

Electronics

Autotronics

Mechatronics

Refrigeration

Tech Prep

Technology Preparation Training LAB



About SES

SES Scientific Educational Systems develops, manufactures and markets worldwide educational training systems since 1982.

SES is a quality assured firm with of ISO-9001:2008 certification.

SES products cover study programs for:

Universities, colleges, vocational schools, high schools, secondary schools and primary schools.

SES products are off-the-shelf products and are course modular systems. They can be adapted to various types of study programs and laboratories.

SES has 4 product lines:

DEGEM Systems Professional training for universities, colleges and vocational schools.

NeuLog Logger sensors for science experiments and robotics systems for all schools.

MagiClass Response system with intuitive clickers for all schools.

MultiCenter Science, robotics, technology, art, music and language training systems for ages 5+.

Technology Preparation

Science and technology are evolving at a fantastic rate. New amazing machines, instruments and applications are created almost every day. Young students know intuitively how to operate them and how to use them.

The big challenge to the education system is how to tap into a young person's curiosity and desire to understand how these systems work and to develop in them capabilities to enable them to participate in the wonderful world of developers, designers, creators, entrepreneurs and smart users.

The Technology Preparation (Tech Prep) laboratory is a classroom-integrated laboratory consisting of educational modules covering a wide range of subjects. The students use the specially developed laboratory tools, learn the theory behind a myriad of technologies and learn how the principles of science are used in real life applications.

Students operate the different laboratory modules and practice the applications. Tech Prep creates awareness of modern technology and the scientific applications and broadens the perception of young persons about a career in technology and industry.

Tech Prep teaches a very wide range of skills to adults already employed in industry, which enables them to grow to handle additional tasks and to adjust better to changes in technology. Unemployed persons can acquire skills using Tech Prep to gain an understanding of technology, to make them more employable.

Tech Prep exposes students to technologies in green and alternative energy, electronics, computerized systems, mechatronics, material processing, robotics and more.

Those who decide to embark on a career in technology find that the Tech Prep courses provide the most needed technical preparation for continuing education in science, technology and engineering.

Tech Prep Equipment

TP-3701 – Solar Energy

Objectives

The TP-3701- Solar Energy Course introduces the student to green energy source – the sun. TP-3701 exposes the student to the concepts, practical applications and uses, and the ecological benefits of utilizing solar energy. The student studies energy derivation, conversion and storage, with the emphasis on solar generated energy. The system courseware and experiments are developed to spark the students' interest and curiosity in the interaction between scientific phenomena, these energy technologies and common applications relating to solar energy specifically.

Description

The TP 3701 training system includes a lamp that simulates the sun and a solar cell that converts the solar energy to electric energy. This electric energy is used to operate different “consumers” – a lamp, an audio source and a mechanical lift. The lamp is located on a mechanical arm that can be rotated. The solar cell is mounted on a rotating base, which allows it to automatically track the light source as it is rotated. The dependence of the solar cell on the electrical energy generated by the light intensity produced by the lamp is illustrated by varying the voltage applied to the lamp and also by varying the angle of incident light. A digital voltmeter and a digital ammeter are used to measure the level of electrical power generator.



TP-3701 – Solar Energy Specifications

Technical Characteristics	Learning Program
<p>Light source</p> <ul style="list-style-type: none"> ▪ Light source power (50 Watts) ▪ Light source voltage (12V DC) ▪ Light house angle (0-60°) ▪ Lamp dimmer (5 positions) ▪ Solar cell ▪ Solar cell motor tracking system ▪ Electric generator ▪ Rechargeable unit ▪ Light load (LED) ▪ Mechanical motor load ▪ Buzzer sound load ▪ Voltmeter and ammeter with common digital display ▪ Input voltage 15VDC (110-230 VAC external switching supply) ▪ General dimensions (610 x 510 x 470 mm) ▪ Emergency stop button ▪ Main power switch 	<p>Tech Prep pedagogical guidelines</p> <ul style="list-style-type: none"> ▪ Concept of work, power, energy and efficiency ▪ Different forms of energy ▪ Energy conservation ▪ Green energy ▪ Introduction to solar energy ▪ Using the TP-3701 training system ▪ Solar cell voltage and the effect of light intensity and incident light angle ▪ Conversion of solar energy to: light, sound, mechanical energy ▪ Energy storage and operation of various loads ▪ Efficiency ▪ Solar cell affectivity – effect of temperature on output voltage <p>The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.</p>
<p>Supplied Accessories</p> <p>The learning unit is supplied with the following accessories:</p> <ul style="list-style-type: none"> ▪ Set of banana wires ▪ Mechanical load weight ▪ Universal AC power cable (European standard) ▪ External DC power supply ▪ Courseware or soft copy electronic book for MS Windows PC 	<p>Safety Features</p> <p>The following safety features are provided by the learning unit:</p> <ul style="list-style-type: none"> ▪ 'Emergency Stop' pushbutton that cuts off all electricity to the unit when pressed. ▪ The lamp is covered with an insulating material to prevent touching the lamp when hot. ▪ The lamp has a handle to afford safe handling and movement when hot.

TP-3702 – Wind Energy

Objectives

The TP-3702 Wind Energy course introduces the student to green energy source – the wind. TP-3702 exposes the student to wind energy, its concepts, practical applications and uses, and the ecological benefits of utilizing wind energy. The student is introduced to issues relating to energy derivation, conversion and storage, with emphasis on wind generated energy. Students study the limitations and advantages of wind as an energy source; how the dependence of energy yield rests on wind velocity and direction. The system courseware and experiments sparks the students' interest and curiosity. They establish an awareness of the technologies involved in the subject discussed, and understand better the interaction between scientific phenomena, these technologies and common applications relating to wind energy.

Description

The TP-3702 training system includes a fan which simulates the natural power of wind, and a wind driven power generator which is used to convert the wind energy to electric energy. This electric energy is then actually used to operate different "consumers" – a lamp, an audio source and a mechanical lift. The fan is located on a mechanical arm, which can be rotated. The dependence of output electrical energy on the angle between the fan (wind source) and the power generator is illustrated by varying the angle between them. A digital voltmeter and ammeter is used to show the level of energy output from the generator.



TP-3702 – Wind energy specifications

Technical Characteristics	Learning Program
<p>Wind motor</p> <ul style="list-style-type: none"> ▪ Wind motor rotation (0-60°) ▪ Generator motor ▪ Electric generator ▪ Rechargeable unit ▪ Light load (LED) ▪ Mechanical motor load ▪ Buzzer sound load ▪ Voltmeter and ammeter with common digital display ▪ Input voltage 15VDC (110-230 VAC external switching supply) ▪ General dimensions (610 x 510 x 470 mm) ▪ Emergency stop button ▪ Main power switch 	<p>Tech Prep pedagogical guidelines</p> <ul style="list-style-type: none"> ▪ Concept of work, power, energy and efficiency ▪ Different forms of energy ▪ Energy conservation ▪ Green energy ▪ Introduction to wind energy ▪ Using the TP-3702 training system ▪ Wind power and generator output ▪ Effect of wind speed on generator output ▪ Effect of wind angle on generator output ▪ Conversion of wind energy to: light, sound, mechanical energy ▪ Energy storage and operation of various loads ▪ Efficiency <p>The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.</p>
<p>Supplied Accessories</p> <p>The learning unit is supplied with the following accessories:</p> <ul style="list-style-type: none"> ▪ Set of banana wires ▪ Mechanical load weight ▪ Courseware or soft copy electronic book for MS Windows PC 	<p>Safety Features</p> <p>The following safety features are provided by the learning unit:</p> <ul style="list-style-type: none"> ▪ 'Emergency Stop' pushbutton that cuts off all electricity to the unit when pressed. ▪ The fan is located in an enclosure to prevent injury from the rotating blades.

TP-3703 – Hydro-Electric Energy

Objectives

The TP-3703 Hydro-Electric Energy course introduces the student to green energy source –water.TP-3703 exposes the student to hydro-electric energy, its concepts, practical applications and uses, and the ecological benefits of utilizing hydro-electric energy. The student is introduced to issues relating to energy derivation, conversion and storage, with the emphasis on wind generated energy. The student is also made aware of the limitations and advantages of wind as an energy source and the dependence of energy yield on wind velocity and direction. The system courseware and experiments will enhance the students' interest and curiosity. They also establish an awareness of the technologies involved in the subject discussed, and the interaction between scientific phenomena, these technologies and common applications relating to wind energy.

Description

The TP-3703 training system includes a fan which simulates the natural power of wind, and a wind driven power generator which is used to convert the wind energy to electric energy. This electric energy is then actually used to operate different "consumers" – a lamp, an audio source and a mechanical lift. The fan is located on a mechanical arm, which can be rotated. The dependence of output electrical energy on the angle between the fan (wind source) and the power generator is illustrated by varying the angle between them. A digital voltmeter and ammeter is used to show the level of energy output from the generator.



TP-3703 – Hydro-electric energy specifications

<p>Technical Characteristics</p> <ul style="list-style-type: none"> ▪ Water electrical pump ▪ Electric generator motor ▪ Rechargeable unit ▪ Light load (LED) ▪ Mechanical motor load ▪ Buzzer sound load ▪ Voltmeter and ammeter with common digital display ▪ Input voltage 15VDC (110-230 VAC external switching supply) ▪ General dimensions (610 x 510 x 470 mm) ▪ Emergency stop button ▪ Main power switch 	<p>Learning Program</p> <p>Tech Prep pedagogical guidelines</p> <ul style="list-style-type: none"> ▪ Concept of work, power, energy and efficiency ▪ Different forms of energy ▪ Energy conservation ▪ Green energy ▪ Introduction to hydro-electric energy ▪ Using the TP-3703 training system ▪ Hydro power and generator output ▪ Effect of river flow on generator output ▪ Conversion of hydro energy to: light, sound, mechanical energy ▪ Energy storage and operation of various loads ▪ Efficiency <p>The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.</p>
<p>Supplied Accessories</p> <p>The learning unit is supplied with the following accessories:</p> <ul style="list-style-type: none"> ▪ Set of banana wires ▪ External power supply ▪ Mechanical load weight ▪ Courseware or soft copy electronic book for MS Windows PC 	<p>Safety Features</p> <p>The following safety features are provided by the learning unit:</p> <ul style="list-style-type: none"> ▪ 'Emergency Stop' pushbutton that cuts off all electricity to the unit when pressed. ▪ The hydro source fan is located in an enclosure to prevent injury.

TP-3704 – Solar Water Heating Energy

Objectives

TP-3704 Solar Water Heating Energy course introduces the student to the application of solar energy to heat water. TP-3704 emphasizes the environmentally friendly nature of solar energy. The student is acquainted with greenhouse and thermodynamic effects. Also discussed is the effect of height differences between water reservoirs in connection with power generation. The system courseware and experiments will spark the students' interest and curiosity. They establish an awareness of the technologies involved in the subject discussed, and the interaction between scientific phenomena, these technologies and common applications relating to solar water heating energy conversion.

Description

The TP-3704 training system includes a lamp that simulates the sun and a water tank connected to a radiator that is used to convert the solar energy to heat energy. Also included are components for demonstrating the effect of heat radiation, absorption and reflection. The temperature at various points is measured by temperature probes and digital displays.



TP-3704 – Solar water heating energy specifications

<p>Technical Characteristics</p> <ul style="list-style-type: none"> ▪ Light source power (60 Watts) ▪ Light voltage (12 VDC) ▪ Draining ball valve ▪ Water tank ▪ Integrated circuit temperature sensor ▪ Digital temperature display ▪ Input voltage 15VDC (110-230 VAC external switching supply) ▪ General dimensions (610 x 510 x 470 mm) ▪ Emergency stop button ▪ Main power switch 	<p>Learning Program</p> <p>Tech Prep pedagogical guidelines</p> <ul style="list-style-type: none"> ▪ Concept of work, power, energy and efficiency ▪ Different forms of energy ▪ Energy conservation ▪ Green energy ▪ Using the TP-3704 training system ▪ Greenhouse effect ▪ Heat transfer ▪ Improving solar water heating efficiency with thermal insulation ▪ Effect of incident light angle on water heating performance <p>The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.</p>
<p>Supplied Accessories</p> <p>The learning unit is supplied with the following accessories:</p> <ul style="list-style-type: none"> ▪ External temperature probe ▪ Syringe from sucking air out of water pipes ▪ Insulating plate ▪ Halogen lamps (3) ▪ Courseware or soft copy electronic book for MS Windows PC 	<p>Safety Features</p> <p>The following safety features are provided by the learning unit:</p> <ul style="list-style-type: none"> ▪ 'Emergency Stop' pushbutton that cuts off all electricity to the unit when pressed. ▪ The lamp is covered with a cover made from insulating material to prevent touching it when hot.

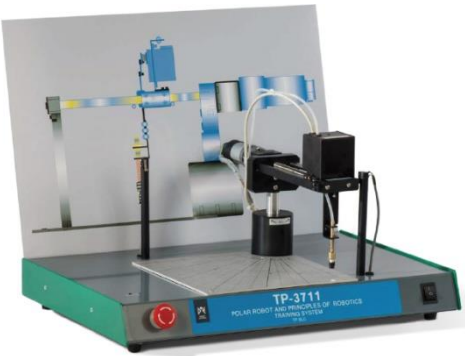
TP-3711 – Polar Robot and Robotic Principles

Objectives

The objective of the TP-3711 Polar Robot and Robotic Principles training module is to expose students to robotic technology and the disciplines to activate and control a robot. The student will gain an understanding of where robot technology is applicable. Supporting knowledge, such as algebraic and polar coordinate systems, logic and sequencing are taught and exercised. The student will be able to write, test and run his own programs by applying the enclosed set of control commands.

Description

The TP-3711 training system is a desktop system which includes a manipulator robot arm. The manipulator arm can move in a two dimensional plane and also has up/down movement. Motion is implemented by small electrical motors under computer control. By employing vacuum technology, the manipulator can lift small discs and move them around. The system control can be modified by dedicated, simple control software for simulation and creating the manipulator motion and operation trajectory. The TP-3711 package allows creating the trajectory sequence flow diagram, performing a simulation of the procedure and, finally, executing the process on the actual manipulator robot arm system.



TP-3711 – Polar robot and Robotic Principles Specifications

<p>Technical Characteristics</p> <ul style="list-style-type: none"> ▪ Mechanical structure (3 degrees of freedom) ▪ Movement range on roll (0-90°) ▪ Movement range on elbow (180 mm) ▪ Movement range on z-axis (50 mm) ▪ Electric vacuum pump gripper ▪ Roll motor type (DC motor) ▪ Elbow motor type (DC motor) ▪ Resolution (± 1 mm) ▪ Input voltage 15VDC (110-230 VAC external switching supply) ▪ General dimensions (610 x 510 x 470 mm) ▪ Emergency stop button ▪ Main power switch ▪ Computer – machine connection (USB) 	<p>Learning Program</p> <p>Tech Prep pedagogical guidelines</p> <ul style="list-style-type: none"> ▪ Introduction to robotics ▪ Cartesian and polar axis systems ▪ Simulation and control software ▪ Programming instructions ▪ Basic program training ▪ Advanced training <p>The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.</p>
<p>Supplied Accessories</p> <p>The learning unit is supplied with the following accessories:</p> <ul style="list-style-type: none"> ▪ 5 discs ▪ Courseware or soft copy electronic book for MS Windows PC 	<p>Safety Features</p> <p>The following safety features are provided by the learning unit:</p> <ul style="list-style-type: none"> ▪ 'Emergency Stop' pushbutton that cuts off all electricity to the unit when pressed.

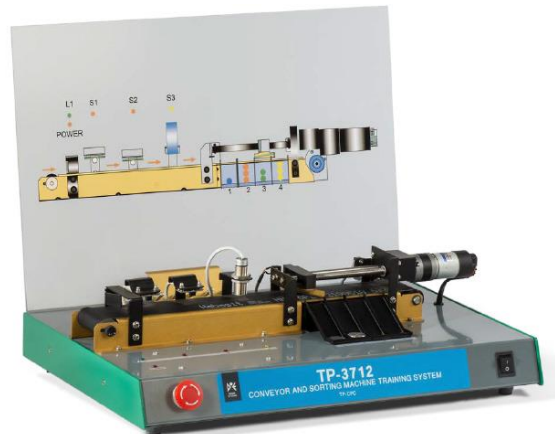
TP-3712 – Conveyor and Sorting Machine

Objectives

The TP-3712 Conveyor and Sorting Machine course introduces a student to the technological field of sensors, conveyors and industrial automation. TP-3712 teaches operation of sensing devices and how to use them in an industrial production line. The use of a conveyor in production line transport, and element sorting by characteristics are demonstrated. The student applies logic, sequencing and control methods to be able to apply these methods to formulate basic algorithms for problem solving. The student applies and learns about the advantages of simulation in industry. TP-3712 enables the student to be able to write, test and run their own programs by applying the user friendly, icon-based set of control commands.

Description

The TP-3712 training system includes a conveyor, three sensors, and a DC motor that moves the sorting barrier to one of four barrier positions. Small discs of different materials can be sorted. The system includes a dedicated, user friendly, control software package. This package allows for the creation of a sequence flow diagram and the execution of the procedure on the actual conveyor system. Measurement and control are all implemented using the computer.



TP-3712 – Conveyor and Sorting Machine Specifications

Technical Characteristics	Learning Program
<ul style="list-style-type: none"> ▪ Four sorting barrier positions driven by a DC motor ▪ Resolution of barrier position (± 1 mm) ▪ Number of storage cells (4) ▪ Optical sensors (2) ▪ Inductive sensor ▪ Nominal movement range of the conveyor (180 mm) ▪ DC conveyor motor ▪ Input voltage 15VDC (110-230 VAC external switching supply) ▪ General dimensions (610 x 510 x 470 mm) ▪ Emergency stop button ▪ Main power switch ▪ Computer – machine connection (USB) 	<p>Tech Prep pedagogical guidelines</p> <ul style="list-style-type: none"> ▪ Introduction to the sorting conveyor ▪ Automation ▪ Introduction to the TP-3712 software ▪ The world of sense and sensors ▪ The world of senses in nature ▪ Process control technology ▪ Experiments with logic tools <p>The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.</p>
<p>Supplied Accessories</p> <p>The learning unit is supplied with the following accessories:</p> <ul style="list-style-type: none"> ▪ Discs of the following types: <ul style="list-style-type: none"> * 3 steel, 6 mm thick * 3 steel, 3 mm thick * 3 plastic, 6 mm thick * 3 plastic, 3 mm thick ▪ Courseware or soft copy electronic book for MS Windows PC 	<p>Safety Features</p> <p>The following safety features are provided by the learning unit:</p> <ul style="list-style-type: none"> ▪ 'Emergency Stop' pushbutton that cuts off all electricity to the unit when pressed.

TP-3713 – Cartesian Robot and Computerized Storage

Objectives

The TP-3713 Cartesian Robot and Computerized Storage course is aimed to teach students the application of the manipulator arm principles, the technologies that are employed by this type of arm, its applications in industry and great insight into the theory required to control the manipulator arm. The application of the manipulator arm is demonstrated by means of a storage system and a pen plotter. The student can study Cartesian coordinate systems, logic, sequencing of events, storage methods and basic robotic control. They will apply logical reasoning to processes and employ them to formulate basic algorithms for problem solving. The students apply and learn about the advantages of simulation in industry.

Description

The TP-3713 training system contains a storage rack with 16 cells and storage pallets. A robotic manipulator arm is used to move the pallets from one cell to another. A simple change of the system configuration transforms the training system into a plotter. The system includes a dedicated, user friendly, control software package. This package enables the student to program the storage procedure flow diagram, simulate the sequence and finally, execute the procedure on the actual system. Control is performed with the computer. The student will be able to write, test and run their own programs by applying the enclosed set of control commands.



TP-3713 – Cartesian Robot and Computerized Storage Specifications

<p>Technical Characteristics</p> <ul style="list-style-type: none"> ▪ Movement range on the X-axis (480 mm) ▪ Movement range on the Y-axis (330 mm) ▪ Movement range on the Z-axis (80 mm) ▪ Gripper ▪ Nominal spacing between compartments on X-axis (116 mm) ▪ Nominal spacing between compartments on Y-axis (60 mm) ▪ Resolution (0.5 mm) ▪ Number of cells in warehouse (16, including input and output) ▪ DC motors ▪ Movement speed along all manipulator axes (900 mm/min.) ▪ Plotter writing medium (whiteboard) ▪ Input voltage 15VDC (110-230 VAC external switching supply) ▪ General dimensions (610 x 510 x 470 mm) ▪ Emergency stop button ▪ Main power switch ▪ Computer – machine connection (USB) 	<p>Learning Program</p> <p>Tech Prep pedagogical guidelines</p> <ul style="list-style-type: none"> ▪ History and uses of storage ▪ Storage principles ▪ Storage methods: FIFO, LIFO, free space ▪ Robotics basics ▪ Cartesian axis system ▪ Absolute and relative (local) coordinates ▪ Introduction to the computerized storage control software ▪ Writing, simulating and executing storage programs to solve storage problems ▪ The plotter ▪ Introduction to the plotter control software ▪ Writing plotter programs and executing them to produce drawings <p>The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.</p>
<p>Supplied Accessories</p> <p>The learning unit is supplied with the following accessories:</p> <ul style="list-style-type: none"> ▪ 16 pallets (blue, red, green, yellow) ▪ Plotter pen and pen holder ▪ Courseware or soft copy electronic book for MS Windows PC 	<p>Safety Features</p> <p>The following safety features are provided by the learning unit:</p> <ul style="list-style-type: none"> ▪ 'Emergency Stop' pushbutton that cuts off all electricity to the unit when pressed.

TP-3716 – Process Control

Objectives

The TP-3716-Process Control course teaches: the uses of process control, the components involved in a process control system, problem solving, and logical reasoning. The application of logic, sequencing and control are demonstrated and Students are able to apply logical thought processes and employ them in formulating basic algorithms for problem solving. The student also applies and learns about the advantages of simulation in industry. Students are able to write, test and run their own programs by applying the user friendly, icon based, set of control commands.

Description

The TP-3716 training system contains three water tanks, filled with colored water. The height of the tanks is adjustable. Each tank has an electrically controlled valve. Water can flow from the tanks to a liquid accumulation tank. The level of the liquid in the accumulation tank is measured and controlled. The system includes a dedicated, user friendly, control software package. This package allows the creation of a process flow diagram, performance of a simulation of the process and finally, the execution of the process on the actual system. Measurement and control are all implemented via the computer.



TP-3716 – Process Control Specifications

<p>Technical Characteristics</p> <ul style="list-style-type: none"> ▪ Upper storage tanks (3) ▪ Main tank for mixing color liquids ▪ Solenoid valve type (on/off) (3) ▪ Drain valve type (manual ball valve) ▪ Float ▪ Water level potentiometer ▪ Input voltage 15VDC (110-230 VAC external switching supply) ▪ General dimensions (610 x 510 x 470 mm) ▪ Emergency stop button ▪ Main power switch ▪ Computer – machine connection (USB) 	<p>Learning Program</p> <p>Tech Prep pedagogical guidelines</p> <ul style="list-style-type: none"> ▪ Introduction to process control ▪ Basic process control terminology, block diagrams ▪ Industrial process control technology ▪ TP-3716 process control system ▪ TP-3716 software ▪ Basic experiments ▪ Experiments with logic tools ▪ Advanced experiments <p>The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.</p>
<p>Supplied Accessories</p> <p>The learning unit is supplied with the following accessories:</p> <ul style="list-style-type: none"> ▪ Paint type – soluble powder (red, yellow, blue) ▪ Colored liquid containers (3) ▪ Container for draining the main tank ▪ Courseware or soft copy electronic book for MS Windows PC 	<p>Safety Features</p> <p>The following safety features are provided by the learning unit:</p> <ul style="list-style-type: none"> ▪ 'Emergency Stop' pushbutton that cuts off all electricity to the unit when pressed. ▪ The soluble powder used to color the water is non-toxic, transparent and should not leave any residue in the tanks.

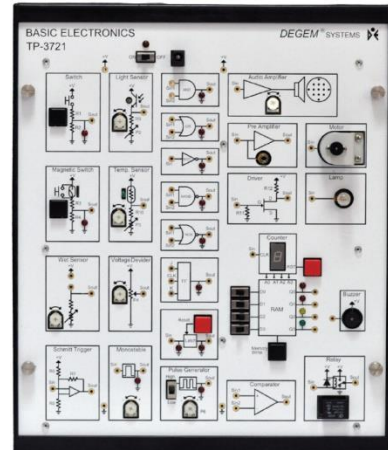
TP-3721 – Basic Electronics

Objectives

The TP-3721 Basic Electronics course introduces the student to analog and digital electronic systems based on a problem-solving approach and covers topics such as: switches and sensors; driver and loads; gate applications; timers and counters; system control; power regulation; amplifiers; measurements in electronic systems; as well as challenging exercises. This course is especially aimed to students in the fields of mechatronics, autotronics, grade schools and junior high schools. Some practical applications of these elements in everyday life are demonstrated.

Description

The TP-3721 training system is a self-contained training system and includes all the electronic equipment necessary to carry out the experiments. The experiment/lab area is located in the central region of the module alongside the circuit diagram, test points and the signal input and output peripherals. The upper printed circuit is protected by a sturdy transparent cover and contains visible components.



TP-3721 – Basic Electronics Specifications

Technical Characteristics

- Sensors: touch, wet, light, magnetic, temperature
- Loads: lamp, motor, relay, buzzer
- Logic gates: AND, OR, NOT, NAND, NOR
- Latch with reset push button
- JK Flip-flop
- Read-write memory
- Schmitt trigger
- Relay
- Pulse generator
- Monostable timer
- Driver
- Audio amplifier
- Voltage divider
- Comparator
- Potentiometer

Supplied Accessories

The learning unit is supplied with the following accessories:

- Set of patch cords
- External power adaptor (110-230 VAC)

Learning Program

Tech Prep pedagogical guidelines

- Introduction to analog electronics
- Input and output components
- Introduction to digital components
- Logic and the AND gate
- OR gate
- NOT gate
- NAND gate
- NOR gate
- Logic combinations
- Flip-flops
- Current, voltage and resistance
- Operational amplifiers
- Challenge exercises

The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.

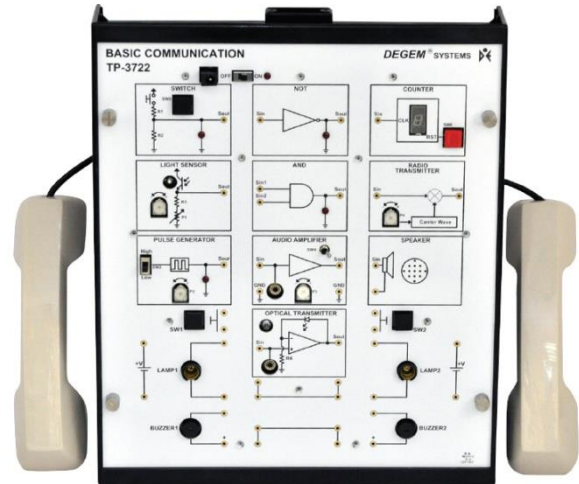
TP-3722 – Basic Communication System

Objectives

The TP-3722 Basic Communication System course introduces the student to the principles of communications and telecommunication systems. The student explores and implements various topics such as: telegraph, audio frequency and volume, light and lasers, fiber optics and radio communications. In addition there are challenge exercises which maintain student interest and cement comprehension of the course material. TP-3722 emphasizes a problem-solving approach, which will increase student interest and involvement throughout the course.

Description

The TP-3722 training system is designed to expose students to the world of communications and to study communication techniques and needs. Students learn the basic principles of communication systems, transmission, reception and amplification. They learn to build a telegraph, a telephone and optical communication systems as well as learn about telephone switching systems. No previous scientific or technological knowledge is required, and the system is easily suited to students from the junior high school level and upwards. The training system contains all the electronic equipment necessary to carry out the experiments.



TP-3722 – Basic Communication System Specifications

Technical Characteristics

- External power supply
- Audio amplifier
- Pulse generator
- Light sensor
- Lamp
- Laser
- Prism
- Folded clear rod
- Fiber optic cable
- Mirrors
- NOT gate
- AND gate
- Counter
- Optical transmitter
- Radio transmitter
- Fiber optic cable
- External loudspeaker
- Push button switches (3)
- Buzzers (2)
- Lamps
- Microphone

Supplied Accessories

The learning unit is supplied with the following accessories:

- Set of patch cords
- External power adaptor (110-240 VAC)
- Radio

Learning Program

Tech Prep pedagogical guidelines

- Introduction to communications
- Telegraph communication
- Telephone communication
- Speakers and intercom
- Frequency and volume
- Telephone exchange
- Fiber optics, light and laser
- Optical communication
- AM radio transmitter

The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.

TP-3723 – Basic Pneumatics

Objectives

Pneumatics is the engineering field which deals with the flow and pressure of gasses. The TP-3723 Basic Pneumatics course develops student comprehension of the subject of pneumatics, the physical and scientific aspects of pneumatics and their interrelationship with various commonly found technological applications. Students are introduced to pneumatics as a first time experience in the field and use elementary pneumatic components. Industrial applications are demonstrated and explained.

Description

The TP-3723 training system includes two equipment panels which are mounted on a common desktop console. The unit includes various types of pneumatic valves and cylinders, pressure gauges, a flow meter and assorted hoses accessories. All measurements are carried out within the unit.



TP-3723 – Basic Pneumatics Specifications

Technical Characteristics	Learning Program
<ul style="list-style-type: none"> ▪ Pressure regulator ▪ Manual valve (3) ▪ Pressure gauge (2) ▪ One-way flow control (restrictor) valve (2) ▪ Directional control valve; 3/2 muscular spring ▪ Directional control valve; 3/2, mushroom type ▪ Directional control valve; 5/2 air/muscular spring ▪ Flow meter ▪ Single-acting pneumatic cylinder returned by spring ▪ Double-acting pneumatic cylinder ▪ Roller valve; 3/2 (3 pieces) ▪ Air bearing ▪ General dimensions 350 x 455 x 490 mm) ▪ Compressed air supply (minimum pressure: 4 bar; maximum working pressure: 6 bar, maximum pressure: 10 bar; maximum air flow: 10 L/min.) ▪ Quick fitting for main air supply (8x6 mm) 	<p>Tech Prep pedagogical guidelines</p> <ul style="list-style-type: none"> ▪ Introduction to pneumatics ▪ Fluids and energy ▪ The TP-3723 training system ▪ Advanced pneumatic elements 1 ▪ Advanced pneumatic elements 2 ▪ Laboratory activities 1 ▪ Laboratory activities 2 <p>The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.</p>
<p>Supplied Accessories</p> <p>The learning unit is supplied with the following accessories:</p> <ul style="list-style-type: none"> ▪ A set of plastic pneumatic tubes ▪ Fittings ▪ T-connectors ▪ Courseware or soft copy electronic book for MS Windows PC 	<p>Required Accessories</p> <ul style="list-style-type: none"> ▪ Air compressor (one per laboratory, 2.5 HP, 24 liters, 10 bars (not included)

TP-3724 – Basic Hydraulics

Objectives

Hydraulics is the engineering field, which deals with the creation and transfer of mechanical power in pressurized liquids. In the TP-3724-Basic Hydraulics course, students are exposed to various aspects of hydraulics. The TP-3724 course provides the students with an understanding and awareness of uses and applications of hydraulics in the world around them. These include aircraft landing gear, hydraulic lifts, braking systems, etc. Students gain an understanding of the physical and scientific aspects of hydraulics and their relationship with various commonly found technological applications. Elementary hydraulic components are introduced and exercised. Industrial applications are demonstrated and explained.

Description

The TP-3724 training system includes two equipment panels which are mounted on a common desktop console. The unit includes various types of pneumatic valves and cylinders, pressure gauges, a flow meter and assorted hosing accessories. All measurements are carried out within the unit.



TP-3724 – Basic Hydraulics Specifications

Technical Characteristics	Learning Program
<ul style="list-style-type: none"> ▪ Pressure gauge (0 to 12 bar; 2 pieces) ▪ On-off electrical switch (1 piece) ▪ Flow measuring device (1 piece) ▪ Non-return valve (1 piece) ▪ Directional control valve; 5/2 muscular spring (1 piece) ▪ Adjustable restrictor valve (1 piece) ▪ One-way restrictor valve (1 piece) ▪ Single-stage pressure relief valve (1 piece) ▪ Double-acting hydraulic cylinder (2 pieces) ▪ Load spring scale (1 piece) ▪ Roller valve; 5/2 return spring (1 piece) ▪ Manifold (4 outlets) ▪ Hydraulic power unit (located in the power supply base unit) ▪ Oil tank ▪ Hydraulic pump (27V DC 6A) ▪ Pressure regulator (6 to 8 bars) ▪ Oil flow 1.2 liter/minute ▪ General dimensions (455 x 560 x 560 mm) 	<p>Tech Prep pedagogical guidelines</p> <ul style="list-style-type: none"> ▪ Fluid, fluid power, open and closed hydraulic systems ▪ Hydraulic fluid properties ▪ The hydraulic jack ▪ Pressure, force, area, volume, capacity ▪ Hydraulic leverage ▪ Hydraulic components: tank, pump ▪ Valve types in hydraulic systems ▪ The hydraulic actuator ▪ The hydraulic circuit ▪ Directional control valves ▪ Experiments with hydraulic circuits <p>The courseware or e-book contains the essential theory and detailed procedures for each hands-on activity.</p>
<p>Supplied Accessories</p> <p>The learning unit is supplied with the following accessories:</p> <ul style="list-style-type: none"> ▪ A set of hydraulic hoses (with non-return valve quick fittings) ▪ Quick fittings with non-return valves for each component ▪ T-connectors ▪ Courseware or soft copy electronic book for MS Windows PC 	<p>Required Accessories</p> <ul style="list-style-type: none"> ▪ Hydraulic oil (General Motors Dextron II oil, Daimler Benz 236.6 oil or equivalent)

Tech Prep Program

Each Tech Prep training system includes a hardware training station accompanied by computerized courseware and an experiment manual.

Schools may select and build customized technology preparation programs from the following topics and others.

The Tech Prep systems are aimed to teach and for experimentation. A Tech Prep classroom is arranged as a multi-disciplinary laboratory made up of different stations. Students move from workstation to workstation independently.

An option is to organize the laboratories according to themes.

This type of arrangement allows the teacher to introduce a topic and its theory to the group at the beginning of the lesson and sum it up for the entire class at the end of the lesson after completing the experiments.

SES supplies SES Teachers' Textbooks, which include highlighted introductions and summaries.

Room 1 – Green Energy Systems

TP-3701 Solar energy
TP-3702 Wind energy
TP-3703 Hydro-electric energy

All three energy conversion systems have similar components and a similar method of operation and usage.

They can be taught in parallel and the differences between the systems can be highlighted.

The classroom laboratory is generally arranged with one system for two students (for example, a class of 18 students will include three of each system).

Room 2 – Computerized Systems

- TP-3711 Polar robot
- TP-3712 Conveyors and sorting machines
- TP-3713 Cartesian robot and computerized storage

The two robots have the same method of programming and the programming method of the conveyor is only little bit different.

Both robots can be taught in parallel and the differences between the systems are highlighted.

The laboratory is generally arranged with one system for two students (for example, a class of 18 students will include three of each system).

Room 3 – Basic Technologies

- TP-3721 Basic electronics
- TP-3722 Basic communications

Basic electronics and basic communication programs are important to understand the way modern telecommunication systems are built.

These are topics that are not taught in one lesson.

It is recommended to arrange the classroom with one system for every two or three students and to teach the subjects in parallel to the whole class.

SES Training LABs

The training labs are based on learning-by-doing, which makes the students learn more quickly and remember what they have studied by performing practical experiments. They provide the students high profession skills and the knowledge on how to improve their chance of employment and earning capacity.

The manuals and courseware that accompany each course provide the theory background and experiments.

Electronics Training Lab

This modular laboratory is aimed for the **Electronics** profession, but also for technology disciplines that are also based in electronics, such as: **Electricity, Mechanics, Automotive, Robotics, Automation, Process control.**

Autotronics Training Lab

This modular laboratory is aimed for the five stages that comprise the automotive program: **Basic and automotive electronics, Car sub-systems simulators, Car sub-systems demonstrators, Car diagnostic and troubleshooting methods, Troubleshooting faults in a real car.**

Mechatronics Training Lab

This modular laboratory is aimed for the mechatronics program which includes the following disciplines: **Basic electronics, Pneumatics systems, Hydraulics systems, CNC machines.**

Refrigeration and Air-Conditioning Training Lab

The Refrigeration and Air-Conditioning training lab covers actual components and their interconnection, related functions, operation, diagnosis and repair methods through safe, hands-on practical activities.

Technology Preparation Training Lab

The Technology Preparation (Tech Prep) laboratory is a classroom-integrated laboratory consisting of educational modules covering a wide range of subjects such as: **Green energy, Computerized systems, Basic electronics, Basic communication, Mechanical systems.**

Science Training Labs

These laboratories (for primary, secondary and high schools) introduce the students to the computerized sensors world, **nature and industry processes** and **nature laws**. It will help them understand modern technologies such as: **home and medical appliances, wearing sensors, precise agriculture** and more.

Robotics Training Labs

The robotics programs (for primary, secondary and high schools) help students to build innovation and creativity skills. The idea is to make the students understand how systems work, to believe that they can improve them and be able to realize their ideas.

MultiCenter Training Lab

The MultiCenter offers a variety of selected interactive learning environments, with a large range of topics and activities such as: **Science, Technology, Graphic Design, Digital Music, Robotics, Computer Technologies** and much more for all sectors of society, cultures, different socio-economic groups and different age groups – from very young children to senior citizens.



Scientific Educational Systems



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