RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE

CEMT 203 – Building Automation I

I. Basic Course Information

A. Course Number and Title: CEMT 203 – Building Automation I

B. New or Modified: Modified

C. Date of Proposal: Fall 2017

D. Effective Term: Fall 2018

E. Sponsoring Departments: Business and Public Service Department

F. Semester Credit Hours: 4

G. Weekly Contact Hours: 6
Lecture: 3
Laboratory: 3
Out of class work per week: 7.5 hours

H. Prerequisites/Corequisites:
ECTC 102 – Air Conditioning Systems Design
ECTC 103 – Electricity for Environmental Control I
ECTC 104 – Electricity for Environmental Control II
ECTC 202 – Heating Systems Design

I. Laboratory Fees: Yes

J. Name and Telephone Number or e-mail Address of Department Chair and Divisional Dean at time of approval: Anne Marie Anderson, AnneMarie.Anderson@raritanval.edu
Terence Lynn, Terence.Lynn@raritanval.edu

II. Catalog Description

Prerequisites: ECTC 102 – Air Conditioning Systems Design; ECTC 103 – Electricity for Environmental Control I; ECTC 104 – Electricity for Environmental Control II; ECTC 202 – Heating Systems Design.
This is the first of two advanced courses on building automation for students in the Commercial Energy Management Technology field. Recent emphasis on increased energy efficiency and occupant comfort, in particular on commercial buildings, has given way to the development of technologies that allow for smart communication amongst various building systems such as HVAC, Lighting, Fire Prevention and Occupant Security/Safety. Networked building automation has become a field in high demand because it allows for precise and reliable

communication between control devices, whether they are from the same or different manufacturers.

This course starts with a review of the fundamentals of Automatic Control: control loops, control points, control responses, HVAC equipment automation options and the classification of building automation systems. It then continues with an overview of wired and wireless networking: the OSI model, Ethernet networks, network Architectures, client versus server computers and their associated control systems, system security, diagnosing and troubleshooting.

III. Statement of Course Need

A. Technicians in the Commercial Energy Management Technology field have very important roles to play in society. This course is vital for all students wanting to become a building automation applications engineer, programmer, service technician, new construction technician, new construction sales associate, project engineer or project manager. Employment opportunities in building automation technology exist with HVAC controls companies, physical plant departments in colleges, universities, hospitals, government buildings, as well as commercial and industrial facilities.

B. Extensive hands-on work in the form of computer-based and field-related activities is necessary to develop sufficient technical know-how in students. This acquired knowledge will help them better understand how web-based system controllers and their networked equipment operate. Lab activities include, but are not limited to: field trips around campus to familiarize the student with control panels and the equipment they control, in-class lab work on hardware setup, physical connections, IP addressing, ARC156 and MS/TP networks. Basic micro-block programming will also be introduced in this course.

C. This course generally transfers as a free elective, but may transfer as a program Elective to Pennsylvania College of Technology for those students graduating with the AAS in Commercial Energy Management who are interested in pursuing B.S. degree at that institution.

IV. Place of Course in College Curriculum

A. Free elective

B. This course meets a program requirement for the A.A.S. Commercial Energy Management Technology Program, and the Commercial Energy Management Technology Certificate.

C. Course transferability: a) for New Jersey schools, go to the NJ Transfer website, www.njtransfer.org; b) For all other colleges and universities go to their individual sites.

V. Outline of Course Content

A. Fundamentals of Automatic Control
   Control loops, Types of Control Action, Controller Technologies
B. Automatic Control of HVAC Systems
   Unit-level Control, System-level Control, System Optimization, Failure Recovery
C. Building Automation Systems
D. Interoperability
E. Networking Overview
   History of Networking, the OSI Model, Ethernet Networks
F. Network Architectures
G. Clients and Servers
   HVAC Control-System Computers, Software, Security, Troubleshooting
H. Wireless Networking
I. Diagnosing and Troubleshooting
   Hardware Tools, Software Tools
J. Basic micro-block based programming

VI. General Education and Course Learning Outcomes

A. General Education Learning Outcomes

At the completion of the course, students will be able to:

1. Explain the difference between the various network protocols. (GE - NJ 1).
2. Wire networked components (GE - NJ 4).

B. Course Learning Outcomes

At the completion of this course, students will be able to:

1. Create basic control programs using micro blocks.
2. Build a simple network tree in the lab.
3. Download simple programs onto DDC controllers.
4. Perform basic troubleshooting on Building Automation networks.

C. Assessment Instruments

The following assessment methods may be used:

1. Projects.
2. Exams.
3. Lab Performance.
4. Demonstrations.

VII. Grade Determinants

A. Lab performance.
B. Exams.
C. Class participation.
D. Projects.

Modes of Teaching and Learning used in the Course:

A. Lecture/discussion.
B. Small-group work.
C. Laboratory work.
D. Student collaboration.

VIII. Text and Materials

Suggested Texts: Building Automation – System Integration with Open Protocols, Latest Edition, by American Technical Publishers
ISBN 978-0-8269-2012-6

HVAC System Control – a Trane Air Conditioning Clinic
TRG-TRC017-EN

IT Skills for HVAC Technicians, Latest Edition, by American Technical Publishers
ISBN 978-0-8269-0789-9

Please note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.

IX. Resources

A. Reference books/manuals
B. Safety equipment
C. Testers used for HVAC troubleshooting
D. Campus facilities used as a living lab
E. Instructional videos/DVDs
F. Various energy auditing tools and testers available in the lab

X. Honors Option

Not applicable