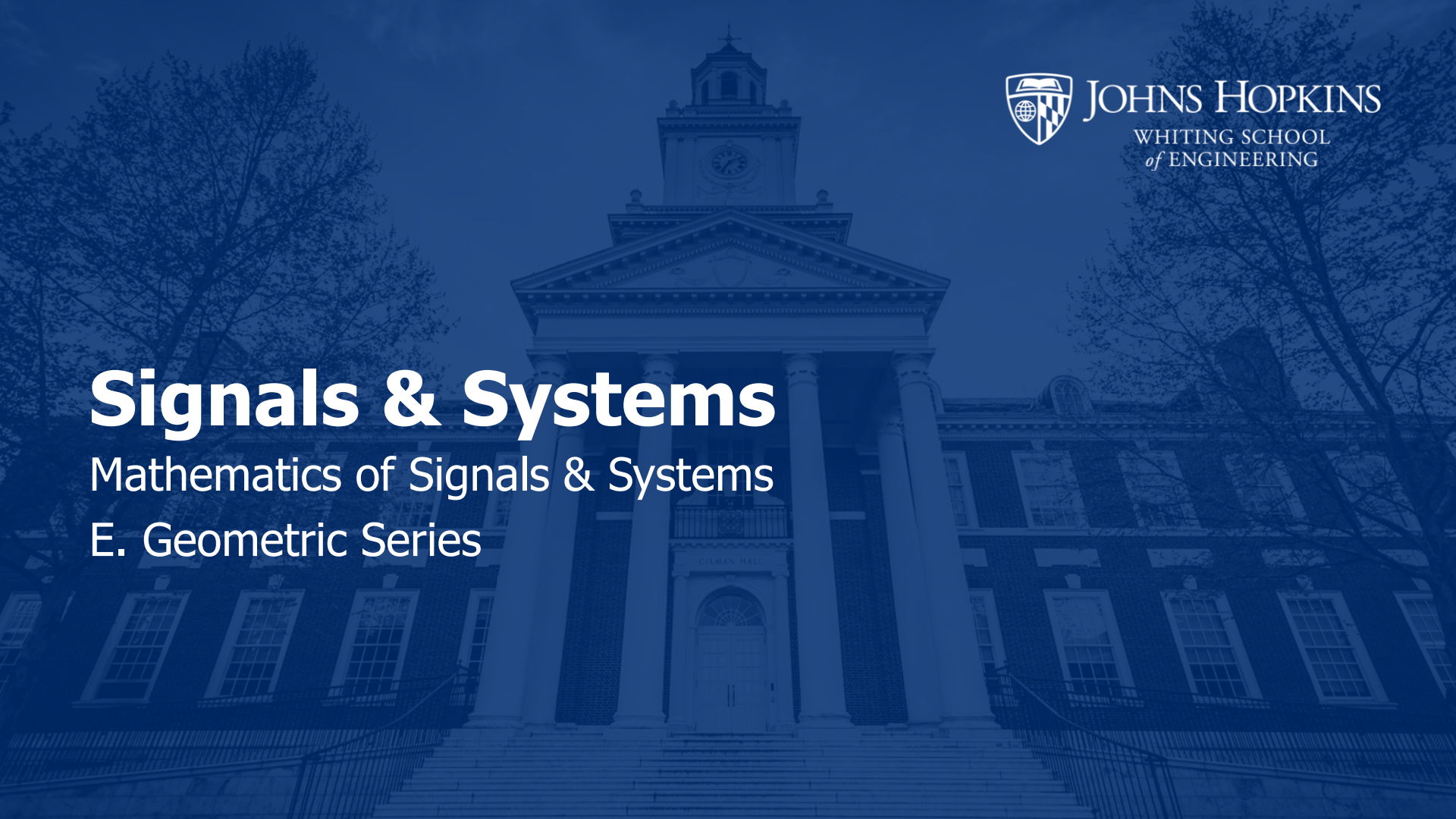

Signals & Systems

Mathematics of Signals & Systems

E. Geometric Series

Finite Geometric Series

- The following finite geometric series is commonly encountered in the study of signals and systems:

$$\sum_{n=0}^{N-1} \alpha^n = \begin{cases} \dfrac{1-\alpha^N}{1-\alpha}, \alpha \neq 1 \\ N, \alpha = 1 \end{cases}$$

Finite Geometric Series: MATLAB routine

- The following MATLAB function computes the terms in a finite geometric series, sums those terms, and compares with the closed form expression:

```
function [sum_val,closed_form_val] = geom_series(alpha,N)

n = 0:N-1;

x = alpha.^n;

sum_val = sum(x);

if alpha == 1
   closed_form_val = N;
else
   closed_form_val = (1-alpha^N)/(1-alpha);
end

end
```

Infinite Geometric Series

- The following infinite geometric series is commonly encountered in the study of signals and systems:

$$\sum_{n=0}^{\infty} \alpha^n = \frac{1}{1-\alpha}, |\alpha| < 1$$