



The Essentials of ICS Engineering Course Syllabus

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The Essentials of ICS Engineering – Core Content and Approach**Integrated Course (3 Days Class Session + 1 Day Workshop)**

Total 3 days for class session + 1 day for workshop session that include the essentials of process and instrumentation engineering, communication framework, fundamental of control system engineering, and detailed Industrial Control System environment (DCS, SIS, SCADA, PLC, DMC, and Flow Computer).

Workshop using FedPlant testbed to explore the SCADA engineering in more detail exposure, from understanding the process and instrumentation control aspect, designing the HMI, I/O assignment (hardware and software), tag mapping, testing and commissioning simulation, and operations and maintenance simulation. The programming language that being used is using Function Block Diagram (FBD) as one of the approved lists of ICS programming language refer to IEC 61311-3 standard.

- **3 Days Class Session**, these 3 days class session will include body of knowledge of ICS Engineering including the case studies. Following are some of the material contents as the scope of this session:

A. Fundamental of Process Instrumentation and Communication Framework

- Process Instrumentation
- Communication Framework
- Case Study: Determining the Process Instrumentation

B. Industrial Control System Environment

- Fundamental of Control System Engineering
- Distributed Control System (DCS)
- Safety Instrumented System (SIS)
- Supervisory Control and Data Acquisition (SCADA)
- Programmable Logic Controller (PLC)
- Flow Computer
- Dynamic Matrix Control (DMC)
- Case Study – System Best Practice
- Game Session – Safety Design and Engineering

C. ICS Design, Programming, and Engineering

- Fundamental of ICS Programming
 - Understanding the Process, Reflecting to HMI
 - Workshop Preparation
- **1 Day Workshop Session** to cover SCADA Engineering with PLC as its main controller with the following coverage:
 - Designing proper HMI based on FedPlant process
 - Instrumentation installation
 - SCADA and PLC integration (hardware and software)
 - FedPlant ICS Engineering Grand Workshop

Course Syllabus

- FedPlant testbed (custom PLC using Raspberry Pi and Arduino families with 3D printed and bricks structure of process miniature simulated)
- Emulated environment using virtualization combined with the FedPlant testbed

▪ **FedPlant ICS Engineering and Cyber Security Testbed**

FedPlant as the ICS Testbed to be used across the course learning process to help participants understand the ICS in its engineering aspect, design, function, operations, and maintenance.

FEDPLANT



OVERVIEW

An ICS testbed to simulate real process (pumpjack and oil processing) through real device (PLC and HMI) to bring new learning environment in exploring ICS engineering and its Cyber Security Assurance. Safety operational features also integrated into the physical control mechanism integrated with logical setup



ICS REAL PROCESS

Production and processing plant process simulation using embedded system, 3D Printing and bricks model.



PLC AND HMI

PLC using Raspberry Pi with 16 Digital I/O, remote PLC using Arduino with more than 16 digital and analog I/O programmed using FBD (IEC 61311-3). Local and remote supervision and control provided through push button and HMI.



MODULAR & EXPANDABLE

Modular system with baseline platform for ICS testbed simulation. Expandable option to include more models and to explore more on ICS Cyber Security.

Your ICS Engineering & Cyber Security Testbed

Design, program, test, manage and explore your own ICS process. Fully compatible to be interconnected to other Purdue Model ICS layers (L2, L3 and L4) either via real or virtual environment to explore more on ICS Cyber Security Assurance

FedPlant - Your ICS Engineering and Cyber Security Testbed

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