

# GPTC BAS PROGRAM CORE COMPETENCIES



**National Science Foundation**  
**Advanced Technological Education**  
**B.E.S.T. Center Winter Workshop 2013**



# COLLEGE-LEVEL COMPETENCIES

Georgia Piedmont Technical College identifies College-level Core Competencies expected of graduates. These Core Competencies are embedded and assessed throughout and within programs of study and courses in the Division of General Studies.

## Effective Communication

- Demonstrate an ability to read and listen with comprehension
- Speak and write clearly using Standard English
- Interact cooperatively with others using both verbal and non-verbal means
- Demonstrate information processing through basic computer skills

## Analytical Competencies

- Analyze information and/or data into systematic parts
- Identify relationships between concepts and put them in logical and/or sequential order
- Demonstrate an ability to organize and integrate information from different sources
- Draw logical conclusions based on analysis of data and information
- Make connections and logical conclusions in learning across disciplines

## Independent Learning

- Use appropriate search strategies and resources to find, evaluate, and use information
- Apply learning in academic, public, and personal situations

## Informational Literacy

- Identify and refine information for investigation and query
- Evaluate information from different possible sources on the basis of accuracy, validity, and appropriateness for needs
- Extract relevant information from a source

# BAS PROGRAM CORE COMPETENCIES

Demonstrate the ability to correctly and safely install control devices	BUAS 2030
Effectively troubleshoot control device problems	BUAS 2020
Develop a control system database	BUAS 2040
Interpret construction drawings and specifications	BUAS 2030
Develop a controls submittal based on plans and specs	BUAS 2030
Interpret and analyze complex schematic and pictorial diagrams	BUAS 2020
Install network cabling to support control system communication	BUAS 1050
Build a complex control panel consisting of relays, controllers, and various control devices	BUAS 2020
Terminate all standard input/output types to a building automation system	BUAS 1040
Properly tune a proportional/integral controller loop	BUAS 2010
Exhibit effective oral and written communications	ALL COURSES
Identify and classify commonly-used building automation devices	BUAS 1040

# **BAS PROGRAM CORE COMPETENCIES**

## **General Studies Courses (Review)**

### **Diploma Option**

COMP1000(3): Introduction to Computers  
COLL 1500(1): Strategies for Student Success  
EMPL 1000(2): Interpersonal Relations  
& Professional Develop.  
ENGL 1010(3): Fundamentals of English I  
MATH 1013(3): Algebraic Concepts

### **Degree Option**

COMP1000(3): Introduction to Computers  
COLL 1500(1): Strategies for Student Success  
ENGL 1101(3): Composition & Rhetoric  
HUMN 1101(3): Introduction to Humanities  
MATH 1111(3): College Algebra  
MATH 1113(3): Pre-Calculus  
XXXX XXX(3): Social Science Elective

# **BAS PROGRAM CORE COMPETENCIES**

## **Core Courses (Review)**

### **Diploma Option**

AIRC 1005(4): Refrigeration Fundamentals  
AIRC 1010(4): Refrig. Principles & Practices  
AIRC 1020(4): Refrig. Systems Components  
BUAS 1010(2): BAS Fundamentals  
BUAS 1020(3): BAS Electrical Concepts I  
BUAS 1030(3): BAS Electrical Concepts II  
BUAS 1040(3): BAS Devices  
BUAS 1050(3): BAS Network Architecture  
BUAS 1060(3): BAS Advanced Elec. Concepts  
BUAS 2010(3): BAS Comm. HVAC/R & Ctrls  
BUAS 2020(3): BAS Logic & Programming  
BUAS 2030(4): BAS Design & Installation

### **Degree Option**

AIRC 1005(4): Refrigeration Fundamentals  
AIRC 1010(4): Refrig. Principles & Practices  
AIRC 1020(4): Refrig. Systems Components  
BUAS 1010(2): BAS Fundamentals  
BUAS 1020(3): BAS Electrical Concepts I  
BUAS 1030(3): BAS Electrical Concepts II  
BUAS 1040(3): BAS Devices  
BUAS 1050(3): BAS Network Architecture  
BUAS 1060(3): BAS Advanced Elec. Concepts  
BUAS 2010(3): BAS Comm. HVAC/R & Ctrls  
BUAS 2020(3): BAS Logic & Programming  
BUAS 2030(4): BAS Design & Installation  
BUAS 2040(5): BAS Integration  
BUAS 2050(5): BAS Internship

# **BAS PROGRAM CORE COMPETENCIES**

## **General Studies Courses for A.A.S. Degree**

### **Courses**

COMP1000(3): Introduction to Computers  
COLL 1500(1): Strategies for Student Success  
ENGL 1101(3): Composition & Rhetoric  
HUMN 1101(3): Introduction to Humanities  
MATH 1111(3): College Algebra  
XXXX XXX(3): Social Science Elective

### **Why?**

Required for A.A.S.  
Required for A.A.S.  
Required for A.A.S.  
Required for A.A.S.  
Required for A.A.S.  
Required for A.A.S.

**MATH 1113(3): Pre-Calculus**

**Specifically Selected**

# **BAS PROGRAM CORE COMPETENCIES**

## **Core Courses for A.A.S. Degree**

### **Courses**

**AIRC 1005(4): Refrigeration Fundamentals**

**AIRC 1010(4): Refrig. Principles & Practices**

**AIRC 1020(4): Refrig. Systems Components**

**BUAS 1010(2): BAS Fundamentals**

**BUAS 1020(3): BAS Electrical Concepts I**

**BUAS 1030(3): BAS Electrical Concepts II**

**BUAS 1040(3): BAS Devices**

**BUAS 1050(3): BAS Network Architecture**

**BUAS 1060(3): BAS Advanced Elec. Concepts**

**BUAS 2010(3): BAS Comm. HVAC/R & Ctrl's**

**BUAS 2020(3): BAS Logic & Programming**

**BUAS 2030(4): BAS Design & Installation**

**BUAS 2040(5): BAS Integration**

**BUAS 2050(5): BAS Internship**

### **Why?**

**Refrigeration fundamentals**

**Use of gauges / Brazing**

**Understanding of components /  
EPA certification prep.**

**Careers in BAS / I/O basics**

**Electrical introduction / I/O ckts.**

**Electrical intro. / Motors**

**Intro. to BAS devices / suppliers**

**IT fundamentals / Network +**

**Reactive ckts / power analysis /  
troubleshooting / oscilloscopes**

**Comm. Systems / Ctrl. Theory**

**Logic / ALICE / Java**

**Hands-on installation & design**

**Lon / BACnet / Modbus / Niagara**

**On-the job training**

# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Fundamentals - BUAS 1010** **Competencies**

- History of BAS industry
- Scope of BAS industry
- Categories of commercial building systems
- Contracting basics
- Types of companies in BAS (contractors / OEMs / suppliers / etc.)
- Career pathways in BAS
- Skills sets required for BAS pathways
- Intro to BAS I/O
- Hierarchy of BAS controls
- BAS architecture diagrams
- Trends in BAS



# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Electrical Concepts I - BUAS 1020** **Competencies**

- Metric units
- Scientific notation
- Atomic theory
- Charge
- Voltage / Current / Resistance / Ohm's Law
- Conductors / Insulators
- Basic electrical circuits
- Electrical safety
- Electrical measurement devices
- Series circuits
- Parallel circuits
- Series / Parallel circuits
- Electrical Energy
- Electrical Power

# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Electrical Concepts II - BUAS 1030 Competencies**

- Power supplies
- Reactive electrical component introduction
- Power distribution
- Circuit protection
- Electric motor theory
- Electric generator theory
- Types of electric motors
- Motor starters
- Switching devices
- Electrical symbols
- Pictorial diagrams
- Schematics
- Sequences of operation

# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Devices - BUAS 1040**

### **Competencies**

- Standard Input & Output wiring
- Temperature devices
- Humidity devices
- Pressure devices
- Flow devices
- Life & Equipment safety devices
- Actuators & dampers
- Control valves
- Power supplies
- Transducers
- Relays & Contactors
- Motor controls
- Enclosures
- Power monitoring devices

# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Networking - BUAS 1050**

### **Competencies**

- Network fundamentals
- Standards organizations
- OSI model
- Internet Protocol
- Network signal transmission
- Network media
- Cabling standards
- Protocols
- Physical topologies
- Logical topologies
- Network hardware
- BAS network types & application

# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Advanced Electrical - BUAS 1060** **Competencies**

- Voltage dividers
- DC voltage & current sources
- Simplification theorems
- AC current & voltage
- Oscilloscope fundamentals
- Reactive components
- Reactive circuits
- Basic filters
- Electrical assessment tools
- Ladder logic
- Shop drawings
- Microsoft Visio fundamentals

# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Comm. HVAC & Ctrls - BUAS 2010 Competencies**

- Psychrometrics
- All-air systems
- All-water systems
- Air & Water systems
- Boiler principles & types
- Chiller principles & types
- Water-side devices
- Air-side devices
- Control theory
- Control systems standards
- Applied control theory
- Control loop theory (PID)
- Control loop application

# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Logic & Programming - BUAS 2020 Competencies**

- History of logic
- Logical form
- Truth tables
- Boolean expressions
- Combinational Boolean logic
- Digital logic circuits & application
- Programming introduction
- Common elements of programming languages
- Object-oriented programming
- Data types
- Programming style
- Decision-making in programs / conditionals
- Modular design

# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Design & Installation- BUAS 2030 Competencies**

- BAS Contracting
- NEC code
- Control system design process
- Device selection
- Control system installation
- Installation tools & devices
- Conduit bending
- Cable pulling
- Control system praxis – Design, install, commission a control system



# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Integration - BUAS 2040 Competencies**

- OSI Model review
- TCP / IP review
- Network packets
- Modbus
- LonWorks
- BACnet
- Niagara platform

# **BAS PROGRAM CORE COMPETENCIES**

## **BAS Internship - BUAS 2050** **Competencies**

- Field training

# MATERIALS OF GPTC BUAS PROGRAM

<i>BAS Course (Cr. Hrs. / CRN #)</i>	<i>Textbook Title</i>	<i>ISBN 13#</i>	<i>Author / Publisher</i>
<b>BUAS 1010 (2 / 48936)</b> <b>BAS Fundamentals</b>	Materials Provided		
<b>BUAS 1020 (3 / 48937)</b> <b>BAS Electrical Concepts I</b>	"AC/DC Principles" "AC/DC Principles Workbook" "Troubleshooting Elect. Systems"	978-0-8269-1350-0 978-0-8269-1351-7 978-0-8269-1791-1	Paul T. Shultz / ATP ATP Staff Mazur & Proctor / ATP
<b>BUAS 1030 (3 / 48938)</b> <b>BAS Electrical Concepts II</b>	"AC/DC Principles" "AC/DC Principles Workbook" "Troubleshooting Elect. Systems"	978-0-8269-1350-0 978-0-8269-1351-7 978-0-8269-1791-1	Paul T. Shultz / ATP ATP Staff Mazur & Proctor / ATP
<b>BUAS 1040 (3 / 48939)</b> <b>BAS Devices</b>	Materials Provided		
<b>BUAS 1050 (3 / none yet)</b> <b>BAS Network Architecture</b>	"CompTIA Network+ 2009"	978-1-59863-878-3	Dean / Cengage Learning
<b>BUAS 1060 (3 / 48940)</b> <b>BAS Adv. Electrical Concepts</b>	"AC/DC Principles" "AC/DC Principles Workbook" "Troubleshooting Elect. Systems" "Industrial Electrical Troubleshooting"	978-0-8269-1350-0 978-0-8269-1351-7 978-0-8269-1791-1 978-0-7668-0603-0	Paul T. Shultz / ATP ATP Staff Mazur & Proctor / ATP Lundquist / Delmar
<b>BUAS 2010 (3 / 48941)</b> <b>BAS Commercial HVAC Systems &amp; Controls</b>	"Mech. & Elect. Equip. for Buildings, 2e" "HVAC Control Systems" "HVAC Ctrl Systems Wrkbk" Building Automation Control Devices & Applications	978-0-470-19565-9 978-0-8269-0757-8 978-0-8269-0758-5 978-0-8269-2000-3	Stein / Wiley Auvil / ATP Auvil / ATP NJATC / ATP
<b>BUAS 2020 (4 / 48942)</b> <b>BAS Logic &amp; Programming</b>	"Starting out with Alice, 2e" "Starting out with Java, 4e"	978-0-321-54587-9 978-0-13-608020-6	Gaddis / Addison-Wesley Gaddis / Addison-Wesley
<b>BUAS 2030 (4 / 48943)</b> <b>BAS Design &amp; Installation</b>	"NEC 2011 Handbook" "Comm. & Ind. Wiring" "Ugly's Elect. Ref. 2011" "Ugly's Elect. Safety & NFPA 70E" "Ugly's Elect. Motors & Controls" "Ugly's Conduit Bending"	978-0-8776-5916-7 978-0-8269-2075-1 978-0-7637-9099-8 978-0-7637-6855-3 978-0-7637-7254-3 978-0-7637-8314-3	Early & Sargent / NFPA Barnett / ATP Jones & Bartlett Publishers Jones & Bartlett Publishers Jones & Bartlett Publishers Stanfield / Jones & Bartlett
<b>BUAS 2040 (5 / 48944)</b> <b>BAS Integration</b>	Building Automation System Integration with Open Protocols	978-0-8269-2012-6	NJATC / ATP
<b>BUAS 2050 (5 / 48945)</b> <b>BAS Internship</b>	No textbook required		

# BEST Center Curricula, Resources & Recordings

## Academic Programs

Georgia Piedmont Technical College - Building Automation Systems

Milwaukee Area Technical College - Sustainable Facilities Operations

Laney College - Commercial HVAC Systems

City College San Francisco - Commercial Building Energy Analysis & Audits

## Professional Development Materials, Presentations & Videos

National Institutes

Building Automation Systems Instructor Workshops

Webinars (e.g., BEST Talks)

## Faculty Profile Videos

## Reports & Case Studies

## Marketing Resources

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