Wyoming Community College Commission
Request for
New, Pilot or Revised Degree or Certificate

A. College: Laramie County Community College

B. Date submitted to WCCC: _____

C. Program

1. Request for:

X New Program ___ Pilot Program ___ Revised Program

2. Program Title: Building Technologies

3. Degree or Certificate to be awarded:

X Degree: ___ AA ___ AS X AAS ___ Other

___ Certificate

4. Educational Pathway:

__ Energy __ Construction __ Hospitality X Technology

__ Health Care __ Other

5. Total number of credit hours: 70

6. Suggested CIP (Classification of Instructional Program) code (6-digit):

15.0503, Environmental Management and Systems Technology/Technician

7. Planned semester/year new program will begin: Fall 2017

8. Will any part of this program be provided by non-accredited vendor(s)?

___ YES (Provide details) X NO

9. Will all or part of this program be available to students via online or other distance education technologies?

__ At the start of the program? __Within three years of the start of the program? X No

D. Program description as it will be included in college catalog:

The Building Technologies program prepares students for a career in the Building Automation Systems (BAS) industry. The BAS industry involves cutting edge and developing technologies that control the mechanical and electrical systems of buildings to maximize efficiency and comfort. The program prepares students to maintain, troubleshoot and repair complex building control and energy management systems.

The Building Technology AAS program is designed for students to begin training during the spring semester. Students interested in the Building Technology AAS program who would like to start in the fall should contact their advisor for completion of the program's general education requirements.

1. Expected Student learning outcomes from completion of the program:

Upon completion of the program, students will be able to:

- Understand and apply the physical properties governing HVAC/R theory.
- Apply the principles of AC and DC Electricity.
- Plan and design the architecture, components, and operations of routers and switches in a network.
- Understand and apply the fundamentals of building automation systems (BAS).
- Select and apply appropriate technology to address the needs of different BAS applications.
- Understand the operational theory governing the operation of automatic building control systems.
- Apply the principles of psychrometrics, Indoor Air Quality (IAQ) and airflow to design a commercial air distribution system.
- Properly select and apply BAS systems components in a functional system.
- Configure and troubleshoot routers and switches and resolve common issues with RIPv1, RIPv2, single-area and multi-area OSPF, virtual LANs and iner-VLAN routing in both IPv4 and IPv6 networks.
- Apply network fundamentals, standard OSI model, IP protocol, network signal transmission, media, protocols, physical topologies and hardware as they relate to BAS networks and subnetworks.

2. Program Layout by Semester:

Course	Title	Credits
COLS 1000	Introduction to College Success: First-Year Seminar	3
ENGL 1010	English 1: Composition	3
IST 1710	DC Electricity	2
IST 1711	DC Electrical Circuits	1
IST 1712	AC Electricity	2
IST 1713	AC Electrical Circuits	1
CSCO 2000	Cisco: Internetworking I	3
HVAC 1610	Heating and Air Conditioning Principles	3
	Semester Credits	**18**
HVAC 1710	Building Automation Systems Fundamentals	3
HVAC 1640	Automatic Building Controls	3
HVAC 1660	HVAC Distribution Systems	3
HVAC 1720	Building Automation Systems Development	3
HVAC 1730	Building Automation Systems Networking	3
COSC 1200	Computer Information Systems	3
	Semester Credits	**18**
CSCO 2010	Cisco: Advanced Internetworking I	3
HVAC 1740	BAS Logic and Programming	3
IST 1520	Introduction to Industrial Safety	1
IST 1770	Motor Controls	2
IST 1771	Motor Control Circuits	1
CO/M 2010 OR CO/M 1015	Public Speaking (Recommended) Foundations of Communication	3
GenEd: WY	Choose from approved U.S./Wyoming Constitution courses.	3
	Semester Credits	**16**
HMDV 1510	Success in the Workplace	3
IST 1780	Electric Motors	2
IST 1781	Electric Motor Circuits	1
HVAC 1750	Building Automation Systems Design and Installation	3
MATH 1010 OR MATH 1510 OR Higher	Problem Solving Technical Mathematics I	3
CSCO 2020	Cisco: Advanced Internetworking II	3
CSCO 2025	Cisco: Advanced Internetworking III	3
	Semester Credits	**18**
	Total Credits	**70**

E. New course prefixes, course credit hours and/or course numbers:

1. **Recommended level of instruction (LOI) code if the community college is using a course prefix which is new to Wyoming public higher education institutions:**

   X No New prefixes ___ Suggested level of instruction

2. **New Course prefixes, numbers and and/or credit hours have been coordinated:**

   with UW (transfer) ___ Yes ___ No X Not Applicable

   or WCCC (career technical) X Yes ___ No ___ Not Applicable

F. New course descriptions:

The following are course descriptions for each new course in the program (include prefix, course number, title, credit hours and description):

Prefix	Number	Course Title	Credit	Course Description
HVAC	1710	Building Automation Systems Fundamentals	3	Building Automation Systems (BAS) Fundamentals is an introduction to the BAS industry. Students will study the history of BAS, identify manufacturers and contractors and study the industry scope and trends as they explore careers in BAS. Students will be introduced to types of BAS systems as well as BAS architecture.
HVAC	1720	Building Automation Systems Devices	3	Building Automation Systems (BAS) Devices introduces students to the major types of components found in BAS systems. Students learn how to properly select and apply BAS systems components in the field. Topics include input/output wiring, temperature sensors, humidity sensors, pressure sensors, flow sensors, safety circuits, actuator devices for dampers and control valves, power supplies, transducers, relays, motor controls, power supplies, enclosures and power monitoring devices.
HVAC	1730	Building Automation Systems Networking	3	Building Automation Systems (BAS) Networking introduces the fundamentals of data transmission. The course is closely aligned with Cisco Systems Certification and assists students in their preparation for that credential. Topics

				covered are network fundamentals, standard, OSI model, IP protocol, network signal transmission, media, protocols, physical topologies, hardware, typical BAS networks and typical BAS subnetworks.
HVAC	1740	Building Automation Systems Logic and Programming	3	Building Automation Systems (BAS) Logic and Programming introduces concepts of logic, truth tables, logical equivalences, conditionals, Boolean expressions, logic gates, digital logic circuits, number systems, object-oriented programming, data types, decision making and programming style.
HVAC	1750	Building Automation Systems Design and Installation	3	Building Automation Systems (BAS) Design and Installation provides students a hands-on introduction to the fasteners, equipment, tools and methods for installing building automation system components. The concepts and principles of previous BAS courses are applied to the design of and commissioning of automation systems.

G.* Can this program be delivered by current faculty? If not, what are the plans, budget and timeline for bringing on needed instructors?

Yes, this program can be delivered by current faculty.

H. Summary of input from and coordination with citizens, business and industry or k-12 education:

A focus group meeting held on March 24, 2016 was attended by several members of the local community including representatives from: Greenhouse Data, Johnson Controls, Long Building Technologies, State of Wyoming Department of A&I, Siemens, Unify Energy Solutions and LCCC. The group agreed that Wyoming has a shortage of workers. Most workers in this field are 120% utilized; working long hours and weekends. Long Building Technologies currently has 29 open positions in this field. There is a lot of this type of work going on in Western and northeast Wyoming. There is a lot of work going on in Northern Colorado. Colorado does not have a program like this. The controls industry is becoming its own individual trade, yet there is no strong organized continuing education or training program for it. There is a need for more certification at a higher trade level. Controls are becoming more intertwined with IT into a highly specialized field.

Control techs are oftentimes the liaisons between the facilities and the IT departments. The proposed curriculum will provide the core Skills necessary for a person starting in the field. The primary reason students in other trades programs are so successful is they must learn the fundamental skills that are needed before they enter into a 4-year apprenticeship program.

I.* Resources required to start and sustain the program and the current plan to meet those resource needs through college or other external funds:

No new resources are needed.

J.* Projected demand in Wyoming and Nation for five years from the proposed implementation date (career technical programs:

1. State and National Trends

United States	**Employment**		**Percent Change**	Projected Annual Job Openings
	2014	**2024**		
Computer Network Support Specialists	181,000	194,600	+8%	3,690
Wyoming	**Employment**		**Percent Change**	Projected Annual Job Openings
	2014	**2024**		
Computer Network Support Specialists	240	260	+10%	10

Source:

- Occupational Information Network (O*NET Online), http://www.onetonline.org/link/summary/15-1152.00

United States	**Employment**		**Percent Change**	Projected Annual Job Openings
	2014	**2024**		
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	292,000	331,600	+14%	8,420
Wyoming	**Employment**			Projected

United States	Employment		Percent Change	Projected Annual Job Openings
	2014	2024		
	2014	2024	Percent Change	Annual Job Openings
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	580	610	+6%	10

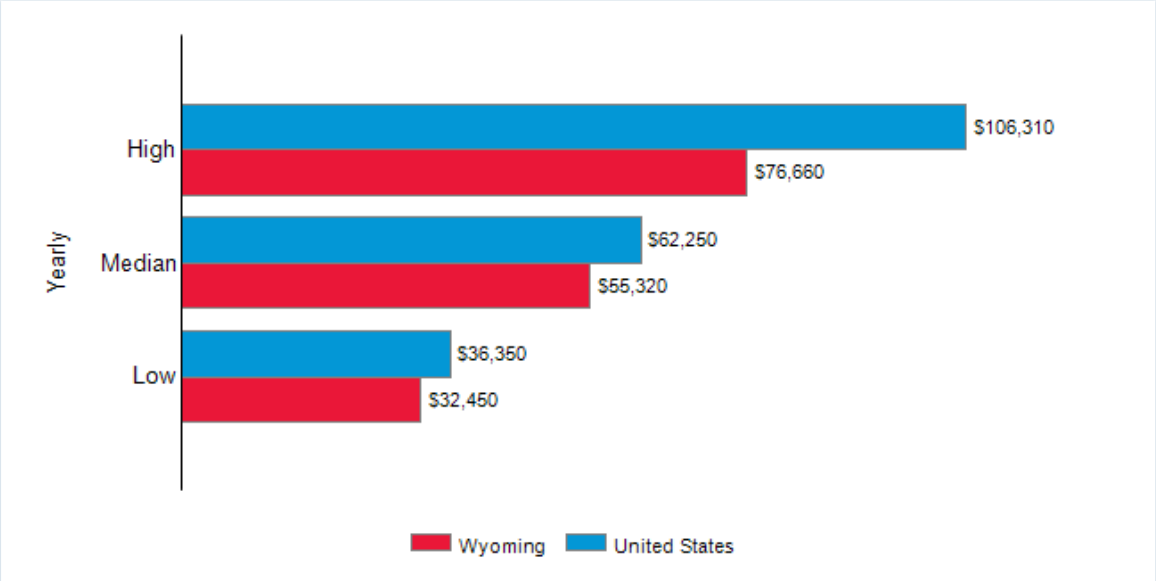
Source:

- Occupational Information Network (O*NET Online), http://www.onetonline.org/link/summary/49-9021.01

Other trend information that would assist the Commission:
Information for both Computer Network Support Specialists and Heating, Air Conditioning, and Refrigeration Mechanics and Installers is provided as a guide for this program. The Building Technologies industry is in its infancy and the Building Efficiency for a Sustainable Tomorrow (BEST) Center is lobbying the Department of Labor for its own identifier. The HVAC instructor, Rob McNabb, at LCCC, is a member of this national team.

2. State and National Wages

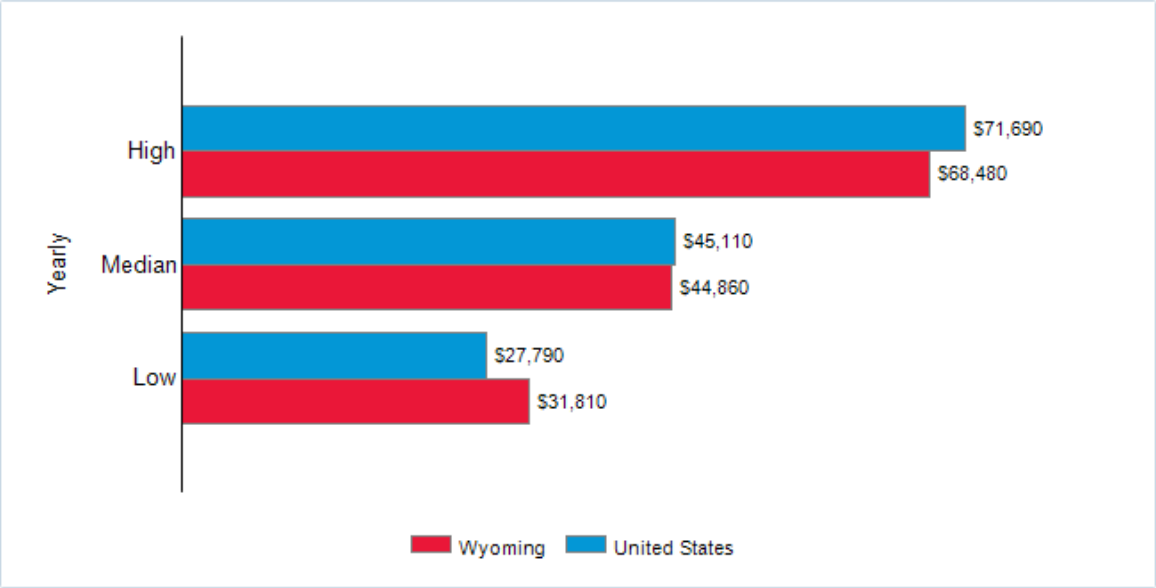
Computer Network Support Specialists:



Source:

- Occupational Information Network (O*NET Online), http://www.onetonline.org/link/summary/15-1152.00

Heating and Air Conditioning Mechanics and Installers:



Source:

- Occupational Information Network (O*NET Online), http://www.onetonline.org/link/summary/15-1152.00

3. Primary student audience identified for this program:

We anticipate targeting several different groups within the community, including incumbent workers who are currently in the HVAC and computer networking fields who want to or are required to expand their knowledge; those that are seeking advancement opportunities; displaced workers desiring retraining; poverty-to-self-sufficiency training programs; and high school graduates who are interested in technical fields.

4. Anticipated enrollment in the three academic years after WCCC approval (unduplicated headcount) with the basis for the estimate:

10 Year One 15 Year Two 15 Year Three

K.* Student recruitment and program marketing strategies to attract the broadest range of individuals for this particular program:

LCCC will utilize industry contacts in HVAC/R and computer career fields to identify and recruit students currently in the workforce who need to update their skills. Industry partners are very supportive and have committed to referring students to the community colleges. We plan to market to Department of Workforce Services, high school counselors and students, veterans and transitioning military personnel, poverty to self-sufficiency programs and other displaced workers. We will work closely with our admissions staff on specific recruitment strategies.

L.* Identification of similar programs at Wyoming Community Colleges and an overview of results of discussions with faculty and administrators at the relevant colleges regarding curriculum and possible joint projects:

Wyoming Community College Programs (Identify title, degree/certificate and number of credit hours)						
Casper College	**Central Wyoming College**	**Eastern Wyoming College**	**Laramie County Community College**	**Northwest College**	**Northern Wyoming Community College District**	**Western Wyoming Community College**
N/A	N/A	N/A	In Process (70 credits)	N/A	N/A	N/A

M. Note available program and course articulations with other likely transfer institutions in the region, particularly for transfer AA and AS programs. (Note regional Bachelor of Applied Science transfer options in addition to UW.)

This program is not designed for transfer.

N. When appropriate, note partnerships with business, industry, associations or agencies that have contributed to the design of the proposed program and/or who will contribute to the delivery of the program.

A focus group meeting held on March 24, 2016 was attended by several members of the local community including representatives from: Greenhouse Data, Johnson Controls, Long Building Technologies, State of Wyoming Department of A&I, Siemens, Unify Energy Solutions and LCCC. The group agreed that Wyoming has a shortage of workers. The HVAC instructor, Rob McNabb, is a member of the BEST Center. This National team designs, develops and shares curriculum ensuring that this emerging industry is working towards a common standard.

O. Assessment of student learning and completer follow-up per performance indicators. How will the assessment outcomes be used to assure student learning and improve the program?

The following measures will be used to assess student learning and program performance:

1. Course success rates will be reviewed each semester.
2. Student learning outcomes will be assessed through culminating coursework.
3. The number of program completers
4. The number of graduates employed
5. Graduate and employer surveys
6. Annual institutional program assessment of student learning competencies and organizational effectiveness
7. Advisory committee review of curriculum and program success.

P.* Other program information or comments that would assist the commission in making a decision using the Guidelines for Use of this Evaluation Tool found in Appendix A of the 2010 WCCC Statewide Strategic Plan.

This program addresses Wyoming and regional interests in the following ways not addressed earlier in this request:

EDUCATED CITIZENTRY – The program supports high demand and high pay occupations, which improves the quality of life for our students and the clients who will be served by their skills.

DIVERSIFIED ECONOMY – This program helps build the technical skills required to support the changing skills required for energy related industries. Many of the fundamental skills developed through the electrical, mechanical, networking and safety courses are relevant across the industry.

WORKFORCE DEVELOPMENT – We developed the Building Technologies program curriculum from nationally recognized industry standards and input from a locally developed focus group. We selected courses that respond to current and emerging technologies in the industry.

EFFICIENT SYSTEMS – Career pathways coordinators will work closely with the instructors to align the skill sets of secondary school students with our program. The alignment will provide a seamless pathway for students from secondary to post-secondary education and on into the Building Technologies industry.

ACCOUNTABILITY and IMPROVEMENT – Course assessment data and course evaluations will be compiled by the program instructors, and will be reviewed under the continuous quality improvement structures used at LCCC.

*Community colleges are not required to complete sections G, I, J, K, L, and P for **pilot** program requests.

SIGNATURE PAGE

Submitted by V. P. for Academic Affairs**

_____
Signature Date

_____
Printed Name Title

Approved by the WCC Academic Affairs Council

_____
Signature Date

_____
Printed Name Title

Approved by Program Review Committee

_____
Signature Date

_____
Printed Name Title

**Signature by the Community College Vice President for Academic Affairs verifies that institutional curriculum approval processes have been completed and that the Community College Board of Trustees has approved this program request as per institutional policy.

2600 Old Happy Jack Rd
Cheyenne, WY 82001
Tel (307) 757-3403

Johnson Controls

January 17, 2017

Board of Trustees
Laramie County Community College
1400 E. College Drive
Cheyenne, WY 82007

Dear Trustees:

Johnson Controls International is a global diversified technology and multi industrial leader serving a wide range of customers in more than 150 countries. Our commitment to sustainability dates back to our roots in 1885, with the invention of the first electric room thermostat. We are committed to helping our customers win and creating greater value for all of our stakeholders through strategic focus on our buildings and energy growth platforms.

We have served on the HVAC/R Advisory Committee in the past, and attended the focus group meeting when the Building Technologies Program was initially proposed. We fully support the Building Technologies Program and feel that the curriculum will provide technicians the entry skills they will need to begin employment with Johnson Controls. We currently are in need of two technicians in the Wyoming/Colorado service area.

We will continue to serve on the advisory committee for this program and look forward to recruiting technicians who complete the Building Technologies Program.

We appreciate Laramie County Community College's efforts to expand new training opportunities for the Building Automation Systems industry.

Sincerely,

Lee Hooker, PMP
General Manager, High Plains Branch
Johnson Controls International