Cyber security in Power system (3-0-0)

Sub Code: MPS2E305                CIE: 50% Marks
Hrs/Week: 03                        SEE: 50% Marks
SEE Hrs: 03                       Max.: 100 Marks

Course outcomes:

On successful completion of the course the students will be able to:

1. Discuss the importance of cyber security in power systems.
2. Apply the cyber security standards for electricity sector.
3. Analyze the cost of cyber security management and controls.


SLE: Future Directions

09 Hours


SLE: Standards Limitations

06 Hours


SLE: Cybersecurity Assessment, Monitoring and Improvement.

09 Hours


SLE: MAiSim

08 Hours


SLE: Situation Awareness Network.

07 Hours

Text book:
1. Rafał Leszczyński “Cybersecurity in the Electricity Sector”, Springer, 2019
Digital Control Systems (3-0-0)

Sub Code: MPS1E204
Hrs/week: 3+0+0
SEE Hrs: 3

CIE: 50% Marks
SEE: 50% Marks
Maxmarks : 100

Course Outcomes
On successful completion of the course, students will be able to:

1. Understand, analyze and apply knowledge of control engineering and mathematics in industrial problems
2. Analyze digital control systems using transform techniques
3. Analyze digital control systems using state-space methods.
4. Design, digital control systems using transform techniques and state-space methods
5. Analyze the concepts of nonlinear digital control systems.

MODULE 1: Introduction to digital control systems and Z- Transform Techniques:
Introduction, Discrete time system representation, data conversion and quantization, sample and Hold devices, mathematical modeling of the sampling process, data reconstruction and filtering of sampled signals, zero-order hold, the first-order hold, aliasing and folding, choice of the sampling period – Z-transform, Inverse Z-transform, pulse transfer and z-transfer function, pulse transfer function of the ZOH, solution of difference equation, response of discrete-data control system.

SLE: Choice of the sampling period
08 Hours

MODULE 2: Analysis using Z- Transform Techniques: Comparison of time responses of continuous data and discrete data systems, steady state error analysis of digital control systems, correlation between time response and root locations in the s-plane and the z-plane, constant damping factor and constant damping ratio loci, dead beat response at the sampling instants, root loci for digital control systems, effect of adding poles and zeroes to the open-loop transfer function

SLE: Practical issues with deadbeat response design
08 Hours

MODULE 3: Discrete state space model: State equations of discrete-data systems with sample and hold devices, state equations of digital systems with all digital elements, different state variable models, digital simulation and approximation, state transition equations, state diagrams of digital systems, Decomposition of discrete data transfer functions, Controllability and observability of discrete data systems, relation between observability, controllability and transfer functions, Controllability and observability versus sampling period.

SLE: Stability of discrete state space models
08 Hours
MODULE 4: Discrete state space model- Controller Design: Controller Design using Discrete-time state model, Pole placement design by state feedback, Full order and reduced order observer design, design of digital control systems with state feedback and dynamic output feedback, realization of state feedback by dynamic controllers. Introduction to Multivariable & Multi-input Multi-output (MIMO) Digital Control Systems

08 Hours

SLE: Set point tracking controller

MODULE 5: Nonlinear Digital control systems: Discretization of nonlinear systems, Extended linearization by input redefinition, input and state, Equilibrium of nonlinear discrete-time systems, Lyapunov stability theory, Lyapunov functions, Stability theorem, Rate of convergence, Lyapunov stability of linear systems, Lyapunov’s linearization method, Instability theorems, Discrete-time nonlinear controller design

07 Hours

SLE: - Extended linearization using matching conditions

Text Books


References

Digital Control Systems (3-0-0)

Sub Code: MCD2E404
Hrs/week: 3+0+0
SEE Hrs: 3
CIE: 50% Marks
SEE: 50% Marks
Maxmarks: 100

Course Outcomes
On successful completion of the course, students will be able to:

6. Understand, analyze and apply knowledge of control engineering and mathematics in industrial problems
7. Analyze digital control systems using transform techniques
8. Analyze digital control systems using state-space methods.
10. Analyze the concepts of nonlinear digital control systems.

MODULE 1: Introduction to digital control systems and Z- Transform Techniques:
Introduction, Discrete time system representation, data conversion and quantization, sample and Hold devices, mathematical modeling of the sampling process, data reconstruction and filtering of sampled signals, zero-order hold, the first-order hold, aliasing and folding, choice of the sampling period – Z-transform, Inverse Z-transform, pulse transfer and z-transfer function, pulse transfer function of the ZOH, solution of difference equation, response of discrete-data control system.

08 Hours

SLE: Choice of the sampling period

MODULE 2: Analysis using Z- Transform Techniques: Comparison of time responses of continuous data and discrete data systems, steady state error analysis of digital control systems, correlation between time response and root locations in the s-plane and the z-plane, constant damping factor and constant damping ratio loci, dead beat response at the sampling instants, root loci for digital control systems, effect of adding poles and zeroes to the open-loop transfer function.

08 Hours

SLE: Practical issues with deadbeat response design

MODULE 3: Discrete state space model: State equations of discrete-data systems with sample and hold devices, state equations of digital systems with all digital elements, different state variable models, digital simulation and approximation, state transition equations, state diagrams of digital systems, Decomposition of discrete data transfer functions, Controllability and observability of discrete data systems, relation between observability, controllability and transfer functions, Controllability and observability versus sampling period.

08 Hours

SLE: Stability of discrete state space models
MODULE 4: **Discrete state space model- Controller Design:** Controller Design using Discrete-time state model, Pole placement design by state feedback, Full order and reduced order observer design, design of digital control systems with state feedback and dynamic output feedback, realization of state feedback by dynamic controllers. Introduction to Multivariable & Multi-input Multi-output (MIMO) Digital Control Systems

08 Hours

SLE: Set point tracking controller

MODULE 5: **Nonlinear Digital control systems:** Discretization of nonlinear systems, Extended linearization by input redefinition, input and state, Equilibrium of nonlinear discrete-time systems, Lyapunov stability theory, Lyapunov functions, Stability theorem, Rate of convergence, Lyapunov stability of linear systems, Lyapunov’s linearization method, Instability theorems, Discrete-time nonlinear controller design

07 Hours

SLE: - Extended linearization using matching conditions

**Text Books**


**References**

Finite Element Method of Analysis of Electric Machines  
(3-0-0)

Sub Code: MCD2E304  CIE: 50% Marks  
Hrs/week: 3+0+0  SEE: 50% Marks  
SEE Hrs: 3  Max marks: 100

Course Outcomes
On successful completion of the course, students will be able to:  
1. Know about characteristics parameters of Electromagnetic fields  
2. Maxwell equations  
3. Principle of finite element method (FEM)  
4. Application of FEM to 2 dimensional fields  
5. Analysis Procedure using Finite element method

UNIT 1: Outline of Electromagnetic Fields: Vector Analysis, Electromagnetic Fields- 
Electric Charge Density, Electric Displacement Field, Current Density Field, Magnetic flux 
density field, Electromotive force, Vector Magnetic Potential and magnetic field strength.  
08 Hours
SLE: Poynting Vector and Maxwell Stress tensor

UNIT 2: Maxwell Equations: Laplace Equation, Poissons equation  
08 Hours
SLE: Helmholtz equation

UNIT 3: Principles of Finite element method: Introduction, Field Problem with boundary 
condition, Finite element method, Partition of domain, Choice of Interpolating function, 
Formulation of system  
08 Hours
SLE: Classical Methods for Field Problem solution

UNIT 4: Applications of the finite element method to 2 dimensional fields: Introduction, 
Linear Interpolation of function, Simple description of electromagnetic field.  
08 Hours
SLE: Integration in triangular elements

UNIT 5: Analysis Procedure using Finite element method: Introduction, Reduction of 
the field Problem to a 2 dimensional problem, boundary conditions and computation of 
solved structure, analytical study of magnetic device, Finite element analysis, Computation 
of solved structure  
07 Hours
SLE: Statement of problem for Electro Magnetic devices

Text Book
Reference Books
