

## Course Number and Title: NRG 253 BAS Capstone

**Campus Location:**

Georgetown, Dover, Stanton

**Effective Date:**

2021-51

**Prerequisite:**

ENG 101, NRG 226, NRG 245, NRG 233 or concurrent

**Co-Requisites:**

none

**Course Credits and Hours:**

3.00 credits

2.00 lecture hours/week

4.00 lab hours/week

**Course Description:**

In this course, students assemble and program a control system for a building central station variable volume air handler and associated components to be integrated into the construction of other building systems. Emphasis is placed on safety, field documentation, project commissioning, and measurement and verification procedures.

**Required Text(s):**

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

**Additional Materials:**

None

**Schedule Type:**

Classroom Course

**Disclaimer:**

None

**Core Course Performance Objectives (CCPOs):**

1. Engage in and demonstrate professional and ethical behavior. (CCC 1, 3, 4; PGC 1, 2, 3, 4, 5, 6, 7)
2. Assemble a control system to operate central station HVAC equipment and components. (CCC 2, 3, 5, 6; PGC 5, 6)
3. Program controllers to operate an HVAC system in accordance with specified sequences. (CCC 2, 3, 5, 6; PGC 5, 6)
4. Integrate building systems for effective operation. (CCC 2, 3, 6, 7; PGC 5, 6, 7)
5. Generate construction and commissioning documents to reflect changes from design conditions. (CCC 1, 3, 5; PGC BAS 1, 2, 3, 4, 7)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

### Measurable Performance Objectives (MPOs):

Upon completion of this course, the student will:

1. Engage in and demonstrate professional and ethical behavior.
  1. Demonstrate punctuality when attending class, participating in off-site projects, and submitting assignments.
  2. Communicate using industry-appropriate language during presentations, reports, and homework.
  3. Demonstrate appropriate professional behavior when working with others.
  4. Use professional and ethical behavior to train personnel on the operation and maintenance of the system.
  5. Discuss sound customer service skills and teamwork.
2. Assemble a control system to operate central station HVAC equipment and components.
  1. Select and install appropriate sensors for each application.
  2. Select and install appropriate actuators for each application.
  3. Use proper techniques to connect power supply, inputs, and outputs in the control panel.
  4. Configure and label control panel to meet contract specifications.
  5. Perform point-to-point system commissioning for each control panel and device.
3. Program controllers to operate an HVAC system in accordance with specified sequences.
  1. Create a programming sequence for the operation of each system.
  2. Create an occupancy schedule for the system.
  3. Configure alarms in accordance with contractual requirements and Building Automation and Control Network (BACnet) standards.
  4. Perform trend analysis to comply with commissioning requirements.
  5. Install program(s) for each system, and confirm correct operational sequence of equipment.
  6. Perform loop tuning and calibration actions as necessary to minimize or eliminate control deviations.
  7. Install graphics to meet contractual requirements.
4. Integrate building systems for effective operation.
  1. Integrate a smart device such as a utility meter, chiller control, or frequency drive into the building system.
  2. Integrate the fire alarm panel into the control system, and graphically display the status.
  3. Integrate building lighting controls into the system.
  4. Graphically display security conditions and occupancy.
  5. Set up a web-based platform for computer access to the control system.
5. Generate construction and commissioning documents to reflect changes from design conditions.
  1. Create an accurate wiring diagram for each control panel.
  2. Label components in accordance with construction documents and commissioning requirements.
  3. Coordinate activities with the commissioning agent to accomplish commissioning milestones.
  4. Create as-built drawing for the projects.

### Evaluation Criteria/Policies:

The grade will be determined using the Delaware Tech grading system:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
0	-	69	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

### Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

### Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Utilize building system and energy technology hardware and software to gather data on building lighting systems operation and energy consumption.
2. Utilize building system and energy technology hardware and software to gather data on heating,
3. Evaluate commercial buildings and make recommendations for optimized building performance and occupant comfort.
4. Prepare and present technical reports.
5. Assemble, install, service, and repair direct digital controls (DDC) for building electrical and mechanical systems.
6. Program and explain operational sequences for building equipment and systems.
7. Integrate and commission building systems and components to ensure reliable performance and compliance with building codes.

**Disabilities Support Statement:**

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.