Community College *of* Philadelphia

AGENDA
Institution-Wide Committee
Monday, January 24, 2011
2:30 p.m.
I.A.S. Boardroom, M2-1

I. Call to Order

II. Attendance

III. Approval of Minutes
(a) December 20, 2010

IV. Old Business

V. New Business
(a) New Program Proposal: Academic Certificate in Energy Conservation (Processed through the Curriculum Subcommittee)
(b) New Program Proposal: Associate of Applied Science Degree in Building Science (Processed through the Curriculum Subcommittee)

VI. Adjournment

Community College *of* Philadelphia

MEETING MINUTES
Institution-Wide Committee
Monday December 20, 2010
2:30 p.m.
Isadore A. Shrager Boardroom
Community College of Philadelphia
1700 Spring Garden Street
Philadelphia, PA 19130

Committee Delegates Present
Pascal Scoles, Mary-Lynn Brown, Judith Gay, Richard Keiser, Valerie Vaincoeur

Committee Alternates Present
John Braxton (voting), Mary Anne Celenza (voting), Jane Gr[illegible] (voting), Bea Jones (voting), Iwanka Kultschyckyj (voting), James Osborne (voting)

Guests Present
Donald Bowers, Pete Watkins

I. Call to Order
The meeting was called to order by Pascal Scoles.

II. Approval of Minutes
The IWC unanimously accepted the minutes of October 25, 2010.

III. Old Business
None

IV. New Business

(a) **Proposal for Revision of the Liberal Arts-Leadership Option *to be renamed* Community Leadership and**
Proposal for Revision of the Leadership Studies Academic Certificate *to be renamed* Community Leadership Certificate

Discussion: Pete Watkins introduced the proposals. He explained that the concept of leadership in higher education is often aligned with business programs while the certificate and the degree at the College are aligned with community change. Changes in the degree are: expanded electives in social and behavioral science; addition of HIST 103; a directed elective of GEOG 180; new communication electives (ENGL 116, 117 and 118); redesignation of ENGL125 (Community Involvement) to LEAD 125; revision of LEAD 114 and renumbering to LEAD 214; revision of LEAD 111, 112, 113 and 114 and renumbering to LEAD 211, 212, 213 and 214; reduction in the science requirement to one course from two.

Changes to the certificate are: new communication electives (ENGL 116, 117 and 118); redesignation of ENGL125 (Community Involvement) to LEAD 125: revision of LEAD 114 and renumbering to LEAD 214; revision of LEAD 111, 112, 113 and 114 and renumbering to LEAD 211, 212, 213 and 214

Pete Watkins also stated that the career and transfer options will be clearer to students in the revised certificate and degree.

There was a discussion about the name of the certificate and degree program. Should the name be something like civic engagement instead of community leadership? Civic engagement may be a term that is more familiar in academia than it may be to prospective students. The concept of civic engagement is embedded in the curriculum according to Pete Watkins and Pat Scoles.

There was a discussion of various organizations and initiatives that may be aligned with the revised certificate and degree. Examples are PHEND's Scholars in Service program, and AACU's Bridging Theory to Practice initiative. Iwanka Kultschyckyj gave examples of initiatives to the Chair. Pat Scoles stated that he had also reviewed a web site at the University of Wisconsin that may be a resource.

There was also a discussion about similar programs at other academic institutions and the extent to which this is a unique endeavor. It is difficult sometimes to be aware of programs at other institutions because the names of the programs vary.

There was a discussion about whether the College would be willing to match the scholarship money for persons who served in organizations like Americorps. It was suggested that the Fels Institute does this. Institutional Advancement will be consulted on this topic. Pete Watkins mentioned that there is loan forgiveness for students who go into certain fields.

There was a question about the rationale for including economics in the curriculum. Pete Watkins responded that economics deals with the allocation of resources.

There was a question about who teaches LEAD 104. Department heads have a responsibility to identify and recommend persons who have the appropriate credentials for instruction.

There was a suggestion that there be coordination with Student Affairs so students in leadership positions are aware of these opportunities. There was also a discussion of service learning opportunities. The topic of service learning is mentioned in the *Academic Master Plan 2010-2013*. There was a question about whether there should be a service requirement linked to science courses. This is a topic for faculty to discuss and recommend.

Iwanka Kultschyckyj mentioned that she has links to web sites that she believes are important for committee members to review. Pat Scoles agreed that she should send them to him and he will make sure that the links are sent to the IWC members.

Action Item: Recommend the proposal for Revision of the Liberal Arts-Leadership Option, to be renamed Community Leadership and the proposal for Revision of the Leadership Studies Academic Certificate, to be renamed Community Leadership Certificate. (Brown/Scoles)
Vote: Eleven (11) in favor. Motion approved.

VI. Adjournment

The meeting was adjourned at 3:26 p.m.

After the meeting it was decided that there is a need for an expedited review of the proposals.

New Program Proposal

Academic Certificate in

Energy Conservation

Community College of Philadelphia
Division of Liberal Studies
Department of Architecture, Design & Construction

Miles Grosbard, RA, Ed.D.
Associate Professor of Architecture and
Chair, Department of Architecture, Design & Construction

Facilitator:
Peter Watkins

Recommended Effective Semester: Fall 2011

January 13, 2011

I. Abstract

In response to broad based interest in Energy Conservation related to buildings, ADC Department faculty, in concert with baccalaureate level institutional and industry partners, are interested in developing two new Programs related to energy conservation in buildings: an Academic Certificate in Energy Conservation and an Associate of Applied Science Degree Program in Building Science (see separate document).

The proposed Academic Certificate in Energy Conservation provides a ladder to the Building Science curriculum, and is included as an element in an academic continuum: starting from pre-collegiate, trade oriented training; through a proficiency certificate; then Academic Certificate, followed by the proposed AAS degree and possible transfer to baccalaureate level programs. Specifically, CCP's Energy Conservation Certificate will be included as part of two new one-year apprenticeship programs sponsored by a partner institution, the Energy Coordinating Agency (see Appendix A & B).

II. Opportunities or Problems Addressed by the Proposed Program

There are many compelling reasons for developing a program that concentrates on energy conservation at this time. Our nation is at a crossroads in regard to energy consumption; the signs are everywhere. Both in terms of environmental degradation and in terms of independence from foreign energy sources, the energy mantra for the new century is "use less, conserve more."

Energy consumption within buildings account for the largest share of the nation's energy use – 41.5% (compared to 30% by the industrial sector and 28.5% by the transportation sector), and, happily, conservation and energy aware design offers the brightest and most readily achievable hope that we may slow the need for additional energy sources.

In February 2009, the U.S. Congress enacted American Reinvestment and Recovery Act (ARRA) to stimulate the national economy with $787 billion. Catalyzing green energy is a central component of ARRA with more than $45 billion in new investments, including $5 billion to retrofit low-income families' homes to make them more energy efficient - up to $1 billion of which may be spent on training and technical assistance. The ARRA is also funding $500 million in green energy training partnerships across the country to help build the green workforce and strengthen states' green jobs training capacity. Community College of Philadelphia is a proud participant in this effort, having launched the Pathways Out of Poverty (POP) grant in April 2010, with our partner, the Energy Coordinating Agency (ECA).

Research suggests many green jobs will be family-sustaining "middle-skill" jobs that require more than a high school diploma but less than a four-year degree. [1] With existing connections to employers and regional credibility, community colleges are well positioned to play key roles in establishing career pathways in green energy sectors to help low-income students advance. Community colleges across the nation have established programs aimed at the emerging new green economy, including:

- City College of San Francisco (CA)
- The City University of New York (NY)
- Los Angeles Trade-Technical College (CA)
- Skyline College (CA)

[1] Center on Wisconsin Strategy, Greener Pathways: Jobs and Workforce Development in the Clean Energy Economy, 2008, Washington Employment Security Department

- Columbia Gorge Community College (OR)
- Lane Community College (OR)
- South Seattle Community College (WA)
- Camden County College (NJ)

To prepare individuals to succeed in the evolving new energy labor market, the nation's workforce and education systems need to be organized around comprehensive career pathways that integrate education, training, and work. The establishment of an Academic Certificate in Energy Conservation (and an AAS Program in Building Science) is designed to bridge the gap between practical skills (taught at ECA) and collegiate level research-based education.

Essentially, the proposed Academic Certificate Program is the first two semesters of the proposed four semester of the AAS program in Building Science, and is designed to provide effective mobility into that credential for students who choose to proceed along this continuum.

A. <u>Developments with Partner Institutions</u>

1. **The Energy Coordinating Agency**

As mentioned above, CCP is fortunate to partner with the Energy Coordinating Agency (ECA) in developing this new program proposal. While the Certificate in Energy Conservation is designed for success independent of that organization, partnering with ECA brings added industry applicability and offers a wider array of experiences for students than CCP could develop and offer separately.

ECA has existed for more than 20 years, most notably administering the Low Income Heating Assistance Program (LIHEAP) for Philadelphia. More recently, ECA has developed the capability to perform weatherization construction work, in both low-income and market rate applications. Just this past April, ECA opened a, new Green Jobs Training Center in the West Kensington section of Philadelphia. The Training Center is approximately 20,000 square feet of classroom and lab space in a newly renovated LEED Gold building which once manufactured Civil War uniforms. The Center is funded through a wide ranging network of public and private partnerships, including manufactures of "green" products such as BASF, Dow, GreenTek and others.

The purpose of that facility is to offer apprenticeships in the area of weatherization and energy auditing. Associated with these apprenticeship programs, the ADC faculty are proposing that CCP offer coursework leading to a Proficiency Certificate in Weatherization ,a program of approximately 15 credits, which will be a ladder into this Academic Certificate in Energy Conservation). The first level apprenticeship program, called Weatherization Installer and Technician (WIT) launched in October 2010, is a combination of hands-on training provided by ECA and academic preparation provided by CCP. The second apprenticeship program, called Building Energy Analyst (BEA) is scheduled to begin in October 2011, and offer more advanced training to prepare people for national certifications such as the Building Performance Institute certification for building analyst. Both these two apprenticeship programs are currently under review by the US Departments of Energy and Labor. This second, higher level apprenticeship will be associated with this Academic Certificate Program in Energy Conservation.

ECA's interest in having students in their apprenticeship program enroll in CCP courses has helped to inform this proposal. In particular, ECA is interested in incorporating our proposed new course ADC 146 - Construction Supervision & Business Practices, as well as ADC 136 Building Codes (revised to include a safety component) into their apprenticeship programs. Including these aspects in the proposed Program will help

launch Energy Conservation as a viable, essential program, and help it gain immediate acceptance in within the regional Energy Conservation community.

This proposal is supportable without ECA's apprenticeship programs, and it is anticipated that many of the Program's students will arrive at CCP through routes that do not include green jobs apprenticeship training. Rather, partnering with ECA provides a readily identifiable base of students which will in a sense 'jump start' the Energy Conservation Certificate Program. ECA reaches a constituency typically excluded from higher education, and this emerging partnership will provide access to many who have been excluded from participation in the construction industry. The partnership will help CCP fulfill its mission to "*provide access to higher education for all who may benefit... enabled to meet the changing needs of business, industry and the professions."*

Budget projections for offering this Program (see section VII) are based on CCP's existing contractual relationship with ECA. ECA is an official CCP neighborhood site and we have enjoyed (and project continuing to have) access to their training facility in West Kensington. To date, we have offered two CCP courses there and will offer two additional courses in Spring 2011 at that location. CCP has access to many specialized tools related to measurement of energy consumption and safety that are available at ECA, and would have to replicate these should that relationship end for any reason. CCP's Energy Conservation Certificate Program is not contingent on our relationship with ECA, but this relationship greatly facilitates and reduces the Program's initial startup costs.

2. Philadelphia High Schools and Charter Schools

The ADC Department has had success in recent years partnering with several institutions at the pre-college level. An important ongoing partnership is with the Architecture, Construction & Engineering Mentors (ACE Mentors – not to be confused with the College's summer program for high school students – also working under the ACE acronym) Program. In Fall 2010 through Spring 2011 the Department is running a dedicated section of the foundational course ADC 101 for this group. The department also has direct relationships with individual high schools including YouthBuild Philadelphia Charter School, Edison, Frankford, Swenson, Douglass, and Mastbaum High Schools. Through these partnerships, the ADC department provides a seamless bridge between high school and college work. This is another identifiable student constituency for the Energy Conservation Certificate.

3. **The National Association of Minority Contractors (NAMC)**

The National Association of Minority Contractors (NAMC) has been a very helpful partner in reviewing the curriculum outlined in this proposal. As an industry, construction has been slow to adopt affirmative practices, but NAMC recognizes that the emerging area of weatherization and energy conservation provides entry into the construction field for many groups that have been traditionally underrepresented in the construction industry. Individuals involved with NAMC will form a third student constituency for the Certificate in Energy Conservation

III. Expected Program Participants

A. <u>Occupational/educational background</u>

Prospective students for the Energy Conservation Certificate Program will likely come from diverse educational and social backgrounds, similar to the population currently attracted to the Construction Management Program. Some will come from the ranks of recently graduated high school seniors hoping to

enter the field. Some will come from programs such as YouthBuild Philadelphia or Edison High School's Construction Program which focus on construction. Some will have worked in the construction industry in some capacity, usually as a tradesperson (not at the managerial level).

B. Professional or academic goals

Students completing the Energy Conservation Certificate will be eligible for some entry level positions within construction management and construction contracting firms. Program graduates may also want to consider embarking on small start-up construction business ventures of their own. In the current economic environment, and that which we anticipate will exist through the next decade, great potential exists for innovative entrepreneurship in the weatherization and energy conservation fields in particular.

IV. Description of the Proposed Programs

A. Program Goals

The primary goal of the proposed Energy Conservation Certificate Program is to prepare students for employment within the regional energy economy. Specifically, the apprenticeship related to this Program prepares students to become crew chiefs working on weatherization projects, and auditors who measure energy performance of existing buildings, making recommendations for improvement. Pennsylvania was recently ranked second in the nation (behind California) in the number of jobs created within the last five years within the energy conservation for buildings industry, and this program is aimed squarely at that demonstrable need. It will help students achieve employment in companies that reduce energy consumption in building and in the design, sales and installation of alternative energy systems. With the inclusion of coursework in construction business practices, safety and supervision, the Program will prepare students who wish to found their own small energy conservation contracting businesses.

A secondary goal of the proposed program is to provide an effective vehicle for movement into the Building Science AAS Program for students whose goals include higher academic achievement. The Certificate Program includes courses that essentially constitute the first two semesters of the four semester AAS Program.

B. *Proposed Catalog Description and Course Sequence*

This program prepares students for a variety of careers in the energy conservation industry and related fields, such as energy auditors, product specifiers, quality control supervisors, materials testers, and site inspectors. Individuals interested in developing small independent energy conservation contracting businesses will also find this program useful toward achieving that goal. Courses within this program utilize the latest industry-standard scientific methods, instruments and software for determining the energy consumption profile for buildings.

STUDENT LEARNING OUTCOMES:
Upon completion of this program graduates will be able to:

- Conduct performance audits of energy consumption in existing buildings.
- Plan energy renovation projects.
- Provide leadership in creating and maintaining a safe working environment.

- Organize and run an independent construction business.

PROGRAM ENTRY REQUIREMENTS:
Students are normally required to take the College's placement tests at the time of entry. Students identified as needing developmental course work must satisfactorily complete the appropriate English and mathematics courses in addition to the requirements of their program.

PROGRAM OF STUDY AND GRADUATION REQUIREMENTS:
To qualify for the Academic Certificate in Energy Conservation, a student must complete a minimum of 30 credits as prescribed and attain a minimum grade point average of 2.0 ("C" average).

Proposed Course Sequence – Academic Certificate in Energy Conservation

			Prerequisites and Corequisites	Credits	Gen Ed Req.
First Semester					
ADC	101	Introduction to Design & Construction		3	Tech Comp
ADC	103	CAD Basics		3	Tech Comp
ADC	136	Construction Safety and Building Codes	ENGL 101 (may be taken concurrently)	3	
ENGL	101	English Composition I		3	ENGL 101
MATH	137	Geometry for Design (or higher MATH)		3	MATH
Second Semester					
ADC	112	Construction Materials & Detailing: Principles	ADC 103 or 109	3	
ADC	146	Construction Supervision & Business Practices	ADC 101	3	
ADC	161	Energy Auditing, Mediation and Monitoring	ADC 101	3	
ADC	286	Building Rehabilitation and Energy Retrofit	ADC 101	3	
ENGL	102	English Composition II	ENGL 101	3	ENGL 102 & Info Lit
Minimum credits needed to graduate				30	

C. Accreditation

The Energy Conservation Certificate will apply to become recognized as a United States Green Building Council (USGBC) Education Provider. This recognition can be earned by agreeing to comply with established operational and educational criteria (see Appendix C).

D. Enrollment Management and Recruitment
The Department of Architecture, Design and Construction will continue to promote its Programs, including the new Energy Conservation Certificate, through an ongoing outreach effort involving high schools, charter high schools and partnerships such as exists with Energy Coordinating Agency. There are two foundational courses in which students following all curricula in the Department of Architecture, Design and Construction usually enroll in their first semester: ADC 101 – Introduction to Design and Construction and ADC 103 – Basic CAD. These two courses have been and will be offered to cohorts of students from these organizations.

E. Technical Competency

Technical Competency, a requirement for Academic Certificates, is addressed by the inclusion of two courses: ADC 101 and ADC 103. These two courses were revised in Spring 2010 to include the competencies within CIS 103.

V. Internal Program Coherence

A. *Student Experience and Academic Growth within the Energy Conservation Certificate Program*

Students will begin the program with two foundational, first semester courses ADC 101 – Introduction to Design and Construction and ADC 103 – Basic CAD. These two courses which form the foundation for all of the Programs offered by the ADC department enable students to gain broad perspective on the professions of architecture, interior design, construction management, facilities management, computer assisted design (CAD), planning, engineering, landscape architecture, energy conservation and related professional specializations, while also introducing Technical Competency early in the student experience. The early development of these technical skills help students perform at higher levels in subsequent courses. Also, this early exposure helps students determine which academic area they are most interested in pursuing, or perhaps decide early that another major may better suit their interests, talents and abilities. In the revised version of ADC 136 – Construction Safety and Building Codes, first semester students will be exposed early to the importance of industrial safety and societally endorsed values embodied in an array of building and energy codes. The balance of first semester courses includes two General Education courses: ENGL 101 and MATH 137 – Geometry for Design (a College level mathematics course designed specifically for design and construction students).

Second semester courses build on the foundational experiences of the first semester. ADC 112 - Construction Materials & Detailing: Principles is also a foundational course present in most ADC curricula, and helps students begin to develop understanding of the products and materials commonly encountered in contemporary construction. Also, students enroll in two new courses, ADC 146 - Construction Supervision & Business Practices which enhances the Program's business content (requested by the industry advisors), and ADC 161 – Energy Auditing, Remediation and Monitoring, the course which introduces the "science" aspect of building science. Students learn and apply industry accepted methods for determining the energy problems and opportunities of existing buildings, using verifiable metrics. Since the majority of anticipated work within the energy conservation field is expected to be within existing buildings, a new course introduced into the department in July 2010, ADC 286 – Building Rehabilitation and Energy Retrofit will appear in this second semester. Finally, students will also enroll in ENGL 102 - English Composition II.

B. Student Enrichment Activities

Energy Conservation Certificate Program students will benefit from a wide array of activities aimed at enhancing their educational experiences. The ADC Department sponsors several trips each year in order to give students the opportunity to view noted architectural and design-oriented sites: trips to New York City and Baltimore are integrated into curriculum in the Fall, and Washington DC or New York City again in the Spring. The Department's annual calendar also includes a lecture series on a variety of topics related to design and construction throughout the year, a show of student work in the Rotunda in January and February, and an alumni panel and jobs fair in March. As the curriculum becomes implemented, we hope to start a student chapter of the US Green Building Council.

VI. Program Institutional Congruence

A. Program Support Structure:

1. Educational Support Services

The Division of Educational Support Services through the SACC provides students opportunities to work on projects at the M2-26 computer lab where students advance their facility with complicated software packages through practice in this informal (non-classroom) setting. Additionally, ESS provides resources for a student CAD tutor who meets with students to provide individualized help with projects and assignments.

2. Library Acquisitions

The Department coordinates with Library staff in keeping the collection current with respect to architecture, design and construction titles. Recommendations for additions to Library holdings will be made as new and revised course proposals are developed and completed.

3. Disabilities Accommodation

Students with documented disabilities are and will continue to be provided reasonable accommodations to enable and facilitate learning.

4. Departmental Technology Plan

All hardware and software needed to initiate this new Program already exist at the College. Faculty endeavor to integrate new computer programs and techniques as they are developed and introduced into the architecture, design, construction and energy conservation fields.

VII. Proposed New and Revised Courses

Below is a list of proposed new and revised courses; for an explanation of how the courses in the program relate to the program level student learning outcomes see the curriculum map appended to this document.

Proposed Course Description:

The requirements of the Occupational Safety and Health Act and other related federal and state legislation as applied to the building construction industry are studied. Students practice and master common safety procedures. Standards for safety administration, accident prevention, hazard identification, and responsibility for compliance are emphasized. Students are introduced to the national model building and energy conservation codes produced by the International Codes Council. The focus will be on the International Building Code (IBC), and the International Energy Conservation Code (IECC), as well as state and local adaptations of these. Requirements of the Americans with Disabilities Act (ADA) are also studied. Successful students earn OSHA-30 and EPA Lead Safety certifications.

Learning Outcomes

Upon successful completion of the course, students will be able to:

- Identify common construction site hazards.
- Demonstrate proper methods to reduce personal safety risks.
- Discuss the historical, legal, and philosophical basis of safety and construction codes.
- Explain the International Building Code (IBC) and the International Energy Conservation Code (IECC) , as well as local interpretations and variations of these.

- Identify the responsibilities of major participants in the design and construction process with regard to personal and societal health and safety.
- Explain the major building characteristics that are affected by code analysis and application, such as occupancy, height and area, egress, fire separations, structural loads, construction methods, and structural and finish materials.
- Determine the code classification of any building, using discriminates such as use/occupancy types, occupancy-detailed requirements, height and area limits, and construction types.
- Calculate the "design occupant load" in sample buildings by the standard methods of calculation.
- Explain the major systems and products used for detection and suppression of fire in buildings, including suppression and standpipe systems and fire alarm systems.
- Design a safe egress system for a simple building by manipulating the factors contributing to the occupant load, such as doors, corridor and exit stair widths.
- Discuss laws and standards related to accessibility, especially the American with Disabilities Act.
- Sit for the OSHA 30 and EPA 10 Lead Safety certification examinations.

Major Course Units:

- Regulatory and Legal Underpinnings – OSHA; EPA; ICC; IECC; ADA; Local Jurisdictions
- Introduction to OSHA & the OSH Act; Recordkeeping
- Basic Safety Orientation; General Safety & Health
- Health Hazards & Hazard Communication
- Health Hazards & Hazardous Materials
- Process Safety Management of Highly Hazardous Materials
- Personal Protective Equipment
- Fire Protection
- Materials Handling
- Hand & Power Tools; Welding & Cutting
- Electrical Safety
- Struck-by & Caught-in-between Safety and Protection; Confined Space Entry
- Fall Protection; Stairways & Ladders Scaffolding
- Cranes & Rigging
- Motor Vehicles
- Excavations; Use of Explosives in the Workplace
- Concrete & Masonry Safety Considerations
- Requirements of the ADA
- Requirements of the IBC
- Requirements of the IECC

Proposed Course Description:

This course is an examination of management functions as they relate to the construction industry, including: contract bidding , working with agencies and commissions, staffing, construction bonding and insurance requirements, permits and certifications, business organization, finance and administration, security, construction marketing, procurement equipment management, and green business

opportunities. In addition to supervision related to financial and operational aspects of running a construction business, human relations skills needed by a construction project manager/supervisor to promote quality, safety efficiency, and productivity are also studied. Problem solving in relation to field conditions is emphasized.

Learning Outcomes:

Upon successful completion of the course, students will be able to:

- Apply general business practices to the special demands of operating a contracting business
- Create a business plan for a small construction business
- Create a marketing plan for a small construction business, with special regard to "green" business opportunities
- Use a value-added, benefits model for selling construction services
- Use and adapt a variety of standard construction contract instruments
- Create a financial plan detailing anticipated cash flow
- Organize recordkeeping for a small construction business
- Assign and explain duties
- Provide motivation to workers
- Perform quality control inspections and provide redirection if needed
- Identify the elements needed to create a safe working environment
- Develop interpersonal skills for effective communication with clients and staff
- Cultivate strong customer service values
- Evince cultural sensitivity when working with a diverse workforce and client base

Major Course Units:

Business Practices

- General business practices – forms of organization – legal and tax considerations
- Planning for operating a small construction business
- Marketing and selling construction services
- Bidding, Insurance, and Bonding
- "Green" business opportunities
- Adaptations of standard construction contract instruments
- Financial planning for cash flow; lines of credit and other financing options
- Construction cost estimating and project scheduling for small projects
- Organize recordkeeping for a small construction business

Leadership

- Assigning duties
- Explaining tasks providing on the spot training and instruction
- Motivational skills
- Quality control
- Safe working environment

Logistics

- Inventory issues – making sure the right materials are present for the job
- Technical problem solving in the field

- Cost awareness and control
- Shifting labor resources among concurrent jobs

Interpersonal

- Communication skills to work with clients
- Communication skills to work with installers
- Cultivate strong customer service attitude among workers
- Cultural sensitivity - issues in working with diverse client groups.

Proposed Course Description:
Students learn to perform traditional energy audits as well as comprehensive, whole-home assessments. Students will learn to diagnose critical performance factors in buildings and increase the energy efficiency of the building and the comfort, health, and safety of the building's occupants. Students learn to identify major energy related problems and prioritize solutions based on demonstrable building science principles and cost benefit analysis. Successful students will be prepared for the Building Performance Institute (BPI) Building Analyst Certification examination.

Learning Outcomes:
Upon successful completion of the course, students will be able to:

- Identify and understand building performance problems including ice dams, mold and mildew, and indoor air quality issues
- Analyze buildings using "Blower Door" technology and other diagnostic equipment
- Assess building tightness, mechanical and distribution systems and combustion safety for a "whole house" performance-based approach
- Apply "blower door," combustion safety and other diagnostics for assessing air leakage and efficiency in buildings
- Prepare for the Building Performance Institute (BPI) Building Analyst Certification examination.

Principles of building science are used to solve heating, cooling and air leakage problems that drive high energy costs. Students learn to use measurement devices designed to quantify these phenomena. The ultimate goal of study in this area is to provide a more comfortable, safer, more energy efficient and more durable interior living environment.

Major Course Units:

- Principles of Energy and Building Science
- The Energy Audit Process
- Building Shell and Thermal Envelope
- Airflow Basics
- Moisture Management
- Air Quality
- Combustion Safety and CO Monitoring
- Building Systems: HVAC, Lighting, Appliances, and DHW
- Diagnosing Common Building Problems
- Blower Door Testing

- Combustion Testing and Safety
- Health and Safety Issues
- Tools, Equipment & Materials
- Refrigerant Cycles & Heat
- Pump principles
- Comfort/Thermal Performance
- Ducted Distribution System Design
- AC and Heat Pump Control

Active Learning:
Students will become proficient in using the following field testing instruments:

- Blower door
- Ambient Carbon Monoxide Detector
- Manometer
- Natural Gas Detector
- Flue Gas Detector

VIII. Fiscal Implications

A. Projected Student Numbers
Current enrollment projections have 40 new students reenrolling in the new Energy Conservation Certificate Program each year.

B. Projected Budget

1. Personnel requirements and costs
Much of the expertise required to develop and teach the content already exists among current full and part-time faculty. Several faculty are currently engaged in developing additional expertise in the area of construction safety, pursuant to offering students the ability to become OSHA and EPA certified. This additional training is available at our partner institution, ECA, and has been offered at no cost to our faculty who wish to develop skills in these areas. No additional full time faculty are needed to make the curriculum revisions contained in this proposal. In time, depending on the success of the new and revised programs in attracting sufficient numbers of new students, the Department will consider making such a request.

2. Capital items
No new capital items are needed to support the revisions proposed in this document, as the scientific instruments needed for instruction are available to CCP freely from ECA. If CCP's relationship with ECA should terminate in the future, CCP will need to purchase approximately $20,000 in instrumentation to support the two unique courses in this Program (ADC 161 and ADC 255). Perkins funding will be sought for these expenditures should that contingency occur.

3. Initial starting costs
No unique costs are anticipated.

4. Projected annual operating budget
There will be no unique operating budget for this Program. It will be run from within the existing

Architecture, Design and Construction Department budget.

5. Program support structure and cost
   No new supports or costs are anticipated.

C. Space Requirements
   The Department of Architecture, Design & Construction is scheduled to relocate from the west side of the West Building to the area currently occupied by the Counseling Department (W2-1 and environs) in the third phase of the current construction project. No additional space requirements are projected.

IX. Appendices

Appendix A - Proposed Program Summary:

Weatherization Installer & Technician (WIT) Apprenticeship

In this first level apprenticeship program, designed to be completed within one calendar year, incumbents will learn skills needed to perform quality work installing energy conserving materials, products and devices to enhance the energy efficiency of existing buildings, and engage in related College level coursework, as follows:

WORK PROCESSES SCHEDULE

Introduction to Weatherization and Building Science	**360 hrs**	**45 days**
Safety Practices	**160 hrs**	**20 days**
Basic Carpentry	**360 hrs**	**45 days**
Materials, Tools and Equipment	**160 hrs**	**20 days**
Insulation	**480 hrs**	**60 days**
Air Sealing	**360 hrs**	**45 days**
Other Measures	**120 hrs**	**15 days**
TOTAL	***2000 hrs***	***250 days***

COURSEWORK SCHEDULE

Fall Semester				
ENGL	**098**	**Fundamentals of Writing** (if needed by the individual trainee – not for College credit)	**45 hrs**	**(3 cr)**
ENGL	**099**	**Fundamentals of Reading** (if needed by the individual trainee – not for College credit)	**45 hrs**	**(3 cr)**
ADC	**103**	**Basic CAD**	**90 hrs**	**3 cr**
Spring Semester				
ADC	**101**	**Introduction to Design and Construction**	**45 hrs**	**3 cr**
MATH	**017**	**Elementary Algebra** (if needed by the individual trainee – not for College credit)	**45 hrs**	**(3 cr)**
Summer Semester				
MATH	**137**	**Geometry for Design**	**45 hrs**	**3 cr**
ADC	**136**	**Construction Safety & Building Codes**	**60 hrs**	**3 cr**
TOTAL			***240 hrs***	***12 credits***

At the conclusion of this one year apprenticeship, successful incumbents will:

- Earn the Journeyman credential as a Weatherization Installer and Technician* (requires DOL approval)
- Earn the Proficiency Certificate in Weatherization from Community College of Philadelphia
- Be prepared to take the exam for OSHA 30 Hour Safety Certification
- Be prepared to take the exam for EPA Lead Certification

Appendix B - Proposed Program Summary:

Building Energy Analyst (BEA) Apprenticeship Program

In this second level apprenticeship program, designed to be completed within one calendar year, incumbents will learn a skill set in applying data-driven building science principles to enhance the energy efficiency of existing buildings, and engage in related college-level coursework. After completing this apprenticeship, trainees will be competent in performing energy audits adhering to industry standards. The content is as follows:

WORK PROCESSES SCHEDULE

Diagnostics	**640**	**hrs**	**80**	**days**
Mechanical Systems	**640**	**hrs**	**80**	**days**
Client Education	**120**	**hrs**	**15**	**days**
Energy Loss Calculations	**240**	**hrs**	**30**	**days**
Principles of Hazardous Materials	**240**	**hrs**	**30**	**days**
Appliances – Base Load Calculations	**120**	**hrs**	**15**	**days**
TOTAL	***2000***	***hrs***	***250***	***days***

COURSEWORK SCHEDULE

Fall Semester						
ADC	**112**	**Construction Materials and Detailing: Principles**	**45**	**hrs**	**3**	**cr**
ENGL	**101**	**English Composition II**	**45**	**hrs**	**3**	**cr**
Spring Semester						
ADC	**286**	**Building Rehabilitation and Energy Retrofit**	**45**	**hrs**	**3**	**cr**
ADC	**161**	**Energy Auditing, Remediation and Monitoring**	**60**	**hrs**	**3**	**cr**
Summer Semester						
ENGL	**102**	**English Composition II**	**45**	**hrs**	**3**	**cr**
ADC	**146**	**Construction Supervision and Business Practices**	**60**	**hrs**	**3**	**cr**
TOTAL			***300***	***hrs***	***18***	***credits***

At the conclusion of this one year apprenticeship, successful incumbents will:

- Earn the Journeyman credential as a Building Energy Analyst* (requires DOL approval)
- Earn the Academic Certificate in Energy Conservation from Community College of Philadelphia
- Be prepared to take the exam for Building Performance Institute (BPI) certification as a Building Analyst

APPENDIX C – Accreditation Requirements

USGBC Education Provider
Portfolio Review Application Form

- ✓ Complete this form by typing answers after each question. When complete, the Provider Admin must upload the application (as a single PDF document) via the Provider dashboard at www.usgbc.org/educationreview. Hardcopies are not accepted.
- ✓ Have 3 courses successfully approved by USGBC.
- ✓ Conduct a conference call with USGBC: Once the first two items are completed you will be contacted by USGBC to schedule a follow-up call (approx. 30-60 minutes). Key players involved in your education are expected to participate.

USGBC may request additional information on any of the questions listed below.

Direct questions to edprovider@usgbc.org. For more information on the portfolio review, please reference the Portfolio Review Guidelines.

Date:

Provider name:

Provider Admin Contact Information (Name, Phone, Email):

Organizational Capability Review

Organizational Commitment

1. Provide a description of how greening of the built environment fits into your organizational activities.

Education Development Capability

2. Does your organization have dedicated instructional designer(s) (on-staff or contracted) for course development [Yes or No]

    a. Describe your organizations general qualifications for instructional design.

    b. Attach all résumés/professional background information for instructional designer(s).

3. Does your organization have dedicated subject matter experts(s) (on-staff or contracted) for course development [Yes or No]

    a. Describe your organization's general qualifications as green building subject matter experts.

    b. Attach all résumés/professional background information on expert(s).

Instruction and Delivery

4. What percentage of your education is delivered in the following formats?

LIVE: Facilitator-led	
LIVE: Online	
On Demand: Online	
LIVE: Conference	
On Demand: Article/Print	
LIVE: Tour	
Other (Please explain below)	
Total	**100%**

5. Describe your organizational capacity and process to deliver courses/events to your target audience.

6. Describe your system for instructor selection.

7. Describe your system for training instructors.

8. Describe how you evaluate instructor effectiveness and maintain continued quality control.

Quality Control

9. Describe your organization's process to maintain quality and updated courses over time.

10. Describe your organization's process to regularly evaluate your catalog of green offerings.

11. Provide testimonials from three (3) students. These students should have no conflicts of interest with your organization (i.e., cannot be sponsors, board members, employees, etc). The testimonials should be in memo/letterhead format and should be signed by the student. All testimonials should be included in the PDF application (no hardcopies will be accepted).

12. Are you an accredited education institution or IACET approved? [Yes or No]

    a. If so, by which accreditation body?

Conference Call

13. Provide the names and titles of all individuals that will participate on the follow-up conference call. USGBC staff will work with you to plan this call after you have submitted your application.

APPENDIX D Curriculum Map – Energy Conservation Certificate

The Energy Conservation Certificate curriculum prepares students to achieve the expected student learning outcomes identified in the College catalog. The following table demonstrates how learning activities in specific courses map to these learning outcomes.

Key:
I – Introduced **R**-Reinforced and opportunity to practice **M**-Mastery at exit level **A**-Assessment evidence collected

Energy Conservation Certificate Program Student Learning Outcomes	ADC 101	ADC 103	ADC 112	ADC 136	ADC 146	ADC 161	ADC 286
Conduct performance audits of energy consumption in existing buildings.	I				R	M A	R
Plan energy renovation projects.	I	R	R	R			M A
Organize and run an independent construction business.	I			R	M A	R	R
Provide leadership in creating and maintaining a safe working environment.	I			M A	R		R

New Program Proposal

Associate of Applied Science Degree in

Building Science

Community College of Philadelphia
Division of Liberal Studies
Department of Architecture, Design & Construction

Miles Grosbard, RA, Ed.D.
Associate Professor of Architecture and
Chair, Department of Architecture, Design & Construction

Facilitator:
Peter Watkins

Recommended Effective Semester: Fall 2011

January 13, 2011

I. Abstract

In response to broad based interest in Energy Conservation related to buildings, ADC Department faculty, in concert with baccalaureate level institutional and industry partners, are interested in developing two new Programs related to energy conservation in buildings: an Academic Certificate in Energy Conservation (see separate document) and an Associate of Applied Science Degree Program in Building Science.

The new AAS Program in Building Science shares its first semester and part of the remainder of the curriculum with the (proposed) revised Construction Management Program, the difference being five courses.

II. Opportunities or Problems Addressed by the Proposed Program

There are many compelling reasons for developing a program that concentrates on energy conservation at this time. Our nation is at a crossroads in regard to energy consumption; the signs are everywhere. Both in terms of environmental degradation and in terms of independence from foreign energy sources, the energy mantra for the new century is "use less, conserve more."

Energy consumption within buildings account for the largest share of the nation's energy use – 41.5% (compared to 30% by the industrial sector and 28.5% by the transportation sector), and, happily, conservation and energy aware design offers the brightest and most readily achievable hope that we may slow the need for additional energy sources.

In February 2009, the U.S. Congress enacted American Reinvestment and Recovery Act (ARRA) to stimulate the national economy with $787 billion. Catalyzing green energy is a central component of ARRA with more than $45 billion in new investments, including $5 billion to retrofit low-income families' homes to make them more energy efficient - up to $1 billion of which may be spent on training and technical assistance. The ARRA is also funding $500 million in green energy training partnerships across the country to help build the green workforce and strengthen states' green jobs training capacity. Community College of Philadelphia is a proud participant in this effort, having launched the Pathways Out of Poverty (POP) grant in April 2010, with our partner, the Energy Coordinating Agency (ECA).

Research suggests many green jobs will be family-sustaining "middle-skill" jobs that require more than a high school diploma but less than a four-year degree. [1] With existing connections to employers and regional credibility, community colleges are well positioned to play key roles in establishing career pathways in green energy sectors to help low-income students advance. Community colleges across the nation have established programs aimed at the emerging new green economy, including:

- City College of San Francisco (CA)
- The City University of New York (NY)
- Columbia Gorge Community College (OR)
- Lane Community College (OR)
- Los Angeles Trade-Technical College (CA)
- Skyline College (CA)
- South Seattle Community College (WA)
- Camden County College (NJ)

To prepare individuals to succeed in the evolving new energy labor market, the nation's workforce and education systems need to be organized around comprehensive career pathways that integrate education,

[1] Center on Wisconsin Strategy, Greener Pathways: Jobs and Workforce Development in the Clean Energy Economy, 2008, Washington Employment Security Department

training, and work. The establishment of an AAS Program in Building Science is designed to bridge the gap between practical skills (taught at ECA, for example) and collegiate level research-based education.

Although the Program awards the Associate of Applied Science Degree, the proposed Building Science Program is also designed to provide effective transfer opportunities to local baccalaureate institutions with Construction Management programs: Temple University and Drexel University (see Course Equivalency Charts, Appendices B and C respectively).

An even more tailored transfer articulation with Temple University is forthcoming. Temple University is planning to offer a Bachelor of Science Degree in Building Science, housed within the same department with Construction Management. That degree is designed to articulate with the curriculum outlined in this proposal. This partnership with Temple University will form the final piece in a continuum of energy efficient building design, remediation and conservation related training, which will include high school based programs, apprenticeships through technical training institutions such as ECA, the Associate Degree offered by CCP, culminating in Temple's Bachelor of Science degree.

A. Developments with Partner Institutions and Expected Program Participants

1. **The Energy Coordinating Agency**

As mentioned above, CCP is fortunate to partner with the Energy Coordinating Agency (ECA) in developing this new program proposal. While the AAS Program in Building Science is designed for success independent of that organization, partnering with ECA brings added industry applicability and offers a wider array of experiences for students than CCP could develop and offer separately.

ECA has existed for more than 20 years, most notably administering the Low Income Heating Assistance Program (LIHEAP) for Philadelphia. More recently, ECA has developed the capability to perform weatherization construction work, in both low-income and market rate applications. Just this past April, ECA opened a new Green Jobs Training Center in the West Kensington section of Philadelphia. The Training Center is approximately 20,000 square feet of classroom and lab space in a newly renovated LEED Gold building which once manufactured Civil War uniforms. The Center is funded through a wide ranging network of public and private partnerships, including manufactures of "green" products such as BASF, Dow, GreenTek and others.

The purpose of that facility is to enable ECA to offer apprenticeships in the area of weatherization and energy auditing. Associated with these apprenticeship programs, the ADC faculty are proposing that CCP offer coursework leading to a Proficiency Certificate in Weatherization (a program of approximately 15 credits, which will be a ladder into the Academic Certificate in Energy Conservation – see separate proposal documents). The first level apprenticeship program, called Weatherization Installer and Technician (WIT) launched in October 2010, is a combination of hands-on training provided by ECA and academic preparation provided by CCP. The second apprenticeship program, called Building Energy Analyst (BEA) is scheduled to begin in October 2011, and offers more advanced training to prepare people for national certifications such as the Building Performance Institute certifications for building analyst. Both these two apprenticeship programs are currently under review by the US Departments of Energy and Labor. This second, higher level apprenticeship will be associated with the Academic Certificate in Energy Conservation (see separate proposal document).

ECA's interest in having students in their apprenticeship program enroll in CCP courses has helped to inform this proposal. In particular, ECA is interested in incorporating our proposed new course ADC 146 - Construction Supervision & Business Practices, or a proposed new course, ADC 255 – Alternative and Renewable Energy Systems, as well as ADC 136 Building Codes (revised to include a safety component) into their apprenticeship programs. Including these aspects in the proposed Program will help launch Building Science as a viable, essential program, and help it gain immediate acceptance in within the regional Energy Conservation community.

The proposal contained in this document is supportable without ECA's apprenticeship programs, and it is anticipated that many of the Program's students will arrive at CCP through routes that do not include green jobs apprenticeship training. Rather, partnering with ECA provides a readily identifiable base of students which will in a sense 'jump start' the Building Science AAS Program. ECA reaches a constituency typically excluded from higher education, and this emerging partnership will provide access to many who have been excluded from participation in the construction industry. The partnership will help CCP fulfill its mission to "*provide access to higher education for all who may benefit... enabled to meet the changing needs of business, industry and the professions."*

Budget projections for offering this Program (see section VII) are based on CCP's existing contractual relationship with ECA. ECA is an official CCP neighborhood site and we have enjoyed (and project continuing to have) access to their training facility in West Kensington. To date, we have offered two CCP courses there and will offer two additional courses in Spring 2011 at that location. CCP has access to many specialized tools related to measurement of energy consumption and safety that are available at ECA, and would have to replicate these should that relationship end for any reason. CCP's Building Science Program is not contingent on our relationship with ECA, but this relationship greatly facilitates and reduces the Program's initial startup costs.

2. Philadelphia High Schools and Charter Schools

The ADC Department has had success in recent years partnering with several institutions at the pre-college level. An important ongoing partnership is with the Architecture, Construction & Engineering Mentors (ACE Mentors – not to be confused with the College's summer program for high school students – also working under the ACE acronym) Program. In Fall 2010 through Spring 2011 the Department is running a dedicated section of the foundational course ADC 101 for this group. Also, we have pioneered direct relationships with individual high schools including YouthBuild Philadelphia Charter School, Edison, Frankford, Swenson, Douglass, and Mastbaum High Schools. Through these partnerships, the ADC department provides a seamless bridge between high school and college work. This is another identifiable student constituency for the Building Science Program.

3. **The National Association of Minority Contractors (NAMC)**

The National Association of Minority Contractors (NAMC) has been a very helpful partner in reviewing the curriculum outlined in this proposal. As an industry, construction has been slow to adopt affirmative practices, but NAMC recognizes that the emerging area of weatherization and energy conservation provides entry into the construction field for many groups that have been traditionally underrepresented in the construction industry. Individuals involved with NAMC will form a third student constituency for the AAS Program in Building Science.

IV. Description of the Proposed Program

A. Program Goals

The primary goal of the proposed Building Science Program is to prepare students for employment within the regional energy economy. Pennsylvania was recently ranked second in the nation (behind California) in the number of jobs created within the last five years within the energy conservation for buildings industry, and this program is aimed squarely at that demonstrable need. It will help students achieve employment in companies that reduce energy consumption in building and in the design, sales and installation of alternative energy systems. With the inclusion of coursework in construction business practices, safety and supervision, the Program will prepare students who wish to found their own small energy conservation contracting businesses.

A secondary goal of the proposed program is to provide an effective vehicle for transfer to baccalaureate level study for students whose goals include higher academic achievement. The CCP Building Science Program will seek formal articulation with the similar programs at both Temple University and Drexel University; both institutions have been consulted about this proposed AAS Program. Please see course equivalency charts (Appendices B and C) for transfer matches.

B. *Proposed Catalog Description and Course Sequence*

This program prepares students for a variety of careers in the energy conservation industry and related fields, such as energy auditors, renewable energy installers and designers, energy conservation installers and computer energy modelers. Individuals interested in developing small independent energy conservation contracting businesses will also find this program useful toward achieving that goal. Although designed for career preparation, it also can serve students interested in continuing their studies leading to a bachelor's degree. Courses within this program utilize the latest industry-standard scientific methods, instruments and software for determining the energy consumption profile for buildings.

STUDENT LEARNING OUTCOMES:

Upon completion of this program graduates will be able to:

- Conduct performance audits of energy consumption in existing buildings.
- Interpret and produce mechanical, electrical and plumbing drawings and details.
- Plan energy renovation projects.
- Plan and detail alternative energy installations including photovoltaic, solar thermal, and wind turbine systems.
- Organize and run an independent energy conservation contracting business.
- Interpret architectural and construction drawings and documents, demonstrating knowledge of various building materials and methods and related building technologies.
- Utilize computer systems for project planning and management and to produce estimates of probable construction cost, including analysis of costs and benefits
- Investigate and resolve problems in construction planning, scheduling and management.
- Provide leadership in creating and maintaining a safe working environment.

PROGRAM ENTRY REQUIREMENTS:

Students are normally required to take the College's placement tests at the time of entry. Students identified as needing developmental course work must satisfactorily complete the appropriate English and mathematics courses in addition to the requirements of their program.

PROGRAM OF STUDY AND GRADUATION REQUIREMENTS:
To qualify for the A.A.S. degree in Construction Management, a student must complete a minimum of 63 credits as prescribed and attain a minimum grade point average of 2.0 ("C" average).

Proposed Course Sequence – AAS in Building Science

			Prerequisites and Corequisites	Credits	Gen Ed Req.
First Semester					
ADC	101	Introduction to Design & Construction		3	Tech Comp
ADC	103	CAD Basics		3	Tech Comp
ADC	136	Construction Safety and Building Codes		3	
ENGL	101	English Composition I		3	ENGL 101
MATH	137	Geometry for Design (or higher MATH)		3	Math
Second Semester					
ADC	112	Construction Materials & Detailing: Principles	ADC 103 OR 109	3	
ADC	146	Construction Supervision & Business Practices	ADC 101	3	
ADC	161	Energy Auditing, Remediation and Monitoring	ADC 101	3	
ADC	286	Building Rehabilitation and Energy Retrofit	ADC 101	3	
ENGL	102	English Composition II	ENGL 101	3	ENGL 102 & Info Lit
Third Semester					
ADC	163	CAD Building Documentation	ADC 103	3	
ADC	236	Construction Cost Estimating I	ADC 101	3	
ADC	246	Contracts and Specifications	ADC 101	3	
ADC	253	Environmental Systems I	ADC 101	3	
EASC	111	Environmental Conservation		3	Social Science
		Humanities Elective		3	Humanities
Fourth Semester					
ADC	237	Construction Cost Estimating II – Computer Methods & Cost/Benefit Analysis	ADC 236	3	
ADC	254	Environmental Systems II	ADC 253	3	
ADC	255	Alternative and Renewable Energy Systems	ADC 103, ADC 253	3	
ADC	261	Construction Management and Scheduling	ADC 246	3	
		Science Elective		3 or 4	Natural Science
Minimum Credits needed to Graduate				63	

General Education Requirements
All General Education requirements are met through required courses (as indicated above) except for the **Writing Intensive** requirement, the **Interpretive Studies** requirement and the **American/Global Diversity** requirement. Therefore, in order to graduate, students in this program must choose one course that is designated **Writing Intensive**, one course that is designated **Interpretive Studies** and one course that is designated **American/Global Diversity**. The same course may be used to fulfill more than one of these requirements. View the courses that fulfill all degree requirements and receive a more detailed explanation of the College's general education requirements to help in your selection.

C. Accreditation

The AAS Program in Building Science will apply to become recognized as a United States Green Building Council (USGBC) Education Provider. This recognition can be earned by agreeing to comply with established operational and educational criteria. Please see Appendix "A" for the Application instrument.

D. Enrollment Management and Recruitment

The Department of Architecture, Design and Construction will continue to promote its Programs, including the new Building Science Program, through an ongoing outreach effort involving high schools, charter high schools and partnerships such as exists with Energy Coordinating Agency. There are two foundational courses in which students following all curricula in the Department of Architecture, Design and Construction usually enroll in their first semester: ADC 101 – Introduction to Design and Construction and ADC 103 – Basic CAD. These two courses have been and will be offered to cohorts of students from these organizations.

V. Internal Program Coherence

A. *Student Experience and Academic Growth within the Building Science Program*

Two foundational, first semester courses in which students following all curricula in the Department of Architecture, Design and Construction are: ADC 101 – Introduction to Design and Construction and ADC 103 – Basic CAD. These two courses enable students to gain broad perspective on the professions of architecture, interior design, construction management, facilities management, computer assisted design (CAD), planning, engineering, landscape architecture, energy conservation and related professional specializations, also introducing Technical Competency early in the student experience. The early development of these technical skills help students perform at higher levels in subsequent courses. Also, this early exposure helps students determine which academic area they are most interested in pursuing, or perhaps decide early that another major may better suit their interests, talents and abilities. In the revised version of ADC 136 – Construction Safety and Building Codes, first semester students will be exposed early to the importance of industrial safety and societally endorsed values embodied in an array of building and energy codes. The balance of first semester courses includes two General Education courses: ENGL 101 and MATH 137 – Geometry for Design (a college level mathematics course designed specifically for design and construction students).

Second semester courses build on these primary experiences: ADC 112 - Construction Materials & Detailing: Principles is also a foundational course present in most ADC curricula, and helps students begin to develop understanding of the products and materials commonly encountered in contemporary construction. A course proposed for revision – ADC 136 Construction Safety and Building Codes - is introduced in response to recent increased attention to construction safety and health issues. Also, students enroll in two new courses, ADC 146 - Construction Supervision & Business Practices which enhances the Program's business content (requested by the industry advisors), and ADC 161 – Energy Auditing, Remediation and Monitoring, the course which introduces the "science" aspect of Building Science. Students learn and apply industry accepted methods for determining the energy problems and opportunities of existing buildings, using verifiable metrics. Since the majority of anticipated work within the energy conservation field is expected to be within existing buildings, a new course introduced into the department in July 2010, ADC 286 – Building Rehabilitation and Energy Retrofit will occur in this second semester, in which students will also enroll in ENGL 102 - English Composition II.

Most third and fourth semester courses are paired experiences, beginning in the Fall semester and continuing into the Spring semester. Building Science students will enroll in ADC 236 Construction Cost Estimating I - followed by ADC 237 - Construction Cost Estimating II: Computer Methods & Cost / Benefit Analysis. ADC 246 - Contracts and Specifications in the third semester is followed by ADC 261 - Construction Management and Scheduling in the last semester. ADC 253 and 254, Environmental Systems I and II are taken by Building Science students in the third and fourth semesters, respectively. ADC 163 – CAD Building Documentation exposes students to intermediate level computer applications commonly used in the construction industry and helps them refine and further develop CAD skills. EASC 111 – Environmental Conservation (Social Science elective) is also part of this semester, as is a Humanities elective. Finally, in the fourth semester, there is a new course unique to the Building Science Program, ADC 255 – Alternative & Renewable Energy Systems, and a natural science elective.

B. Student Enrichment Activities

Building Science Program students will benefit from a wide array of activities aimed at enhancing their educational experiences. The ADC Department sponsors several trips each year in order to give students the opportunity to view noted architectural and design-oriented sites: trips to New York City and Baltimore are integrated into curriculum in the Fall, and Washington DC or New York City again in the Spring. The Department's annual calendar also includes a lecture series on a variety of topics related to design and construction throughout the year, a show of student work in the Rotunda in January and February, and an alumni panel and jobs fair in March. As the curriculum becomes implemented, we hope to start a student chapter of the US Green Building Council.

VI. Program Institutional Congruence

A. *Intra-Departmental Considerations*

While the existing Construction Management Program is directed towards jobs that involve management of large construction projects, the AAS in Building Science will prepare students for positions that are hands-on and field based. The other AAS Programs in the ADC Department, Facilities Management and Computer Assisted Design, also prepare students for occupations that occur within offices. Building Science, because it pertains to improving energy performance of existing buildings, occupationally occurs mostly on location, not in offices. As a curriculum, Building Science will appeal to students interested in working with their hands as well as their heads.

This proposed Program includes two new courses that will be unique to it: ADC 161 – Energy Auditing, Remediation and Monitoring and ADC 255 – Alternative and Renewable Energy Systems. Additionally, other curriculum projects will be undertaken to suit contemporary construction industry needs: ADC 136 – Construction Safety & Building Codes (revision) and ADC 146 - Construction Supervision & Business Practices (new - both these latter two curriculum projects also relate to proposed changes in the Construction Management Program). All other Program courses already exist at the College.

Several curriculum projects that relate to this proposal are already complete. Broadly based changes to departmental curricula were implemented in Fall 2010 in anticipation of this new Program proposal in Building Science. ADC 253 and 254 – Environmental Systems I and II, ADC 112 – Construction Materials and Detailing: Principles and ADC 237 – Construction Cost Estimating II: Computer Methods & Cost/Benefit Analysis were all

revised in the Spring 2010 semester to include more attention to "green" and energy conservation topics.

B. Effect upon other Departmental Curricula

A possible impact of the development of the new course ADC 146 - Construction Supervision & Business Practices and the revision of ADC 136 - Construction Safety and Building Codes might be to include these courses in the Facilities Management – Construction Option Program. Faculty will study this question and recommend appropriate amendments.

C. Program Support Structure:

1. Educational Support Services

The Division of Educational Support Services through the SACC provides students opportunities to work on projects at the M2-26 computer lab where students advance their facility with complicated software packages through practice in this informal (non-classroom) setting. Additionally, ESS provides resources for a student CAD tutor who meets with students to provide individualized help with projects and assignments.

2. Library Acquisitions

The Department coordinates with Library staff in keeping the collection current with respect to architecture, design and construction titles. Recommendations for additions to Library holdings will be made as new and revised course proposals are developed and completed.

3. Disabilities Accommodation

Students with documented disabilities are and will continue to be provided reasonable accommodations to enable and facilitate learning.

4. Departmental Technology Plan

All hardware and software needed to initiate this new Program already exist at the College. Faculty endeavor to integrate new computer programs and techniques as they are developed and introduced into the architecture, design, construction and energy conservation fields.

VII. Proposed New and Revised Courses

Below is a list of proposed new and revised courses; for an explanation of how the courses in the program relate to the program level student learning outcomes see the curriculum map appended to this document.

Proposed Course Description: The requirements of the Occupational Safety and Health Act and other related federal and state legislation as applied to the building construction industry are studied. Students practice and master common safety procedures. Standards for safety administration, accident prevention, hazard identification, and responsibility for compliance are emphasized. Students are introduced to the national model building and energy conservation codes produced by the International Codes Council. The focus will be on the International Building Code (IBC), and the International Energy Conservation Code (IECC), as well as state and local adaptations of these. Requirements of the Americans with

Disabilities Act (ADA) are also studied. Successful students earn OSHA-30 and EPA Lead Safety certifications.

Learning Outcomes

Upon successful completion of the course, students will be able to:

- Identify common construction site hazards.
- Demonstrate proper methods to reduce personal safety risks.
- Discuss the historical, legal, and philosophical basis of safety and construction codes.
- Explain the International Building Code (IBC) and the International Energy Conservation Code (IECC) , as well as local interpretations and variations of these.
- Identify the responsibilities of major participants in the design and construction process with regard to personal and societal health and safety.
- Explain the major building characteristics that are affected by code analysis and application, such as occupancy, height and area, egress, fire separations, structural loads, construction methods, and structural and finish materials.
- Determine the code classification of any building, using discriminates such as use/occupancy types, occupancy-detailed requirements, height and area limits, and construction types.
- Calculate the "design occupant load" in sample buildings by the standard methods of calculation.
- Explain the major systems and products used for detection and suppression of fire in buildings, including suppression and standpipe systems and fire alarm systems.
- Design a safe egress system for a simple building by manipulating the factors contributing to the occupant load, such as doors, corridor and exit stair widths.
- Discuss laws and standards related to accessibility, especially the American with Disabilities Act.
- Sit for the OSHA 30 and EPA 10 Lead Safety certification examinations.

Major Course Units:

- Regulatory and Legal Underpinnings – OSHA; EPA; ICC; IECC; ADA; Local Jurisdictions
- Introduction to OSHA & the OSH Act; Recordkeeping
- Basic Safety Orientation; General Safety & Health
- Health Hazards & Hazard Communication
- Health Hazards & Hazardous Materials
- Process Safety Management of Highly Hazardous Materials
- Personal Protective Equipment
- Fire Protection
- Materials Handling
- Hand & Power Tools; Welding & Cutting
- Electrical Safety
- Struck-by & Caught-in-between Safety and Protection; Confined Space Entry
- Fall Protection; Stairways & Ladders Scaffolding
- Cranes & Rigging
- Motor Vehicles
- Excavations; Use of Explosives in the Workplace
- Concrete & Masonry Safety Considerations
- Requirements of the ADA

- Requirements of the IBC
- Requirements of the IECC

Proposed Course Description:
This course is an examination of management functions as they relate to the construction industry, including: contract bidding , working with agencies and commissions, staffing, construction bonding and insurance requirements, permits and certifications, business organization, finance and administration, security, construction marketing, procurement equipment management, and green business opportunities. In addition to supervision related to financial and operational aspects of running a construction business, human relations skills needed by a construction project manager/supervisor to promote quality, safety efficiency, and productivity are also studied. Problem solving in relation to field conditions is emphasized.

Learning Outcomes:
Upon successful completion of the course, students will be able to:

- Apply general business practices to the special demands of operating a contracting business
- Create a business plan for a small construction business
- Create a marketing plan for a small construction business, with special regard to "green" business opportunities
- Use a value-added, benefits model for selling construction services
- Use and adapt a variety of standard construction contract instruments
- Create a financial plan detailing anticipated cash flow
- Organize recordkeeping for a small construction business
- Assign and explain duties
- Provide motivation to workers
- Perform quality control inspections and provide redirection if needed
- Identify the elements needed to create a safe working environment
- Develop interpersonal skills for effective communication with clients and staff
- Cultivate strong customer service values
- Evince cultural sensitivity when working with a diverse workforce and client base

Major Course Units:
Business Practices

- General business practices – forms of organization – legal and tax considerations
- Planning for operating a small construction business
- Marketing and selling construction services
- Bidding, Insurance, and Bonding
- "Green" business opportunities
- Adaptations of standard construction contract instruments
- Financial planning for cash flow; lines of credit and other financing options
- Construction cost estimating and project scheduling for small projects
- Organize recordkeeping for a small construction business

Leadership

- Assigning duties
- Explaining tasks providing on the spot training and instruction
- Motivational skills
- Quality control
- Safe working environment

Logistics

- Inventory issues – making sure the right materials are present for the job
- Technical problem solving in the field
- Cost awareness and control
- Shifting labor resources among concurrent jobs

Interpersonal

- Communication skills to work with clients
- Communication skills to work with installers
- Cultivate strong customer service attitude among workers
- Cultural sensitivity - issues in working with diverse client groups.

Proposed Course Description:

Students learn to perform traditional energy audits as well as comprehensive, whole-home assessments. Students will learn to diagnose critical performance factors in buildings and increase the energy efficiency of the building and the comfort, health, and safety of the building's occupants. Students learn to identify major energy related problems and prioritize solutions based on demonstrable building science principles and cost benefit analysis. Successful students will be prepared for the Building Performance Institute (BPI) Building Analyst Certification examination.

Learning Outcomes:

Upon successful completion of the course, students will be able to:

- Identify and understand building performance problems including ice dams, mold and mildew, and indoor air quality issues
- Analyze buildings using "Blower Door" technology and other diagnostic equipment
- Assess building tightness, mechanical and distribution systems and combustion safety for a "whole house" performance-based approach
- Apply "blower door," combustion safety and other diagnostics for assessing air leakage and efficiency in buildings
- Prepare for the Building Performance Institute (BPI) Building Analyst Certification examination.

Principles of Building Science are used to solve heating, cooling and air leakage problems that drive high energy costs. Students learn to use measurement devices designed to quantify these phenomena. The ultimate goal of study in this area is to provide a more comfortable, safer, more energy efficient and

more durable interior living environment.

Major Course Units:

- Principles of Energy and Building Science
- The Energy Audit Process
- Building Shell and Thermal Envelope
- Airflow Basics
- Moisture Management
- Air Quality
- Combustion Safety and CO Monitoring
- Building Systems: HVAC, Lighting, Appliances, and DHW
- Diagnosing Common Building Problems
- Blower Door Testing
- Combustion Testing and Safety
- Health and Safety Issues
- Tools, Equipment & Materials
- Refrigerant Cycles & Heat
- Pump principles
- Comfort/Thermal Performance
- Ducted Distribution System Design
- AC and Heat Pump Control

Active Learning:

Students will become proficient in using the following field testing instruments:

- Blower door
- Ambient Carbon Monoxide Detector
- Manometer
- Natural Gas Detector
- Flue Gas Detector

Proposed Course Description:

This course is an introduction to current research and practical application of alternative and renewable energy technologies focusing on realistic energy conversion to meet the constantly evolving demand for sustainable development. Established energy systems that are investigated in the course include: wind turbines, solar thermal and photovoltaic (PV) systems, geothermal heat transfer, and renewable biofuels. Students learn to design and deploy established alternative solutions that can replace conventional energy systems and perform laboratory experiments to explore the practical applications of alternative energy. Students use building energy modeling software and spreadsheets to analyze proposed alternative energy systems

Learning Outcomes for ADC 255

Upon successful completion of the course, students will be able to:

- Compare and contrast “established” alternative energy systems with conventional systems

- Describe the distinguishing attributes of passive solar design, solar thermal and photovoltaic systems.
- Apply principles of solar radiation and heat transfer to the design of common applications of current solar thermal technology.
- Describe and detail elements of solar systems including flat-plate collectors, thermal energy storage.
- Describe the distinguishing attributes of geothermal heat transfer
- Describe the distinguishing attributes of small scale production of electricity from wind power including sub-components of a wind turbine.
- Interpret atmospheric data necessary to effectively locate wind turbines
- Describe direct conversion of solar energy to electricity (PV systems).
- Discuss advantages and disadvantages of derived biofuels as practical energy sources for buildings
- Demonstrate knowledge of experimental procedures and methods for measuring atmospheric conditions related to alternative energy systems and apply calibration techniques,
- Apply statistical estimates of experimental uncertainty.
- Select the optimal measurement method to greatest accuracy given field conditions
- Use energy modeling software to justify investment in alternative systems
- Develop and draw construction details related to solar thermal, turbines, PV systems

Major Course Units:

- Introduction to Alternative Energy
- Wind Turbines
- Solar Thermal
- Photovoltaic (PV) Systems
- Geothermal Heat Transfer
- Biofuels
- Experimentation and Measurement
- Alternative Energy Systems Design

VIII. Fiscal Implications

A. Projected Student Numbers
Current enrollment projections have 40 new students enrolling in the new Building Science Program each year.

B. Projected Budget

1. Personnel requirements and costs
Much of the expertise required to develop and teach the content already exists among current full and part-time faculty. Several faculty are currently engaged in developing additional expertise in the area of construction safety, pursuant to offering students the ability to become OSHA and EPA certified. This additional training is available at our partner institution, ECA, and has been offered at no cost to our faculty who wish to develop skills in these areas. No

additional full time faculty are needed to make the curriculum revisions contained in this proposal. In time, depending on the success of the new and revised programs in attracting sufficient numbers of new students, the Department will consider making such a request.

2. Capital items
   No new capital items are needed to support the revisions proposed in this document, as the scientific instruments needed for instruction are available to CCP freely from ECA. If CCP's relationship with ECA should terminate in the future, CCP will need to purchase approximately $20,000 in instrumentation to support the two unique courses in this Program (ADC 161 and ADC 255). Perkins funding will be sought for these expenditures should that contingency occur.

3. Initial starting costs
   No unique costs are anticipated.

4. Projected annual operating budget
   There will be no unique operating budget for this Program. It will be run from within the existing Architecture, Design and Construction Department budget.

5. Program support structure and cost
   No new supports or costs are anticipated.

C. Space Requirements
   The Department of Architecture, Design & Construction is scheduled to relocate from the west side of the West Building to the area currently occupied by the Counseling Department (W2-1 and environs) in the third phase of the current construction project. No additional space requirements are projected.

IX. Appendices

APPENDIX A – Accreditation Requirements

USGBC Education Provider
Portfolio Review Application Form

- ✓ Complete this form by typing answers after each question. When complete, the Provider Admin must upload the application (as a single PDF document) via the Provider dashboard at www.usgbc.org/educationreview. Hardcopies are not accepted.
- ✓ Have 3 courses successfully approved by USGBC.
- ✓ Conduct a conference call with USGBC: Once the first two items are completed you will be contacted by USGBC to schedule a follow-up call (approx. 30-60 minutes). Key players involved in your education are expected to participate.

USGBC may request additional information on any of the questions listed below.

Direct questions to edprovider@usgbc.org. For more information on the portfolio review, please reference the Portfolio Review Guidelines.

Date:

Provider name:

Provider Admin Contact Information (Name, Phone, Email):

Organizational Capability Review

Organizational Commitment

1. Provide a description of how greening of the built environment fits into your organizational activities.

Education Development Capability

2. Does your organization have dedicated instructional designer(s) (on-staff or contracted) for course development [Yes or No]

    a. Describe your organizations general qualifications for instructional design.

    b. Attach all résumés/professional background information for instructional designer(s).

3. Does your organization have dedicated subject matter experts(s) (on-staff or contracted) for course development [Yes or No]

    a. Describe your organization's general qualifications as green building subject matter experts.

    b. Attach all résumés/professional background information on expert(s).

Instruction and Delivery

4. What percentage of your education is delivered in the following formats?

LIVE: Facilitator-led	
LIVE: Online	
On Demand: Online	
LIVE: Conference	
On Demand: Article/Print	
LIVE: Tour	
Other (Please explain below)	
Total	**100%**

5. Describe your organizational capacity and process to deliver courses/events to your target audience.

6. Describe your system for instructor selection.

7. Describe your system for training instructors.

8. Describe how you evaluate instructor effectiveness and maintain continued quality control.

Quality Control

9. Describe your organization's process to maintain quality and updated courses over time.

10. Describe your organization's process to regularly evaluate your catalog of green offerings.

11. Provide testimonials from three (3) students. These students should have no conflicts of interest with your organization (i.e., cannot be sponsors, board members, employees, etc). The testimonials should be in memo/letterhead format and should be signed by the student. All testimonials should be included in the PDF application (no hardcopies will be accepted).

12. Are you an accredited education institution or IACET approved? [Yes or No]

    a. If so, by which accreditation body?

Conference Call

13. Provide the names and titles of all individuals that will participate on the follow-up conference call. USGBC staff will work with you to plan this call after you have submitted your application.

APPENDIX B

Course Equivalency Chart – Building Science – Construction Management / Energy Conservation
Temple University – Community College of Philadelphia

Temple University Course				Community College of Philadelphia Course			
ENGL	0802[C050]	**College Composition**	3	ENGL	101	**English Composition I**	3
ENGR	1101[0001]	**Intro. to Engr.**		ADC	101	**Intro to Design & Construction**	
CE	1105[0005]	**Surveying**	2	ADC	186	**Surveying**	3
CE	1115[0015]	**Surveying Lab**	1			**(forgiven)**	
Engr	1117[0011]	**Engr. Graphics**	3	ADC	103	**CAD Basics**	3
IH	1196[X051]	**Intellectual Heritage I**	3			**Humanities Elective**	3
CCET	2120[0120]	**Constr. Methods &**		ADC	112	**Construction Materials & Detailing:**	3
		Materials	3			**Principles**	
CE	2341[0241]	**Constr. Materials Lab**	2			**(forgiven)**	3
Math	xxxx	**Approved Math Elect #1**	3	MATH	137	**Geometry for Design**	3
CCET	2125[0125]	**Constr. Contracts & Specs**	3	ADC	246	**Contracts and Specifications**	3
CE	1010[0010]	**Comp & Spec. Topics**	3	ADC	163	**CAD Building Documentation**	3
				ADC	236	**Construction Cost Estimating I -**	3
CCET	3121[0121]	**Construction Estimating**	3			**Quantity & Takeoff**	
CCET	3123[0123]	**Construction Est. Lab**	1			**(forgiven)**	
				ADC	136	**Construction Safety & Building Codes***	3
CE	2396[W147]	**Safety & Envir. Aspects**	2			**(revised course)**	
				ADC	286	**Building Rehabilitation &**	3
XXXX	xxxx	**Appr. Specialty Elective**	3			**Redevelopment**	
				ADC	146	**Construction Supervision & Business**	3
XXXX	xxxx	**Appr. Specialty Elective**	3			**Practices (new course)**	
Science	xxxx	**Approved Science Elective**	4	EASC	111	**Environmental Conservation**	3
CCET		**Construction Planning &**		ADC	261	**Construction Management &**	3
	3322[0122]	**Scheduling**	3			**Scheduling**	
				ADC	237	**Construction Cost Estimating II - Comp**	3
Engr	3096[W241]	**Economic Analysis**	3			**Methods and Cost Benefit Analysis**	
				ADC	255	**Alternative and Renewable Energy**	3
		Specialty Elective	3			**Systems**	

COURSES NOT Required in CCP's Building Science Program, but available at CCP

Math	1022[C074]	**PreCalculus**	4	MATH	162	**Precalculus II**	3
Math	1031/1041	**Diff & Integral/Calc I**	4	MATH	171	**Calculus I**	4
Phys	1011[C083]	**College Physics I**	4	PHYS	111	**General Physics I**	4
Core	xxxx	**Language/Int'l Studies II**	3			**Language/Int'l Studies**	3
Engr	2331[0131]	**Statics**	3	ENGR	221	**Vector Mechanics I (Statics)**	3
Phys	1012[C084]	**College Physics II**	4	PHYS	112	**General Physics II**	4
IH	1297[X052]	**Intellectual Heritage II**	3			**Humanities Elective**	3
Math	xxxx	**Approved Math Elective #2**	3	MATH	172	**Calculus II or Higher**	4
Core	xxxx	**American Culture**	3			**Soc Sci or Humanities elective**	3
Econ	1101/02[C0	**Micro/Macro Econ.**	3	ECON	181	**Principles of Macroeconomics OR**	3
	51/52]			ECON	182	**Principles of Microeconomics**	
	(Core-IN)						
Core	xxxx	**The Arts**	3			**Arch Hist / Art / Theater**	3
CCET	4335[0335]	**Steel and Wood Structures**	3	ADC	227	**Structures II**	3
ENGL	2696	**Tech Writing**	3	ENGL	112	**Report and Technical Writing**	3

COURSES TO TAKEN @ Temple University

Engr	2333[0133]	**Mechanics of Solids**	3

CCET	3330[0330]	**Soils Mechanics**	3
CCET	3350[0350]	**Applied Hydraulics**	3
ET	4119[0313]	**Professional Seminar**	1
CCET	4336[0336]	**Concrete & Masonry Design**	3
CCET	4355[0355]	**Transportation Systems Mgt.**	3
CCET	4396[W36X]	**Capstone in Construction**	3
		Specialty Elective	3

APPENDIX C

Course Equivalency Chart – Building Science – Construction Management / Energy Conservation
Drexel University – Community College of Philadelphia

Drexel University Course				Community College of Philadelphia Course			
(courses grouped to preserve equivalency (trimester credits > semester credits)							
ENGL	101	**Expository Writing and Reading**	3	ENGL	101	**English Composition I**	3
ENGL	102	**Persuasive Writing and Reading**	3	ENGL	102	**English Composition II**	3
ENGL	103	**Analytical Writing and Reading**	3				
CHEM	111	**General Chemistry I**	4	CHEM	110	**Introductory Chemistry (Sci Elec)**	4
CHEM	113	**Chemistry Laboratory I**	1.5				
CMGT	161	**Building Materials and Construction Management I**	3	ADC	112	**Construction Materials and Detailing: Principles**	3
CMGT	263	**Understanding Construction Drawings**	3	ADC	161	**Energy Auditing, Remediation & Monitoring**	3
CMGT	265	**Information Technology in Construction**	3	ADC	163	**Digital Documentation in Architecture and Construction**	3
		Free Elective (6 of 12)	6	ADC	103	**CAD Basics**	3
CMGT	266	**Building Systems I**	3	ADC	253	**Environmental Systems I**	3
CMGT	267	**Building Systems II**	3	ADC	254	**Environmental Systems II**	3
		Construction Elective (3 of 12 @ CCP)	3				
CMGT	101	**Introduction to Construction Management**	3	ADC	101	**Introduction to Design and Construction**	3
CMGT	261	**Construction Safety**	3	ADC	136	**Construction Safety & Building Codes**	3
CMGT	262	**Building Codes**	3				
CMGT	264	**Construction Management of Field Operations**	3	ADC	146	**Construction Supervision & Business Practices* (new course)**	3
PHIL	301	**Business Ethics**	3	ADC	261	**Construction Management and Scheduling**	3
BLAW	201	**Business Law I**	4				
CMGT	363	**Estimating I**	3	ADC	236	**Construction Cost Estimating I - Quantity & Takeoff**	3
CMGT	364	**Estimating II**	3	ADC	237	**Construction Cost Estimating II - Cost Benefit Analysis**	3
CIVE	240	**Engineering Economics**	3				
		Construction Electives (9 of 12 @ CCP)	9	ADC	246	**Contracts and Specifications**	3
				ADC	286	**Building Rehabilitation and Energy Retrofit**	3
		Free electives (8 of 12 @ CCP)	8	MATH	137	**Geometry for Design**	3
				ADC	255	**Alternative and Renewable Energy Systems**	3

		Humanities elective	3			**Humanities Elective**	3
ENVS	260	**Environmental Science and Society I**	3	EASC	111	**Environmental Conservation (Soc Sci elective)**	3
		Social Science elective	3				
		ACCEPTED in TRANSFER from CCP (trimester cr)	**92.5**			**TRANSFERRED from CCP**	64
		Equivalent to (semester cr)	**62**				

COURSES NOT IN BS-CM or BS-EC PROGRAM, but available at CCP

PHYS	182	**Applied Physics I**	3	PHYS	111	**General Physics I**	4
ACCT	115	**Financial Accounting**	4	ACCT	101	**Financial Accounting**	3
ECON	201	**Principles of Microeconomics**	4	ECON	182	**Principles of Microeconomics**	3
ECON	202	**Principles of Macroeconomics**	4	ECON	181	**Principles of Macroeconomics**	3
STAT	201	**Statistics I**	4	ECON	112	**Statistics I**	3
COM	230	**Techniques of Speaking**	3	ENGL	115	**Public Speaking**	3
MATH	110	**Pre-Calculus**	4	MATH	162	**Pre-Calculus II**	3
MATH	121	**Calculus**	4	MATH	171	**Calculus**	4
COM	270	**Business Communication**	3	ENGL	113	**Writing and Research for Professions (new course)**	3
		Soc Sci or Humanities elective	3			**Soc Sci or Humanities elective**	3
CMGT	266	**Building Systems I**	3	ADC	253	**Environmental Systems I (EC ONLY)**	3
CMGT	267	**Building Systems II**	3	ADC	254	**Environmental Systems II – LEED Green Assoc Prep (EC ONLY)**	3
		Free Elective (3 of 12)	3				
CIVE	251	**Engineering Surveying**	3	ADC	186	**Surveying**	3
CMGT	162	**Building Materials and Construction Management II**	3	ADC	212	**Construction Materials and Detailing: Methods**	3
CMGT	163	**Building Materials and Construction Management III**	3				

COURSES TO TAKEN @ DREXEL U

HRMT	323	**Principles of Human Resource Administration**	4
ORGB	300	**Organizational Behavior**	4
CMGT	265	**Soil Mechanics in Construction**	4
COM	330	**Professional Presentations**	3
FIN	301	**Introduction to Finance**	4
COM	310	**Technical Communication**	3
ENVS	272	**Physical Geology**	4
CMGT	461	**Construction Management I**	3
CMGT	463	**Value Engineering I**	3
CMGT	467	**Techniques of Project Control**	4
CMGT	361	**Contracts & Specifications I**	3
CMGT	362	**Contracts & Specifications II**	3

APPENDIX D – Building Science Program Curriculum Map

The Building Science curriculum prepares students to achieve the expected student learning outcomes identified in the College catalog. The following table demonstrates how learning activities in specific courses map to these learning outcomes.

Key:
I – Introduced **R**-Reinforced and opportunity to practice **M**-Mastery at exit level **A**-Assessment evidence collected

Building Science Program Student Learning Outcomes	ADC 101	ADC 103	ADC 112	ADC 136	ADC 146	ADC 161	ADC 163	ADC 236	ADC 237	ADC 246	ADC 253	ADC 254	ADC 255	ADC 261	ADC 286
Conduct performance audits of energy consumption in existing buildings.	I				R	M A	R								R
Interpret and produce mechanical, electrical and plumbing drawings and details.	I	R	R			R	R				R	M A	M A		
Plan energy renovation projects.	I	R		R			R		R	R	R	R	R	R	M A
Organize and run an independent construction business.	I			R	M A	R		R	R	R				R	R
Interpret architectural and construction drawings and documents, demonstrating knowledge of various building materials and methods and related building technologies.	I	R	R			R	M A	R	R		R	R	R		
Utilize computer systems for project planning and management and to produce estimates of probable construction cost, including analysis of costs and benefits.	I	R			R	R		R	M A	M				M	
Investigate and resolve problems in construction planning, scheduling and management.	I				R					M A				M A	R
Provide leadership in creating and maintaining a safe working environment.	I			M A	R					R					R