Engineering Systems Endsems

- ✅ Robotics - Case Study
- ✅ Emergency Assessment - Case Study
- ✅ Chapter 1
- ✅ Chapter 2
- ✅ Chapter 3
- ✅ Chapter 4
- ✅ Chapter 11
- ✅ Climate Change
- ✅ Regional Water Management
- ✅ Human Factors
- ✅ Industrial Wireless
- ✅ IoT
- ✅ Mobile Phone voting
- ✅ RF Permeability of Bio-Liquids
- ✅ Product Architecture
- ✅ Product Manager
- ✅ System Architecture
- ✅ Systems Engineering

Robotics

- Robot degrees of motion - kinematic arrangements.
- Definition and feedback control.
- Generations of Robotics
- Types of robots - Bionic, Cyborg, Android
- Humanoid details.
- Kinematics.
- Dynamics.
- Planning and Intelligence.
- Wheels.
- Sensors.
- Vision.
- Micro robots.

Emergency Assessment

- Response Modelling - Evacuation
- Needs
  - Integration of Data between agencies
  - Better collaboration between agencies
- **System Architecture**

Climate System

- Definitions
- Climate Models
- **Global Circulation Model**
  - Limitations
  - Downscaling
- IPCC Assessment Reports
- Scenario
- **General Circulation Model**
- Hydrological Model through GCM downscaling and observations
- Predictors, predictands and assumptions.
- **Statistical Downscaling Methodology**
- Mitigation and Adaptive Policies

Water Resource Management

- Problems
- Solutions (3)
- Hydraulic Structures
- Water Resource Management Subsystems
- Components of Hydraulic Structures (Storage, Flow Control, Flow Diversion, Conveyance)
- River Water Quality System
- Environmental Factors

Human Factors in Design

- List of human factors
- Task Analysis Techniques
- Charting Techniques
- Human Error Identification and Analysis

Internet of Things

- IoT as an asset management system.

- 3 tiered implementation
- NCAP (Network Capable Applications Processor)

System Architecture

- Component
- Entity
- System
- Development Models (SSAD)
- Modular Architecture
- Integral Architecture
- Slot Modular Architecture
- Bus Modular Architecture
- Sectional Modular Architecture
- Integral vs Modular
- 5 Phases [Opp, Concept Gen, Concept Eval, Dev, Launch]

Industrial Wireless

- Core requirements for wireless.
- 3 Second Challenge
- ISA100

Chapter 11

- Mission definition.
- Mission Event Timeline.
- Problem identification, Problem Space definition.
- Solution space definition.
- Use Case - Attributes
- UML Diagram
- Use Case Sequence Diagram
- SPS, OCD
- Phases, Modes, States.
- Applications.

Chapter 1

- **Definition of System**
- An integrated set of interoperable elements, each with explicitly specified and bounded capabilities, working synergistically to perform value-added processing to enable a User to satisfy mission-oriented operational needs in a prescribed operating

environment with a specified outcome and probability of success.

- **Categories of System**
  - Hard : Involving simulation
  - Soft : Hard to quantify
  - Evolutionary : Open, Complex system.
- **Systems Thinking :** Process of predicting, how something influences other things.
- **Systems Engineering :** how complex engineering projects should be designed and managed.
- **Engineering Systems :** study dealing with diverse, complex design problems.
- **Characteristics of Engineering Systems**
  - Tech enabled
  - Large Scale
  - Socio-Technical Aspect
  - Nested Complexity
  - Dynamic
  - Emergent Properties

Chapter 2

- **Systems Approach**
  - Interdependence
  - Goal Seeking
  - Holism
  - Inputs and Outputs
  - Transformation
  - Entropy
  - Regulation
  - Hierarchy
  - Differentiation
  - Equifinality
  - Multi-finality
- **System vs Product vs Tools**
- Product has specific capability.
- Supporting product is tool.
- **Systems Attributes**
  - The term *attributes* classifies *functional* or *physical* features of a system.
- **Properties :** Mass properties.

- **Characteristics :** Behavioural and Physical.
- **System Performance :** Objective and Subjective.
- **System Conditions**
  - Pre-requisites
  - Initial Operating Condition
  - Static vs Dynamic
  - Stabilisation
  - Balance of Power

Chapter 3

- **Stakeholders.**
- **Measures of a system**
  - Measure of Performance (Mo Effectiveness, Suitability)
  - Operational Effectiveness
  - Operational Suitability
  - Cost Effectiveness
- **Acceptability of a System**
  - Market
  - User perception
  - User mission- *System*
  - Return of Investment

Chapter 4

- **Stages in System's Life Cycle**
  - Definition (SWOT)
  - Procurement
  - Development
  - Production
  - Operation and Support
  - Disposal
- **System Interface — Objectives**
  - Link Systems
  - Adapt on incompatible systems
  - Buffer effects of incompatible systems
  - Leverage Human Capabilities
  - Restrain system element's usage.
- **Types of Interfaces**
  - Active
  - Passive

    - Combined
    - Logical
    - Physical
- **Interface Failures**
    - Disruption
    - Intrusion
    - Stress Loading
    - Physical Destruction

System Architecture - 1

- **Diagrams**
    - IDEFO
    - FFBD
    - N^2
    - Tree
    - ER
    - Context

System Architecture - 2

- Functional Specifications
- Non-Functional Specifications — ity
- **Physical Architecture** — Divides in Sub-systems
- **System Architecture**
- The System Architecture identifies all the products (including enabling products) that are necessary to support the system and, by implication, the processes necessary for development, production/construction, deployment, operations, support, disposal, training, and verification.