Cairo University
Faculty of Engineering
Mech. Power Department

CAIRO UNIVERSITY
FACULTY OF ENGINEERING

ACC Virtual Labs
Automatic Control Circuits &Virtual Labs
for Mechanical Power Systems

معمل التحكم الأوتوماتيكى و المعامل الإفتراضية لأنظمة القوى الميكانيكية

دبلوم تطبيقات التحكم الأوتوماتيكى فى نظم القوى الميكانيكية

MEP 587 Advanced Measurements and Instrumentation for Control Systems

Or

Selected Topics for Control Systems for Mechanical Power Engineering
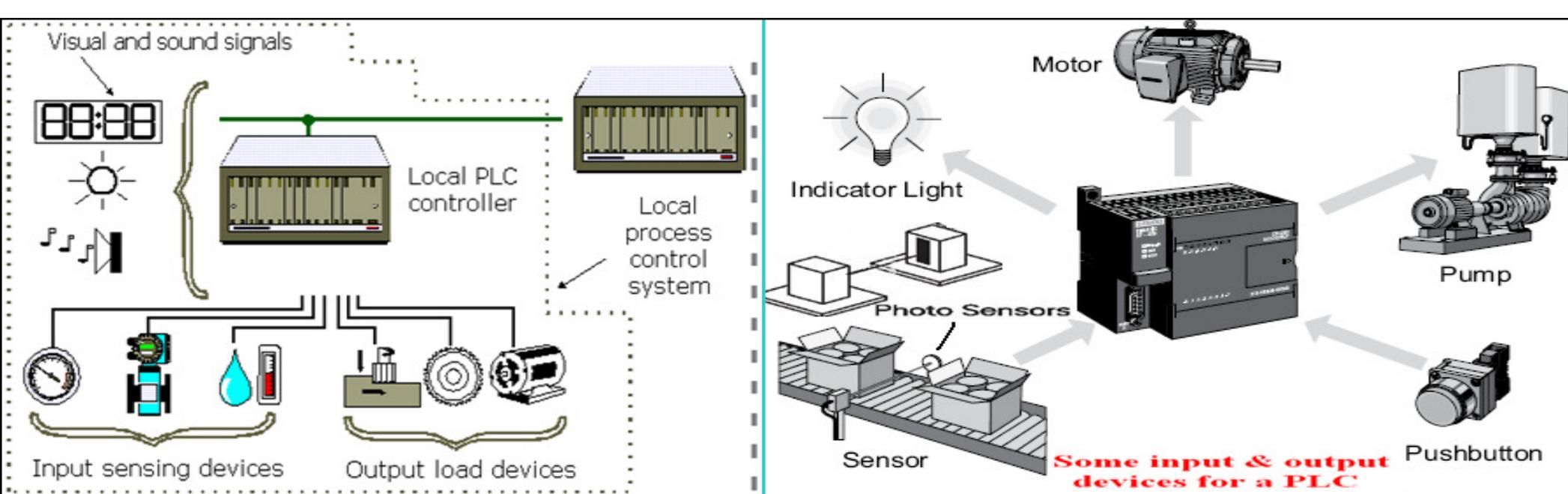
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إسم المقرر ــ مكق587 موضوعات مختارة فى نظم التحكم فى هندسة القوى الميكانيكية:

المحتوى والأهداف: هذا المقرر الإختيارى يعتبر الجزءالثانى التابع للمقرر الإجبارى مكق 560 (أجهزة القياس والإختبارات والتحكم فى نظم القوى الميكانيكية)

ويتضمن هذا المقرر موضوعات مختارة فى نظم التحكم-تطبيقات أجهزة القياس فى PLC: مبادىء عملية التحكم،أهم أنواع وتطبيقات الأجهزة الكهربية الأساسية الموجودة فى نظم التحكم الأوتوماتيكى(خاصة مع PLCs)

MEP587 provides very valuable, detailed technical and also very essential information about basics of main electric components and most fundamental PLCs Input and Output devices, such as: **Proximity Sensors, Photo-electric Sensors, Switches, Relays, Contactors, Timers, Counters, AC/DC Power supplies, Temperature Controllers, inverters, and others.** Understanding of all those devices is essential for the benefit of the newcomers to PLCs control systems and PLCs industry. Real-life examples are also incorporated in this course. This course is pre-requisite or must be completed before attempting to study thoroughly about the Basics of PLCs. Understanding of many of concepts covered in this course is required for understanding practical applications of PLCs and control systems.

Visual and sound signals
Local PLC controller
Local process control system
Input sensing devices
Output load devices

Motor
Indicator Light
Photo Sensors
Sensor
Pump
Pushbutton
Some input & output devices for a PLC

To answer Three main questions:
 1-What do we mean by Measurements and Instrumentations?
2-Why do we need Measurements/Tests (what is relation with Automatic Control systems)?
3-How can we do accurate and meaning-full Measurements, Tests, and Calibrations?

Course Objectives & Contents

Measurements & Instrumentations are Part of Process Control (measure + compare +adjust):

Example: if we have process with **physical parameters/variables** to be controlled (e.g., $T_{oil-out}$ to be kept $\leq$ set point). To do this we have many steps: 1st, these physical variables have to **be measured by sensors**. Output signals (electric) are sent to controller (PLC/ PID) unit to do control actions based on preset data+measured values. Controller may do control actions by controlling flow rate of either water or oil by variable flow valves, or changing rpm of variable speed pump.

Hot oil in
T_{O_i} $\dot{m}_2$
T_{W_0}
$\dot{m}_1$ cooling water out
T_{W_i}
$\dot{m}_1$ cooling water in
$\dot{m}_2$
Hot oil out T_{O_o}
Control system (process control)