

# Comprehensive Career Program

Educational Training Equipment for the 21st Century

Bulletin 285D

## Purpose

The Hampden Comprehensive Career Program is designed to provide students planning careers in electronics with a solid foundation in the practical applications of electrical and electronic circuits and devices. Topics include everything from Ohm's law, motors, and vacuum tubes through latest state-of-the-art devices such as MOSFETs, digital logic gates and operational amplifiers.

A total of 189 topics are contained in five experiment manuals, providing maximum flexibility in establishing the electronic curriculum to meet a variety of career objectives. The hardware consists of discrete components integrated circuits, and printed circuit boards, utilizing Velcro work surfaces and snap connectors.

## Description

The Hampden Comprehensive Career Program consists of five segments which may be sequenced in a dozen different ways to produce the type and extent of electronics career preparation desired. Individual segments may be purchased separately or in any combination. The five segments are as follows:

- (1) **H-CCP-B:** Basic Electricity/Electronics, including Ohm's law, magnetism, motors, diodes, transistors, etc.
- (2) **H-CCP-C:** Fundamental Consumer Electronics, including transformers, capacitors, inductors, filters, amplifiers, etc.
- (3) **H-CCP-C2:** Advanced Consumer Electronics, including vacuum tubes, JFETs, MOSFETs, super heterodyne radio, etc.
- (4) **H-CCP-I:** Fundamental Industrial Electronics, including power factor, multivibrators, UJTs, photocells, etc.
- (5) **H-CCP-12:** Advanced Industrial Electronics, including SCRs, Diacs, Triacs, digital logic gates, operational amplifiers, etc.



### H-CCP-B: Basic Program Topics

1. Introduction to Laboratory Experimentation
2. Techniques of Preparing Laboratory Reports
3. Switching Devices and Circuits
4. Measuring Electrical Phenomena
5. Solid State Volt-Ohm-Milliammeter
6. Creation of Electrical Energy
7. Practical Uses of Electricity
8. Voltage, Current, Resistance - Ohm's Law
9. Series Circuits
10. Parallel Circuits
11. Series- Parallel Circuits
12. Kirchhoff's Voltage Law
13. Kirchhoff's Voltage Law - Two Sources
14. Kirchhoff's Current Law
15. Kirchhoff's Current Law - Two Sources
16. Potentiometers
17. Rheostats
18. Voltage Dividers - Unloaded
19. Voltage Dividers - Loaded
20. DC Ammeter Shunts
21. DC Voltmeter Multipliers
22. Ohmmeters
23. Balanced Bridge Circuits
24. Superposition Theorem
25. Thevenin's Theorem
26. Norton's Theorem
27. Power Transformer
28. Magnetism and Magnets
29. Electromechanical Relays
30. Permanent Magnet DC Motors and Generators
31. Introduction to the Oscilloscope
32. Comparison of Alternating and Direct Current
33. Semiconductor Diodes
34. Full-Wave and Half-Wave Rectifiers
35. Bipolar Transistors
36. Transistor Testing
37. Transistor Control Circuits

### H-CCP-C: Fundamental Consumer Program Topics

1. Triggered Oscilloscope / AF Generator
2. Oscilloscope Voltage Measurements
3. Lissajous Patterns
4. Inductance and Inductance Reactance
5. Measuring Phase Angle by Lissajous
6. Transformers
7. Capacitors and Capacitance
8. RC time Constants
9. Capacitive Reactance
10. Phase Shift Caused by Capacitance
11. Capacitances in Series and Parallel
12. Capacitive Voltage Dividers
13. Impedance of a Series RL Circuit
14. Volt. Relationships/Series RL Circuit
15. Impedance of a Series RC Circuit
16. Voltage Relationships/Series RC Circuit
17. Frequency Response - Reactive Circuit
18. Impedance of a Series RLC Circuit
19. Effect of Frequency - Series RLC Circuit
20. Impedance of a Parallel RL/RC Circuit
21. Series Resonant Circuit
22. Parallel Resonant Circuit
23. High-Pass and Low-Pass Filters
24. Phase Shifting Networks
25. Diode Clippers
26. Zener Diodes
27. Zener Diode Clipper and Wave Shaper
28. Diode Limiter and Clamper
29. Half - Wave and Full - Wave Rectifiers
30. Transformer Power Supply and Filter
31. Power Supply Troubleshooting
32. The Voltage Doubler
33. Transistor Familiarization
34. Current Gain - Common Emitter Amplifier
35. Characteristic Curves for CE Circuit
36. CE Amplifier Biasing and Gain
37. CE Impedance Power and Phase Relationships
38. Troubleshooting a CE Amplifier
39. Emitter Follower
40. Cascaded Transistor Amplifier

All Hampden units are available for operation at any voltage or frequency

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## H-CCP-C2: Advanced Consumer Program

1. Vacuum Tube Diodes
2. Vacuum Tube Triodes
3. Vacuum Tube Class A Amplifier
4. Vacuum Tube Cathode Bias
5. Transistor Hartley Oscillator
6. Transistor Phase Shift Oscillator
7. Transistor Class A Audio Power Amplifier
8. Push-Pull Power Amplifier
9. Complementary-Symmetry Push-Pull Amplifier
10. Frequency Response of an Audio Amplifier
11. Troubleshooting an Audio Amplifier
12. Integrated Circuit Audio Amplifier
13. Junction Field Effect Transistor (JFET)
14. JFET DC Characteristics and Load Lines
15. JFET Biasing and AC Signal Amplification
16. JFET Voltage Amplifier
17. JFET Common-Source Amplifier
18. JFET Common-Drain Amplifier
19. JFET Common-Gate Amplifier
20. Feedback Principles
21. MOSFET Common-Source Amplifier
22. Dual-Gate MOSFET
23. MOSFET Armstrong Oscillator
24. MOSFET Hartley Oscillator
25. MOSFET Colpitts Oscillator
26. MOSFET Phase Shift Oscillator
27. RF Signal Generator
28. RF Amplifier
29. Amplitude Modulation
30. Transmitting Antenna
31. Superheterodyne Detector and AVC Stage
32. Superheterodyne IF Stage
33. Superheterodyne Detection and IF Amplification
34. Superheterodyne Converter Stage
35. Superheterodyne Receiver Alignment
36. Superheterodyne Receiver Troubleshooting

## H-CCP-I: Basic Industrial Program

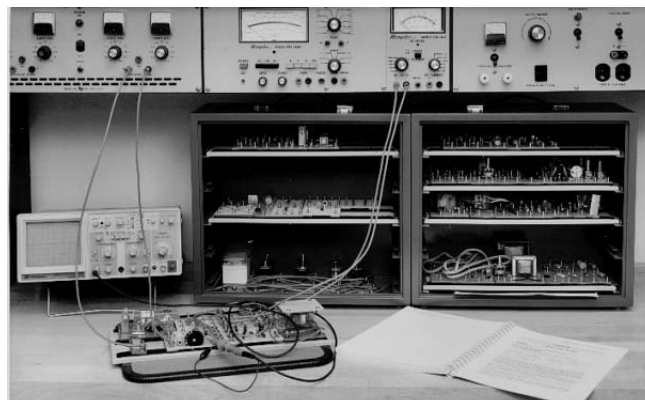
1. Inductors and Inductance
2. Transformers
3. Inductive Reactance and Impedance
4. Power Factor
5. Capacitors and Capacitance
6. Capacitors in Series and Parallel
7. Capacitive Reactance and Impedance
8. Impedance of Series RLC Circuits
9. Impedance of Parallel RL and RC Circuits
10. Impedance of Parallel RLC Circuits
11. R/L and RC Time Constants

12. Measurement of RC Time Constants
13. Neon Glow Lamps
14. Thermistors
15. Varistors
16. Superimposing AC on DC
17. Steering Diodes and Diode Clippers
18. Diode Limiters and Clampers
19. Zener Diodes
20. Zener Diode Regulators
21. Transistors
22. Common Emitter Amplifier
23. Transistor Time Delay
24. Transistor Squaring Circuits
25. Transistor Shunt Voltage Regulator
26. Transistor Series Voltage Regulator
27. Astable (Free Running) Multivibrator
28. Bistable Multivibrator (Flip-Flop)
29. Monostable (One Shot) Multivibrator
30. Common Base Amplifier
31. Emitter Follower (Common Collector) Amplifier
32. Darlington Pair
33. Differential Amplifier
34. Unijunction Transistor (UJT)
35. UJT Relaxation Oscillator
36. Photoconductive Cell

## H-CCP-I2: Advanced Industrial Program

1. Silicon Controlled Rectifier (SCR)
2. The SCR As a Static Switch
3. SCR Triggering Methods
4. SCR Control Circuits
5. UJT-Triggered SCR
6. Triac Static Switch
7. Diac Operation
8. Diac-Triac Phase Control
9. UJT-SCR Heat Control

10. UJT Timer
11. Integrated Circuit Timer
12. Light-Emitting Diodes
13. Diode Digital Logic Gates
14. Transistor Logic Gates
15. IC Quad Two-Input NAND
16. IC Logic Gates
17. J-K Flip-Flop
18. Binary Counter
19. Decade Counter
20. Operational Amplifier (Op-Amp)
21. Inverting Amplifier
22. Noninverting Amplifier
23. Summing Amplifier
24. Differential Amplifier
25. Variable Gain Amplifier
26. Buffer/Follower
27. Sign Changer
28. Current Source
29. Integrator
30. Practical Differentiator
31. Zero-Crossing Detector
32. Limiting Amplifier
33. Comparator
34. Absolute Value Circuit
35. Astable Multivibrator
36. Monostable Multivibrator
37. Bistable Multivibrator
38. Sawtooth Generator
39. Staircase Generator
40. Pulse Width Modulator



Typical CCP Experiment utilizing components from the H-CCP-2 Program.

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