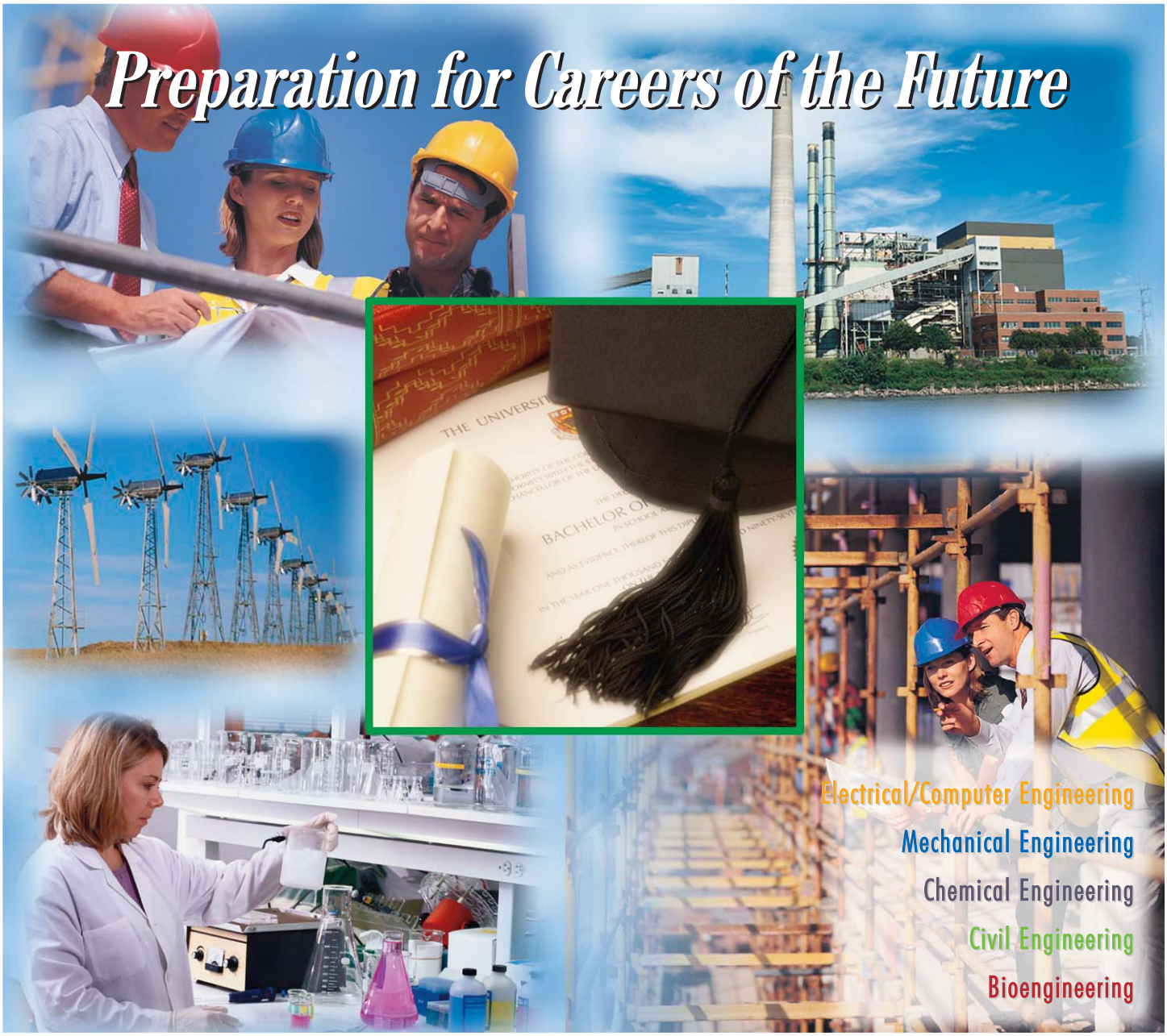
Pre-Engineering Program



Hampden® ENGINEERING CORPORATION

ISO 9001:2015

MADE IN U.S.A.

Pre-Engineering Program

Pre-Engineering Overview

The Hampden Engineering Corporation Pre-Engineering Program was developed specifically to give your students the ability to explore opportunities available in higher education.

The following equipment has been selected for Pre-Engineering applications while also maintaining the structure of real-world industrial design. These characteristics ensure that all your students will receive the maximum educational experience through the use of our equipment. Computer control and data acquisition tools are recommended features of this program.

Learning Modules

Each module contains its own set of objectives with post testing. These pre-engineered courses allow for selection of independent modules without disturbing the integrity of the Pre-Engineering Program. The learning modules covered under the umbrella of pre-engineering are as follows:

Electrical and Computer

- Electrical Engineering and Digital Circuits Program
- Electrical Power Program
- Computer Control Program
- Robotics Program

Mechanical

- Fluidics I Program
- Fluidics II Program
- Kinematics Transfer System
- Thermodynamics Program
- Manufacturing I System
- Manufacturing II System

Chemical

- Chemical Reaction
- Process System Control and Instrumentation

Civil

- Structures Program
- Environmental Program
- Hydrology Program
- Alternative Energy Program
- Fuel Cell
- Quality Control
- Auto Cad

Bioengineering

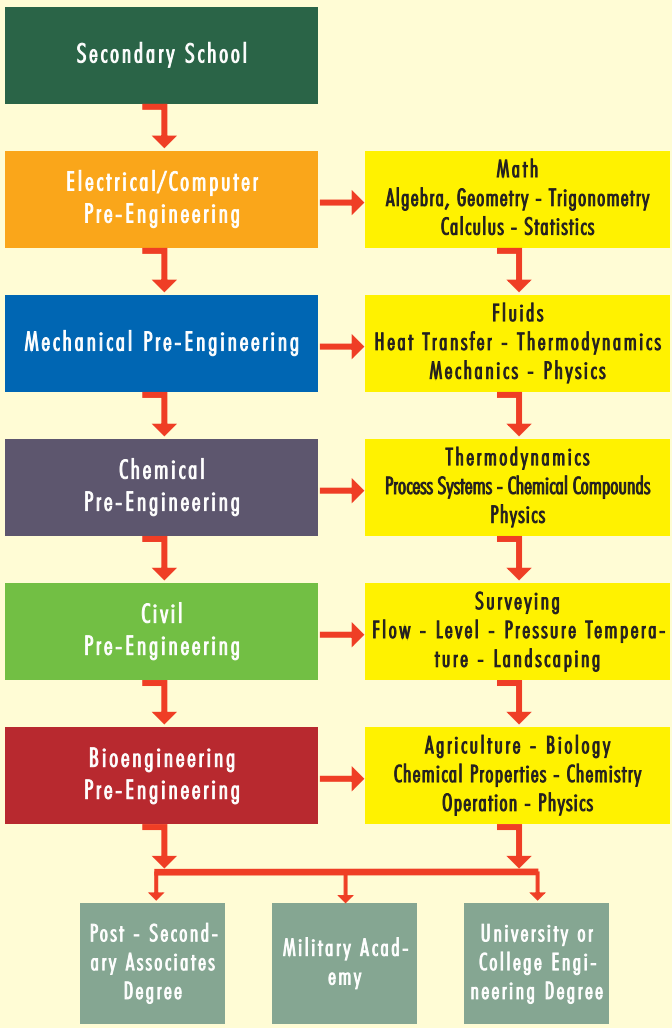
- Instrumentation and Process Control
- Fluids and Hydrostatics

For five decades, Hampden Engineering has been a world leader in the design, manufacture and marketing of quality American made equipment for use in educational, industrial, utility and governmental training facilities.

Hampden Engineering Corporation also provides curriculum for instructor review as well as training workshops for staff and students.

Our representatives and factory engineers are always available to meet with you and discuss your current and future needs.

All Hampden equipment is available for operation on any voltage or frequency



Pre-Engineering Program

Electrical/Computer Pre-Engineering

Hampden's Pre-Engineering Program in Electrical Engineering encompasses a wide range of technologies and prepares students for a career in the diverse fields of Electrical and Computer Engineering. Electrical and Computer Engineers specialize in different areas such as power generation, transmission and distribution, communications and electrical equipment manufacturing as well as, subdivisions of these areas such as robotics and telecommunications.

Electrical/Computer Pre-Engineering Disciplines

Math	*Algebra*
Geometry	*Trigonometry*
Calculus	*Statistics*

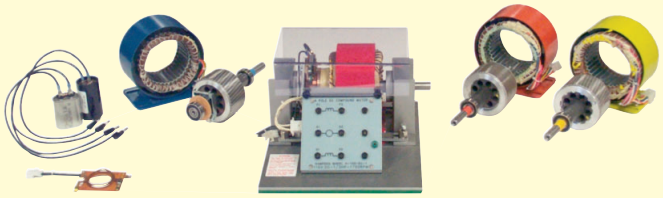
Digital Circuits

- Principles of Electrical/Electronic Components
- Principles of AC/DC Circuits
- Principles in the Use of Test Instruments
- Principles of Circuit Design
- Principles of Diagnostics

MODEL HEE-A Core Segment

Electrical Power

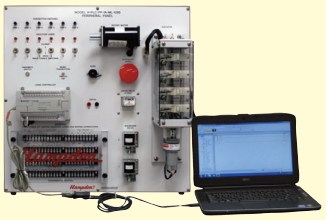
- Principles of Motors
- Principles of Measuring Efficiency
- Principles of Operation
- Principles of Control



MODEL HDI-100
Dissectible Motors include DC and
Single-phase and Three-phase AC in fractional horsepower size

Computer Control

- Principles of Programmable Controls
- Principles of Ladder Diagrams
- Principles of Self Diagnostics
- Principles of I/O Interfacing
- Principles of Applications



MODEL H-PLC-PP-1A-ML-1200
Programmable Logic Control Training System
with RSLogix Micro Software

Robotics

- Principles of Power and Motion by Means of AC/DC Servo Motors
- Principles of Automation
- Principles of Programming
- Principles of I/O Interfacing

MODEL H-MRS-2
Mobile Robotics Systems Trainer

Pre-Engineering Program

Mechanical Pre-Engineering

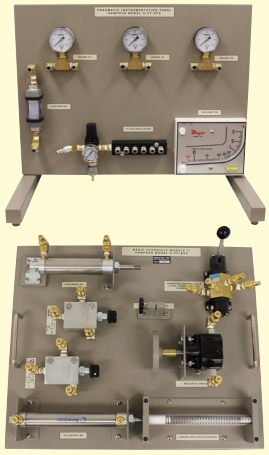
Hampden's Pre-Engineering Program in Mechanical Engineering prepares students for a career in the broadest of all the engineering disciplines. Mechanical Engineers work in many industries and have many specialties, such as: applied mechanics, computer-aided design and manufacturing, energy systems, pressure vessels and piping, and heating, refrigeration, and air conditioning.

Mechanical Pre-Engineering Disciplines

Fluids
Heat Transfer
Thermodynamics
Mechanics
Physics

Fluidics I & II

Principles of Pneumatics
Principles of Pneumatic Design
Principles of Power Transfer through the Media of Air
Principles of Automation
Principles of Hydraulics
Principles of Hydraulic Design
Principles of Power Transfer through the Media of Liquid



MODEL H-FP/BPS - H-FP/BHS
Basic Pneumatics and Hydraulics Systems

Manufacturing I

Principles of Programming, CNC Control and Machining
Principles of Creating Objects from 2D Profiles to Complex 3D Shapes
Principles of Production
Master CAM - Version 6 Software - CAM Systems

CIM-CELL IV CNC Milling Machine

Kinematics

Principles of Mechanical Drives and Linkages
Principles of Tolerance and Alignment
Principles of Mechanical Calculation and Efficiency

MODEL H-MTS-3 Mechanical Transfer System (shown with options)

Thermodynamics

Principles of Refrigeration Systems
Principles of Heat Pump Systems
Principles of Thermodynamics
Principles of Temperature Measurement, Control and Conversion

Model H-ACTK-CTA-BMF
Refrigeration Trainer
with Faults

Manufacturing II

Principles of Programming, CNC Control and Machining
Principles of Manufacturing Basic and Complex Profiles
Principles of Production
Master CAM - Version 6 Software - CAM Systems

CIM-CELL IV CNC Lathe System

PRE-ENGINEERING PROGRAM

CHEMICAL PRE-ENGINEERING

Hampden's Pre-Engineering Program in Chemical Engineering prepares students for a career that includes an understanding of the chemical reactor, the most commonly used and important piece of equipment in a chemical plant. Hampden's Modular Chemical Reactor System permits the student to move from theory to hands-on applications. The student will control the process and measure those variables which control the reactor.

CHEMICAL PRE-ENGINEERING DISCIPLINES

- *Thermodynamics*
- *Biology*
- *Chemistry*
- *Physics*
- *Process Systems*
- *Chemical Compounds*
- *BioChemistry*

PROCESS SYSTEM CONTROL AND INSTRUMENTATION

Principles of Process System Control and Instrumentation

MODEL H-ICS-7627 Modular Instrumention and Controls Modules
(H-ICS-7627-20, H-ICS-7627-10 and H-ICS-7627-60 shown)

CHEMICAL REACTION

Principles of Controlling the Process and Measurement of a Wide Variety of Products

Fundamentals of Process System Control and Instrumentation

MODEL H-6252
Modular Chemical Reactor System

MODEL H-6252-C
Batch Reactor Module

MODEL H-6252-D
Tubular Reactor Module

MODEL H-6252-E
Continuous Stirred Tank
Reactor Module

MODEL H-6252-I
Product Tank Module

MODEL H-6252-J
Product Tank Module

Pre-Engineering Program

Civil Pre-Engineering

Hampden's Pre-Engineering Program in Civil Engineering prepares students for a career in one of the oldest engineering disciplines. Civil Engineering students can choose from many specialties including: structural, water resources, environmental, construction, energy, and transportation.

CIVIL PRE-ENGINEERING DISCIPLINES

Surveying	*Flow*
Level	*Pressure*
Temperature	*Landscaping*
Architecture	*Geology*
Earth Science	

ENVIRONMENTAL

Principles of Land Drainage, Flood Risks, Wells, and Drainage of Lakes or Ponds

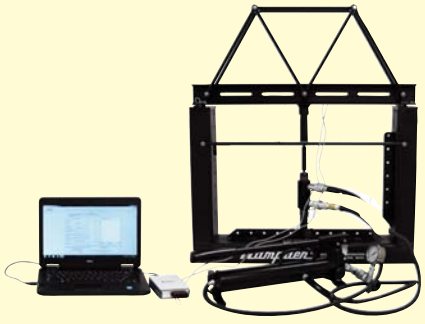
Principles of Level Measurements and Profile Using Sand as a Medium

Principles of Design & Test

MODEL H-6526
Ground Water Flow Tank

STRUCTURES

Principles of Effects of Static and Dynamic Mechanical Loading of Various Engineering Components and Structures such as: beams, simple and complex bridge trusses, cantilever beams and trusses and crane trusses.



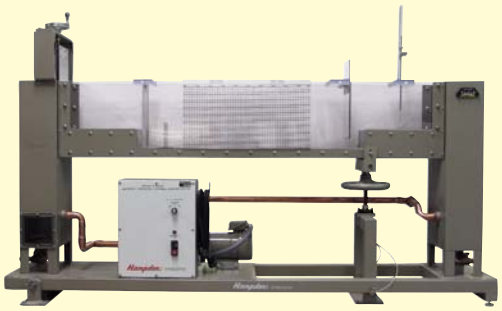
MODEL H-6320-CDL Base shown with optional CDL package & optional Computer

HYDROLOGY

Principles of Suspended Sediment in a Moving Stream and Bed Load Movement

Principles of Controlling Fast Flowing Streams or Slow Moving Rivers

Principles of Design & Test



MODEL H-6523A Sediment Transport Channel Demonstrator

Pre-Engineering Program

Civil Pre-Engineering

ALTERNATIVE ENERGY

Principles of How Wind Generators Function

Principles of Measuring the Efficiency of Wind Generation

MODEL H-WPG-1B Wind Powered Generator

SOLAR POWER

Principles of How Solar Energy Functions as an Alternative Energy Source

Principles of Measuring the Efficiency of Solar Energy

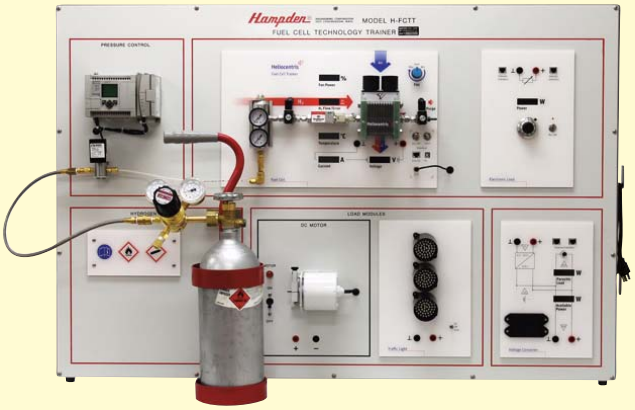
Principles of Converting Radiant Energy into Electrical Energy

Model H-SST-1A Solar System Trainer
(Shown with CDL and FP Options)

FUEL CELLS

Principles of Fuel Cell Systems

Principles of Producing Hydrogen and Oxygen Gases from Electrical Energy



Model FCTT-1 Fuel Cell Technology Trainer

AUTO CAD

Introduction to AutoCAD

Pre-Engineering Program

Bioengineering Pre-Engineering

Hampden's Pre-Engineering Program in Bioengineering prepares students for a career in the broad field of Bioengineering. The Hampden Instrument and Process Control Trainer and Software System provides hands-on training for industrial process automation. The trainer provides measurement and/or control of flow, temperature and level with both internal control and external access.

BIOENGINEERING PRE-ENGINEERING DISCIPLINES

- *Agriculture*
- *Biology*
- *Chemical Properties*
- *Chemistry*
- *Operations*
- *Physics*

FLUIDS AND HYDROSTATICS

Principles of Fluids and Hydrostatics

MODEL H-6535
Hydrostatics Bench

INSTRUMENTATION AND PROCESS CONTROL

Principles of Biotechnology and Bioprocessing

Principles of Measurement, Flow, Temperature and Level with Both Internal and External Controls

MODEL H-ICS-7617
Instrument and Process Control Trainer

PRE-ENGINEERING PROGRAM

CLASSROOM MANAGEMENT

POWERFUL MANAGEMENT TOOLS

Hampden's Classroom Management System, Model H-CMS-1,* provides instructors with the ability to monitor & manage student(s) activities and progress. A wide variety of Hampden training units are supported by the software, making it the most powerful teaching aid available in the classroom today.

Step 1. The instructor develops a database of students.

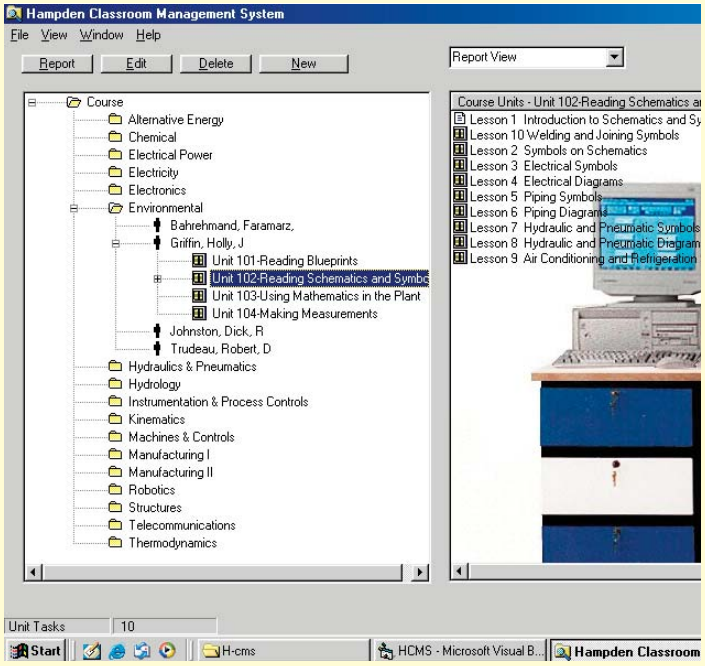
Step 2. Students log in at a PC and choose a task.

Step 3. Students record their progress on the computer, automatically updating the main database.

Step 4. The instructor reviews students' progress through the use of on-screen and printed reports.

The H-CMS-1 program operates on networked or individual computer systems, identifying all classes and student databases as well as providing a fast 'drag & drop' interface for keeping your class and student enrollments up to date.

*Requires Windows® XP OS/Vista/7 (32 bit) on the instructor's PC.



POWERFUL REPORTING CAPABILITY

The H-CMS-1 Classroom Management Windows-Based Software includes one teacher's license, a single-classroom/multiple student license, barcode support, and a user's manual. Management of a multi-disciplinary classroom includes:

- Class/Student Enrollment and Tracking
- Authentic Assessment with Barcode Data Entry
- Class and Student Reports/Analysis

A powerful reporting capability is included which enables teachers to produce:

- Mid/End of Term Reports
- Competency Profiles with Scores
- Student Progress Reports
- List of Competencies for Each Course

CURRICULUM

OPERATION OF A MERCURY BAROMETER

DISCUSSION

A barometer is a device used to measure the pressure of the atmosphere. A conventional mercury-filled barometer consists of a narrow tube that is closed at one end, evacuated, and filled with mercury and inverted as shown in Figure 1-1.

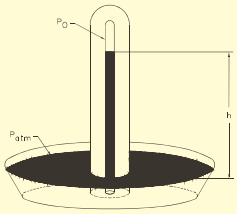


Figure 1-1

The open end is submerged in a reservoir of mercury called the cistern. In a Fortin type barometer, such as the Princo Model 469 (Figure 1-2), the level in the cistern is adjustable. The atmospheric pressure acts on the mercury in the cistern which in turn supports the column of mercury in the narrow tube. The height of the mercury column in the narrow tube is a measure of the pressure acting on the mercury in the cistern.

$$P_{atm} = \rho g h \qquad \text{Eq. 1-1}$$

where $\rho = 13600\ kg/m^3$ (density of mercury)

$g = 9.8\ m/s^2$

$P_{atm} = 101000\ Pa$ (Pa = Pascal or N/m^2)

Substituting these values into Eq. 1-1 and solving for h yields a height of .758 m. or 75.8 cm. or 29.8 in. at normal atmospheric pressure. Most barometers use mercury because the heights are more workable than most other fluids. For instance if water were used for the barometer where $\rho = 1000\ kg/m^3$ the height of the column would be 10.3 m or 33.8 ft. A water barometer would need to be over 10 meters or 34 feet in height to measure normal atmospheric pressure.

REQUIRED MATERIALS

- Hampden H-6535 Hydrostatics Bench
- Nova Barometer (equivalent to Princo Model 469)

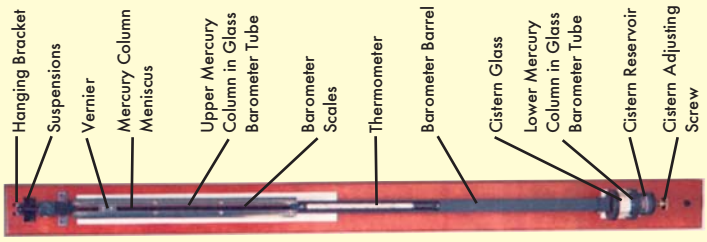


Figure 1-2: Fortin Type Mercurial Barometer

PROCEDURE

Step 1. Adjust the level of mercury in the cistern by turning the cistern adjusting screw until the white pointer just touches the surface of the mercury, causing a small dimple on the surface. The smaller the dimple on the surface of the mercury as viewed thru the cistern glass, the more accurate the reading.

Step 2. Tap the cistern glass and the narrow upper glass barometer tube at the level of the meniscus of the mercury column.

Step 3. Check the level of the meniscus of the mercury column as in Step 1 and readjust if necessary the level of mercury in the cistern.

Step 4. Place the vernier so that the bottom edge appears to be just touching the top of the mercury meniscus.

Step 5. Read the barometer scale directly adjacent to the lower edge of the movable vernier using the vernier scale to estimate the last digit. For example, if the fifth line of the vernier lines up exactly with a line on the main scale, then the estimated last digit should be a five. Record the measured reading.

Step 6. Using a Table for Temperature Correction (English Units and Metric Units), record the temperature correction. Use the thermometer on the Princo Model 469 Barometer. Interpolate when values fall between listed values in the tables. Subtract temperature correction from the observed reading.

Step 7. Using a Gravity Correction Table (Temperature Corrected Barometer Reading), record gravity correction. A map may be required to determine the latitude for your local area. Add or subtract from the temperature corrected reading. This is your local pressure.

Step 8. Use a Barometric Sea Level Differential for Standard Conditions Table to correct the reading to sea level. The values in are based on hypothetical atmospheric conditions whereas the actual differential used by the Weather Service varies with temperature and humidity.

Knowledge of the elevation in your local area is required for this step and can be determined by a topographical map or a survey of your local area. Enter the sea level differential. Add to your local reading.

LAB ACCESSORIES

Hampden can provide all the necessary accessories for your Pre-Engineering laboratory, including: workstations, stools, and computer systems. We offer an assortment of attractive workstations. All components are designed and installed at our factory to match your curriculum. Also available is a variety of drafting stools and desk chairs. Hampden's computer system is American-made, fast, rugged, and expandable, built to stand-up to the heavy demands of an educational environment.

WORKSTATIONS

262-15S Student Work Bench with SP3S-A208G Pedestal
Outlet and single lockable storage drawer

H-4KH38 Stools

COMPUTERS

H-CS Core 3 Base Computer System

H-LTCS Laptop Computer System

Pre-Engineering Program

LOOK TO HAMPDEN ENGINEERING FOR ALL YOUR ENGINEERING TRAINING NEEDS!

Hampden Engineering is a world leader in the design and development of engineering training systems for universities, colleges, and technical institutes. Since 1954, Hampden has supplied state-of-the-art equipment to engineering schools throughout the United States and in more than 50 countries worldwide.

Hampden offers complete hardware and software for engineering training at all levels of complexity. Its comprehensive engineering equipment solutions address a range of engineering disciplines, including: Electrical, Computer, Mechanical, Civil, Chemical, and Bioengineering. Hampden continues to develop and introduce new products in response to technological needs.

Hampden's success in hands-on engineering training is grounded in the philosophy of Real World Trainers = Real Training. Hampden's personnel bring real-world experience in both engineering and training. The result is the best in engineering training systems, coupling in-depth engineering expertise with hands-on, real-world training.

Hampden is committed to providing industry-leading technology.

For the latest from Hampden, visit our home page at http://www.hampden.com or e-mail us at sales@hampden.com

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