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# Industrial Automation Lab Portfolio

## Courses Covered:

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Industrial Automation  
Microcontroller Based Systems  
Power Electronics  
Mechatronics System Design

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Lab Engineer: Engr. Muhammad Nabeel

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# Pictorial View Of Lab

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# 1. CNC Lathe

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Figure 1: ST/6 Rhino CNC

Concerned Course	Industrial Automation
List of Experiments	<ol style="list-style-type: none"><li>1. Manual CNC Control Experiment</li><li>2. Auto Control CNC with GCODE Experiment</li><li>3. Threading on Aluminum Bar Experiment</li></ol>

## 2. Servo System

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Figure 2: Adtech Servo System

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**Concerned  
Course**

**Industrial Automation**

**List of  
Experiments**

1. Operation of Servo System Experiment
2. Closed Loop Servo Experiment
3. Analog Control Experiment
4. Pulse Train Control Experiment
5. Torque Control Experiment
6. Servo With AD-tech Controller Experiment

### 3. CNC 4 Axis Controller



Figure 3: ADTECH 4940 CNC Controller

**Concerned  
Course**

**Industrial Automation**

**List of  
Experiments**

1. Manual Servo Control Experiment
2. Servo Control with G-code Experiment
3. Closed Loop Integration Experiment
4. Multiple I/O Experiment
5. Macro Code Experiment
6. Spindle Control Experiment

## 4. Delta HMI

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Figure 4: Delta HMI

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**Concerned  
Course**

**Industrial Automation**

**List of  
Experiments**

1. HMI Design Experiment
2. HMI Interfacing With PLC Experiment
3. HMI Graphical Animation Experiment



## 5. PLC Siemens

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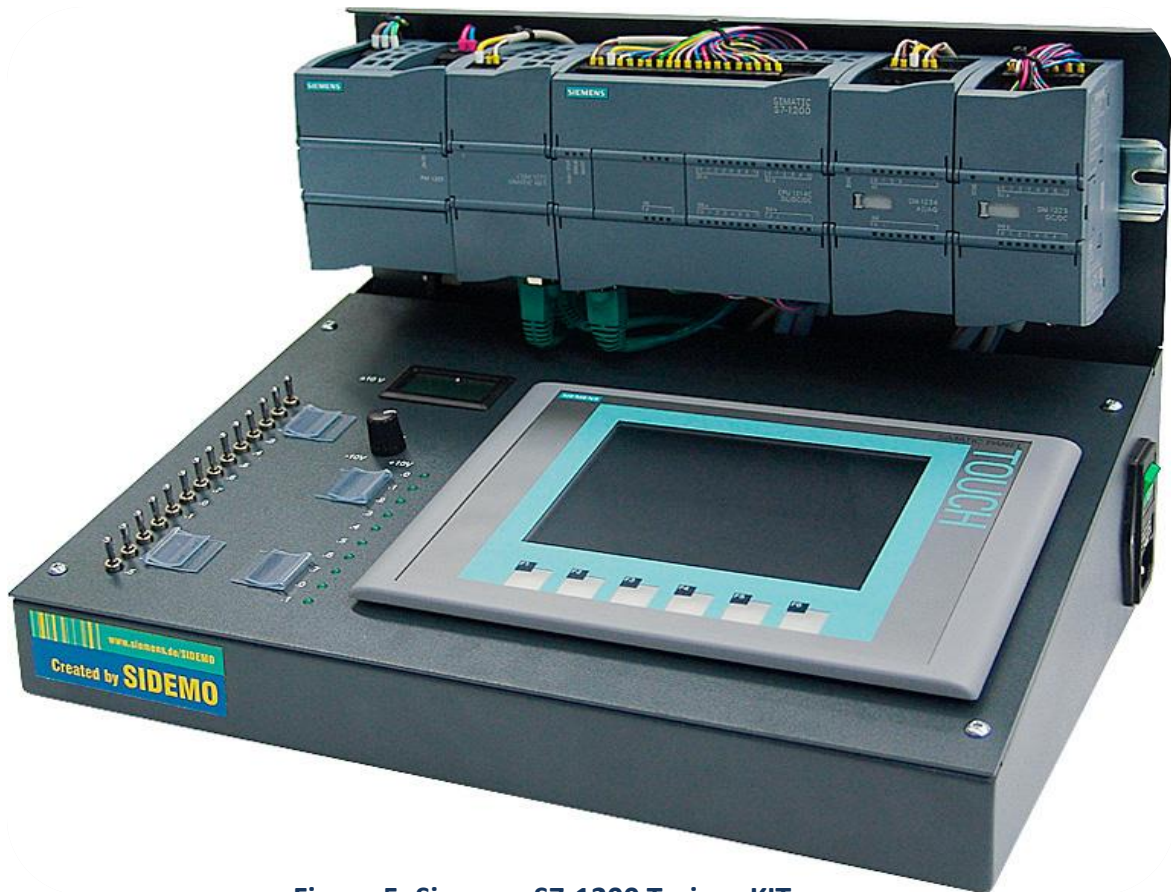


Figure 5: Siemens S7-1200 Trainer KIT

**Concerned  
Course**

**Industrial Automation**

**List of  
Experiments**

1. Digital I/O Interfacing Experiment
2. Analog I/O Experiment
3. Timer/Counter Experiment
4. HMI Interfacing Experiment
5. PID Control Experiment

## 6. PLC Allen Bradley

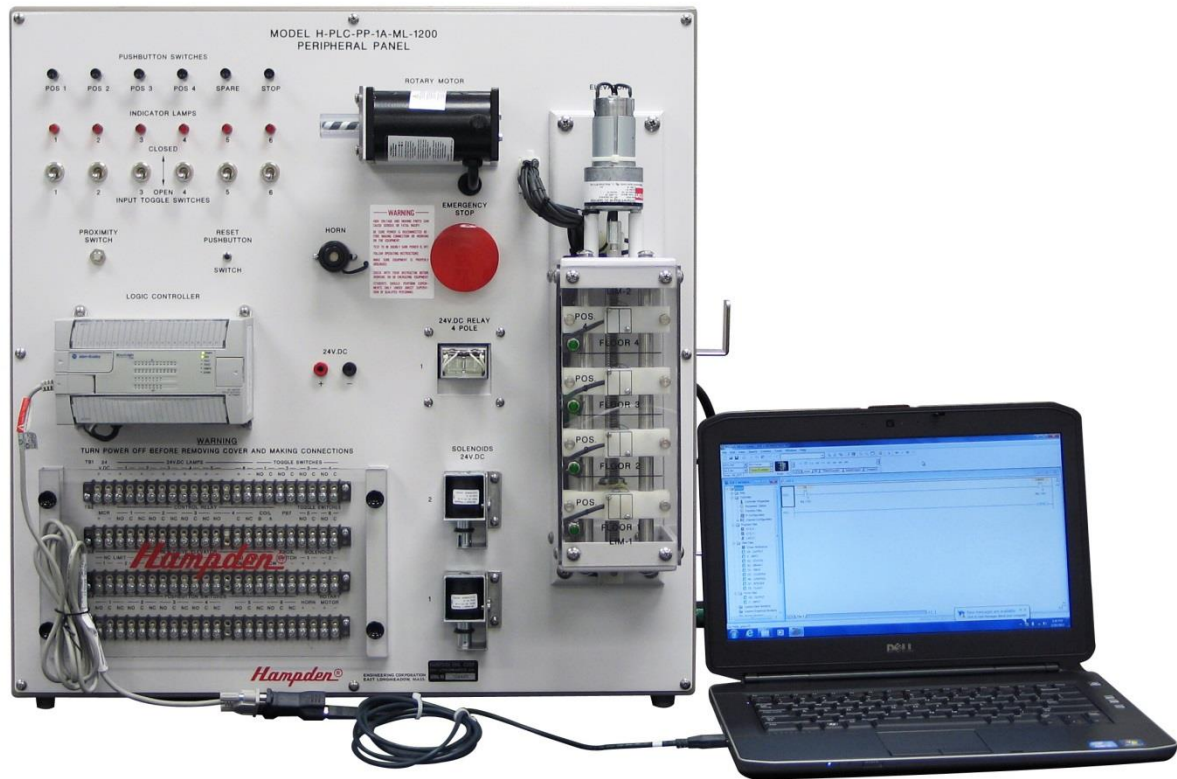


Figure 6: PLC Allen Bradley Trainer KIT

**Concerned  
Course**

**Industrial Automation**

**List of  
Experiments**

1. Digital I/O Experiment
2. Dc Motor Control Experiment
3. Proximity Sensor Experiment
4. Sensors/Actuators Experiment
5. Timer/Counter Experiment
6. Lift Control Experiment



## 7. 3D Printer

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Figure 7: 3D Printer

**Concerned  
Course**

**Industrial Automation, Mechatronics System Design**

**List of  
Experiments**

1. Part Design Experiment
2. Part Manufacturing Experiment

## 8. Midas MDA Multi-Kit Trainer



Figure 8: MDA Multi Kit Microcontroller Trainer

### Concerned Course

### Microcontroller Based Systems

#### List of Experiments

1. Led display Experiment
2. Traffic Signal Control Experiment
3. FND Display Experiment
4. Text LCD Display Experiment
5. ADC Experiment
6. DAC Experiment
7. Sound Experiment
8. DC Motor Control Experiment

- 9. Stepper Motor Control Experiment
- 10. Key Matrix Experiment
- 11. Rotary Switch Experiment
- 12. Digital Clock (DS1302) Experiment
- 13. I2C Communication Experiment
- 14. Digital Thermometer (DS1620) Experiment
- 15. UART Communication Experiment
- 16. 32X16 Dot Matrix Display Experiment
- 17. SPI Communication Experiment

## 9. Arduino

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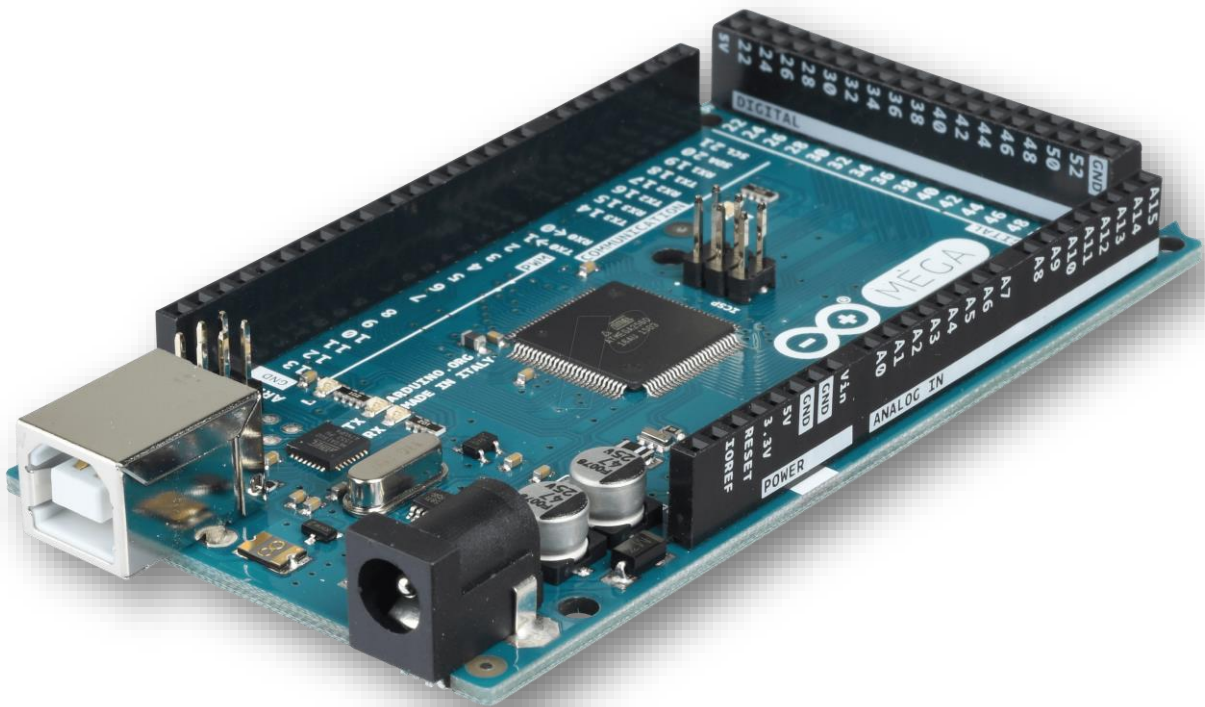


Figure 9: Arduino MEGA

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### Concerned Course

### Microcontroller Based Systems

#### List of Experiments

1. Various Experiments of Digital I/O Interfacing (i.e. relays, sensors etc.)
2. Various Experiments of Analog I/O Interfacing (i.e. temperature sensor, moisture sensor, humidity sensor etc.)
3. PWM Based Experiment
4. I2c Communication with DS3231 Real Time Clock Experiment
5. UART Communication with Wi-Fi module ESP8266 Experiment
6. UART Communication with Bluetooth Module HC-05 Experiment
7. LCD 16x2 Interfacing Experiment

## 10. Raspberry Pi

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Figure 10: Raspberry Pi 3B

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### Concerned Course

### Microcontroller Based Systems

#### List of Experiments

1. Various GPIO Experiments
2. I2c Real Time Clock Experiment
3. SPI Communication Experiment
4. LCD 16x2 Experiment
5. 3.2" touch TFT LCD Experiment
6. UART Communication Experiment
7. Socket Communication Experiment
8. GUI-Tkinter Experiment



# 11. IOT Equipment

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Figure 11: USR-WIFI-IO-

Concerned Course	Microcontroller Based System
List of Experiments	<ol style="list-style-type: none"><li>1. IOT (Internet of things) experiment</li><li>2. Cloud Data Base Server Experiment</li><li>3. Google Real Time Database Experiment</li></ol>

## 12. Motion Sensing

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Figure 12: Leap Motion

Concerned Course	Mechatronics System Design
List of Experiments	1. Cursor control Experiment 2. Experiment to Control RPi GPIO

## 13. Power Electronics Trainer

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Figure 13: Power Electronics Trainer Kit

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**Concerned  
Course**

**Power Electronics**

**List of  
Experiments**

1. UJT Experiments:
  - 1.1.Characteristics and applications of photoconductive detectors
  - 1.2.UJT Characteristic & Equivalent Circuit
  - 1.3.UJT Oscillator Circuit & Timer Switch
  - 1.4.UJT introduction
  - 1.5.UJT characteristic
  - 1.6.CDS trigger, RTH trigger
  - 1.7.UJT relaxation oscillator
2. Power Supply Unit Experiments
  - 2.1.DC voltage measurement
  - 2.2.Ac Motor controlling Experiment
  - 2.3.Dc Motor controlling Experiment

### 3. PUT Experiments:

- 3.1.PUT Characteristic & Equivalent Circuit
- 3.2.PUT Oscillator Circuit & Timer Switch
- 3.3.PUT introduction
- 3.4.PUT characteristic
- 3.5.PUT equivalent circuit
- 3.6.CDS trigger
- 3.7.RTH trigger
- 3.8.PUT circuit oscillator
- 3.9.PUT timer switch

### 4. SCR Control DC Motor & DIAC, TRIAC Experiments:

- 4.1.TRIAC trigger mode
- 4.2.TRIAC static measurement
- 4.3.DIAC, TRIAC Characteristic Experiment
- 4.4.SCR cut-off principle
- 4.5.SCR control DC motor forward / reverse control experiment

### 5. Over /Under Voltage Breaker and Flasher Control Experiments:

- 5.1.Over/Under Voltage Breaker Experiment
- 5.2.Flasher Control Experiment

### 6. TRIAC Liquid Level & IC Timer Switch Experiments:

- 6.1.TRIAC liquid level control experiment
- 6.2.NE 555 IC circuit introduction
- 6.3.IC timer switch experiment

### 7. SCS Experiments:

- 7.1.SCS Characteristic Experiment
- 7.2.SCS Trigger Circuit Experiment
- 7.3.SCS construction and operation mode
- 7.4.Use VOM meter measuring SCS
- 7.5.SCS Schmitt circuit
- 7.6.SCS simulate PUT circuit
- 7.7.CDS trigger
- 7.8.RTH trigger

## 14. QNET Mechatronics System Board

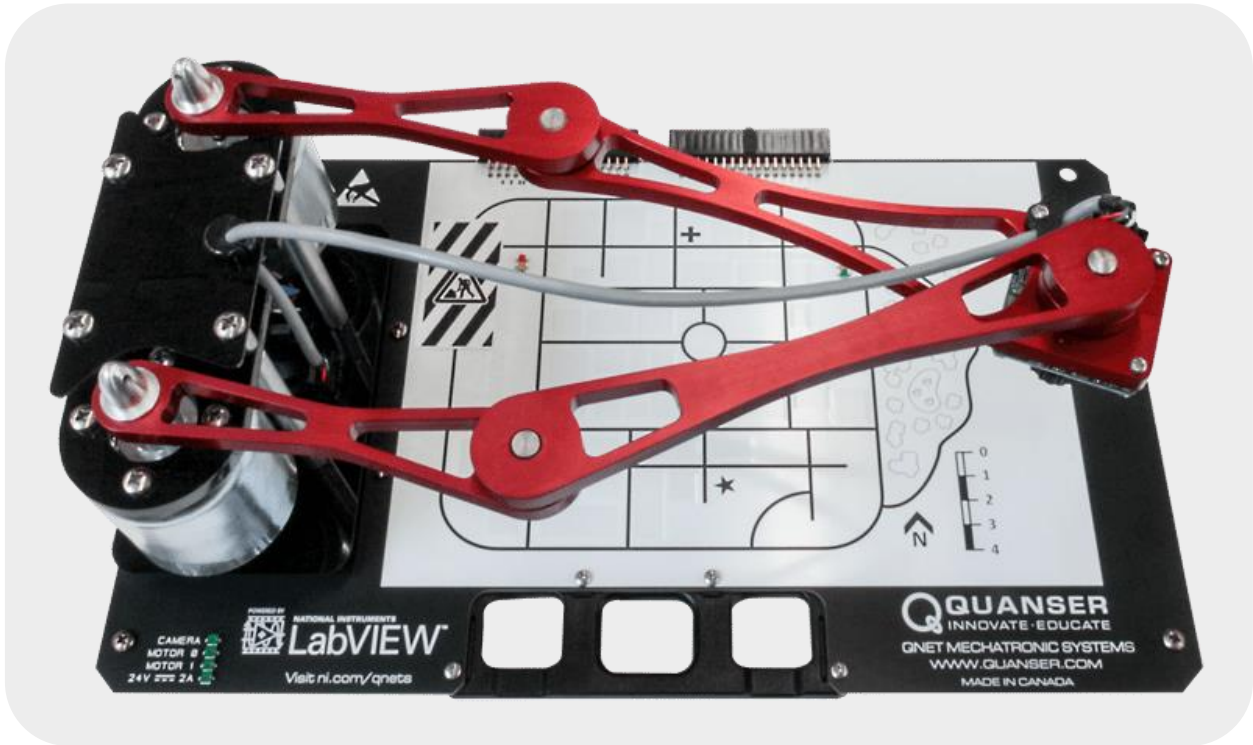


Figure 14: QNET Mechatronic Systems Board for NI ELVIS



**Concerned  
Course**

**Mechatronics System Design**

**List of  
Experiments**

1. Reading Encoder
2. PID Implementation
3. Forward and Inverse Kinematics
4. Goal-directed line following using Image Processing



# 15. QNET Mechatronics Actuators Board



Figure 15: QNET Mechatronic Actuator Board for NI ELVIS

**Concerned  
Course**

**Mechatronics System Design**

**List of  
Experiments**

1. Observing characteristics and configuration of different motors such as:
  - 1.1. Linear Brushed DC Motor
  - 1.2. PWM Brushless DC Motor
  - 1.3. Solenoid
  - 1.4. Stepper Motor
  - 1.5. Micro-servo Motor