

Outcomes-Based Accreditation

American Council for Construction Education (ACCE)

Annual Meeting

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Agenda

- Process Oriented vs Outcomes-Based Accreditation
- Curriculum Requirements – Current vs OBS
- Student Learning Outcomes
- Quality Improvement Plan
- Assessment Methods
- Case Study



Process Oriented vs Outcomes- Based Accreditation



Program Accreditation

- Program accreditation is both a structure and a process that demonstrates a measure of public accountability that graduates have mastered a baseline set of knowledge and skills in order to function as required in specific professional venues.
 - Process Oriented Accreditation
 - Outcomes-Based Accreditation



Process Oriented Accreditation

- It requires academic programs to offer a given set of topics in a prescribed sequence (input based - what is taught).
- The presumption is that students passing such classes had indeed mastered the knowledge or skill set required in their profession.
- Problem: passing grades do not always equate to a mastered skill.
- Solution: Outcomes-based accreditation



Outcomes-Based Accreditation

- It requires a set of outcomes that represent behaviors, skills, and knowledge practitioners need to possess in order to function in their profession (output based - what is learned).
- Outcomes-based accreditation focuses on
 - Learning, not teaching
 - Students, not faculty
 - Outcomes, not inputs or capacity



Student Learning Outcomes (SLOs)

- SLOs are statements that specify what students will know, be able to do or be able to demonstrate when they have completed or participated in a program.
- Outcomes are usually expressed as knowledge, skills, attitudes or values.
- SLOs specify an action by the student that must be observable, measurable and able to be demonstrated.



Outcomes-Based Standards (OBS)

- OBS specify SLOs and require documentation of:
- the evidence of the achievement of SLOs
- the systematic use of SLOs in self evaluations, and the routine use of outcome assessment results to inform strategies for improvement at the course and program level.

Why outcomes based standards?

- *Allows construction units greater flexibility to emphasize specialties (e.g., Residential, Industrial, Heavy Civil, MEP, Demolition, etc.).*
- *Allows construction units greater flexibility to respond to emerging subject matter areas (e.g., BIM, Green Building, LEAN, IPD, etc.).*
- *Would help units better align their curriculum with the core curriculum requirements of their university.*
- *Regional Accreditation Organizations (such as SACCS) require SLOs*



Curriculum Requirements Current vs OBS



ACCE Curriculum Requirements

The current ACCE curriculum requirements are prescriptive in nature:

- Minimum no. of hours in each category
- Minimum no. of subject matter hours
- Inclusion of specific topical content

ACCE Curriculum Category Requirements

<u>Curriculum Categories</u>	<u>Minimum Academic Credit</u>
1) General Education	15 semester (22 quarter) hours
2) Mathematics and Science	15 semester (22 quarter) hours
3) Business and Management	18 semester (27 quarter) hours
4) Construction Science*	20 semester (30 quarter) hours
5) Construction*	20 semester (30 quarter) hours
 Total Combined Construction Science and Construction*	 50 semester (75 quarter) hours
 <u>Subtotal: Prescribed Category Credits</u>	 98 semester (146 quarter) hours
 6) Other Credit Hours (As needed to complete 120 hour threshold or to meet additional institutional and program requirements)	 22 semester (34 quarter) hours
 Total ACCE Accreditation Requirement	 120 semester (180 quarter) hours**

Core Subject Matter Requirements

Construction

Core Subject Matter	Minimum Academic Credit
Estimating	3 semester (4 quarter) hours
Planning and Scheduling	3 semester (4 quarter) hours
Construction Accounting and Finance	1 semester (1.5 quarter) hour(s)
Construction Law	1 semester (1.5 quarter) hour(s)
Safety	1 semester (1.5 quarter) hour(s)
Project Management	3 semester (4 quarter) hours

Topical Contents

	Construction Graphics
	Basic Sketching and Drawing Techniques
	Graphic Vocabulary
	Detail Hierarchies, Scale, Content
	Notes and Specifications, Reference Conventions
	Computer Applications
	Construction Surveying
	Survey, Layout, and Alignment Control
	Site Organization and Development
	Construction Methods and Materials (including: concrete, steel, wood, and soils)
	Composition and Properties
	Terminology & Units of Measure
	Standard Designations, Sizes, and Graduations
	Conformance References and Testing Techniques
	Products, Systems and Interface Issues
	Equipment Applications & Utilization
	Comparative Cost Analysis
	Assembly Techniques & Equipment Selection

OBS - Category Semester (Quarter) Hour Requirements

Curriculum Categories	Minimum Academic Credit			
	Bachelor Degree		Associate Degree	
	Semester Hours	Quarter Hours	Semester Hours	Quarter Hours
A Communications	6	9	3	4
B Mathematics	3	4	3	4
C Physical Science	6	9	3	4
3.2.1.2 Business & Management	12	18	3	4
Total Combined A, B, C, and 3.2.1.2 *	33	48	18	27
3.2.1.3 Construction	50	75	33	48
Subtotal prescribed category credits	83	123	51	75
Other credits **	37	57	9	15
Total ACCE Accreditation Requirements	120	180	60	90

Major Changes

	Curriculum Categories	Minimum Semester Credit Hour	
		Current	New
	General Education	15	None
A	Communications	8	6
B	Math and Science	15	9
C	Business and Mgmt.	18	12
	Construction Science	20	None
	Construction	20	None
	Total A+B+C	41	33
	Total Construction	50	50
	Total Prescribed Category	98	83
	Other Semester CH	22	37
	Total Semester CH Requirements	120	120

Construction Category

Core Subject Matter	Minimum Semester Credit Hour	
	Current	New
Design Theory	3	None (SLO 19, 20)
Analysis and Design of Const. Sys.	6	None (SLO 19, 20)
Construction Methods and Mat.	6	None (SLO 8)
Construction Graphics	1	None (SLO 7)
Construction Surveying	1	None (SLO 11)
Ethics	1	None (SLO 6)
Estimating	3	None (SLO 4)
Planning and Scheduling	3	None (SLO 5)
Const. Accounting and Finance	1	None (SLO 14)
Const. Law	1	None (SLO 17)
Safety	1	None (SLO 3)
Project Mgmt.	3	None (SLO 16)

Topical Contents in Current Standards are Replaced by SLOs

	Construction Graphics
	Basic Sketching and Drawing Techniques
	Graphic Vocabulary
	Detail Hierarchies, Scale, Content
	Notes and Specifications, Reference Conventions
	Computer Applications
	Construction Surveying
	Survey, Layout, and Alignment Control
	Site Organization and Development
	Construction Methods and Materials (including: concrete, steel, wood, and soils)
	Composition and Properties
	Terminology & Units of Measure
	Standard Designations, Sizes, and Graduations
	Conformance References and Testing Techniques
	Products, Systems and Interface Issues
	Equipment Applications & Utilization
	Comparative Cost Analysis
	Assembly Techniques & Equipment Selection



Student Learning Outcomes

Bloom's Taxonomy Verbs

- **Remembering:** The lowest level of the taxonomy, remembering, requires students to do very little with the information they are learning. They may be asked to recall, list, or name an idea or concept.
- **Understanding:** At the next level, students demonstrate that they understand the content by explaining, summarizing, classifying, or translating the given information.
- **Applying:** At the application level, students begin to put the information they are learning into context. Here they are able to integrate ideas across multiple situations, or utilize the content in a new way.
- **Analyzing:** When students are presented with analysis tasks, they begin to develop higher order thinking. They may be asked to compare and contrast or take a concept and break it into parts to explore the relationships present.
- **Evaluating:** At this stage, students are asked to judge an idea. This may involve predicting, experimenting, critiquing, or making an argument from evidence.
- **Creating:** At the highest level, students are producing new ideas or products that integrate the knowledge they have gained. When students are involved in creating new artifacts, they are actively engaged in the subject matter.

ACCE SLOs for 4-year Degree Program

- 1. *Create written communications appropriate to the construction discipline (4.57).*
- 2. *Create oral presentations appropriate to the construction discipline (4.37).*
- 3. *Create a construction project safety plan (4.39).*
- 4. *Create construction project cost estimates (4.26).*
- 5. *Create construction project schedules (4.42).*
- 6. *Analyze professional decisions based on ethical principles (4.51).*
- 7. *Analyze construction documents for planning and management of construction processes (4.49).*
- 8. *Analyze methods, materials, and equipment used to construct projects (4.49).*
- 9. *Apply construction management skills as a member of a multi-disciplinary team (4.50).*
- 10. *Apply electronic-based technology to manage the construction process (4.06).*

ACCE SLOs - Continued

- 11. *Apply basic surveying techniques for construction layout and control (3.91).*
- 12. *Understand different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process (4.22).*
- 13. *Understand construction risk management (3.96).*
- 14. *Understand construction accounting and cost control (3.91).*
- 15. *Understand construction quality assurance and control (4.05).*
- 16. *Understand construction project control processes (4.00).*
- 17. *Understand the legal implications of contract, common, and regulatory law to manage a construction project (3.95).*
- 18. *Understand the basic principles of sustainable construction (3.93).*
- 19. *Understand the basic principles of structural behavior (3.91).*
- 20. *Understand the basic principles of mechanical, electrical and piping systems (3.80).*



Quality Improvement Plan



Quality Improvement Plan (QIP)

- QIP serves as the basis for the continuous improvement of the construction program. It has three major components:
 - Strategic Plan for the educational unit
 - Assessment Plan for the construction program
 - Assessment Implementation Plan for the construction program



Assessment Plan Components

- Mission Statement of the construction program.
- Construction program objectives.
- Program Learning Outcomes (PLOs). Shall meet or exceed the ACCE SLOs.
- Assessment tools. Shall measure construction program objectives and learning outcomes.
- Performance criteria. Shall be used to measure the achievement of the construction program objectives and learning outcomes.



Assessment Implementation Plan

- Educational units shall conduct a comprehensive assessment at the construction program level.
- The results of each assessment cycle shall be documented in a systematic manner.
- Evaluation of the construction program objectives and learning outcomes shall be compared to the stated performance criteria to determine whether stated objectives and learning outcomes were achieved and if there is a validated need for improvement in any areas.



Assessment Methods

Assessment Methods

- Data-collection methods for assessment purposes fall into two categories: direct and indirect.
- Direct: evidence of student learning is in the form of a student product or performance that can be evaluated
- Indirect: evidence is the perception, opinion, or attitude of students (or others).

Direct vs Indirect Assessment

- Direct:
 - reveals what students have learned and to what degree
 - it does not provide information as to *why* the student learned or did not learn
- Indirect:
 - can be used to answer *why* questions
 - the *why* is valuable because it can guide faculty members in how to interpret results and make improvements
- Indirect evidence by itself is insufficient and direct evidence is required
- Ideally, a program collects both types



Examples of Assessment Methods

- Direct:
 - licensure or certification
 - embedded testing or quizzes
 - embedded assignment
 - pre- post-tests, and capstone projects.
- Indirect:
 - student surveys
 - alumni surveys
 - employer surveys
 - end-of-course evaluations
 - Interviews
 - job placement data
 - enrollment in higher degree programs

Associate Constructor (AC) Exam

- I. Communication Skills: 13% SLO 1- Written
- II. Engineering Concepts: 5% SLO 19 - Structures
- III. Management Concepts: 12% SLO 12- Delivery Meth.
- IV. Materials/Methods: 10% SLO 8- Materials/Meth.
- V. Bidding and Estimating: 12% SLO 4- Estimating
- VI. Budget/Costs/Cost Control: 12% SLO 14- Cost Control
- VII. Planning/Scheduling: 12% SLO 5- Scheduling
- VIII. Construction Safety: 7% SLO 3- Safety
- IX. Construction Geomatics: 2% SLO 11- Surveying
- X. Project Administration: 15% SLO 16 - Project Control



Examples

Example of QIP

Table of Contents

- **Strategic Plan**
 - Background and History
 - Mission Statement
 - Vision
 - Core Values
 - Goals, Strategies, and Metrics
 - Goal 1
 - Goal 2
 - Goal 3
 - Goal 4
- **Assessment Plan for Degree of Bachelor of Science in Construction Management**
 - Mission Statement
 - Objectives
 - Program Learning Outcomes
 - Assessment Tools
 - Performance Criteria
 - Evaluation Methodology
- **Assessment Implementation Plan**

Mission Statement for BSCM Degree

- The mission of the undergraduate program is to prepare graduates for an outstanding professional career in the construction industry and related fields through an appropriate curriculum delivered with expert instruction to achieve a high level of student learning.

Objectives for BSCM Degree

- 1. Students should be academically high achieving.
- 2. Students should have members of under-represented groups.
- 3. Provide a curriculum and educational experience relevant to a career in construction management with expert instruction that results in a high level of student learning.
- 4. Provide diverse career opportunities for students.
- 5. Provide graduates for the construction industry.

BSBC Program Learning Outcomes

- 1. Apply knowledge of engineering, materials, methods, equipment, and processes to safely construct buildings and structures.
- 2. Survey and quantify building components to estimate project costs, analyze progress, and control expenditures.
- 3. Create an effective planning, scheduling and control system by identifying, evaluating and organizing the diverse elements of a construction project.
- 4. Set up and manage project administration and management systems to efficiently document and monitor the construction process.
- 5. Communicate technical and financial data effectively in speech and in writing to all stakeholders in the construction process

Assessment Tools for the BSBC Degree Program Objectives

- 1. Students should be academically high achieving.
 - - Measure: Average SAT and GPA of pre-BCN courses
- 2. Students should have members of under-represented groups.
 - - Measure: Percentages of underrepresented groups
- 4. Provide diverse career opportunities for students
 - - Measure: Percentage of placement rate within 3 months after graduation
 - - Measure: Percentage of students complete an internship
 - - Measure: Diversity of companies attending the career fair
- 5. Provide graduates for the construction industry
 - - Measure: Upper division enrollment
 - - Measure: Number of graduates¹.

Assessment Tools for Objective 3

- Provide a curriculum and educational experience relevant to a career in construction management with expert instruction that results in a high level of student learning.
- - Measure: Evaluation of curriculum by industry
- - Measure: Student learning outcome assessments
- - Measure: AC exam results
- - Measure: Student's exit survey
- - Measure: Student's informal discussion with industry advisory board members
- - Measure: One and five year alumni surveys
- - Measure; Employer survey
- - Measure: Percentage of students on a competition team
- - Measure: Percentage of competition teams placing in top three
- - Measure: Percentage of students on an international exchange

Course Learning Outcomes (CLOs)

- **BCN 3521 – Electrical Systems**
- Upon completion of the course students will demonstrate their ability to:
- **①** Understand fundamentals of electrical systems (ACCE SLO 20)
- **②** Recognize safety issues in dealing with electrical systems (ACCE SLO 3)
- **③** Read, understand, and use electrical drawings, specifications, and codes (ACCE SLO 7)
- **④** Describe properties of boxes and conduits, service and distribution, transformers, grounding, branch circuits and feeders, motors and motor controls, lighting, fire alarm systems, and low voltage systems. (ACCE SLO 8)

ASSESSMENT METHODS AND TARGETS for CLOS

Assessment	CLO 1	CLO 2	CLO 3	CLO 4	Target
Final Exam	X		X	X	At least 80% receive a C- or better
Lab		X			At least 80% receive a B- or better

Course Learning Outcomes (CLOs):

- **BCN 4510 – Mechanical Systems**
- Identify conditions that constitute a comfortable environment, (ACCE SLO 20).
- Demonstrate knowledge of residential and commercial plumbing systems, (ACCE SLO 20).
- Explain the components and operation of direct expansion and chilled water equipment (ACCE SLO 8).
- Locate the properties of air with a psychrometric chart, (ACCE SLO 20).
- Understand the operation of air distribution systems and be able to interpret and extract information from codes and standards. (ACCE SLO 20).
- Interpret mechanical specifications, drawings and submittals (ACCE SLO 7).
- Discuss energy efficiency measures to reduce a building's heating and cooling load (ACCE SLO 18).

Assessment	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5	CLO 6	CLO 7	Target
Test 1	X							At least 80% receive a grade of B- or better
Test 2			X					At least 80% receive a grade of B- or better
Test 3				X				At least 80% receive a grade of B- or better
Test 4					X			At least 80% receive a grade of B- or better
Test 5							X	At least 80% receive a grade of B- or better
Submittal Lab		X				X		Successful completion of 90% of lab questions

19-May-14		Mapping SACS SLO, ACCE SLO, and CLOs				
SACS SLO	ACCE SLO					
No	SACS Student Learning Outcome	SACS Assessment	No	ACCE Student Learning Outcome	ACCE Assessment	Course Learning Outcomes
1	Apply knowledge of engineering, materials, methods, equipment, and processes to safely construct buildings and structures.	BCN 4787 Assignment 6 AIC Exam	8	Analyze methods, materials, and equipment used to construct projects.	AIC Exam Employer Survey	BCN 1210 (CLO 1,2) BCN 3223 (CLO 1, 3, 5, 6, 8) BCN 3224 (CLO 1, 2, 3, 4, 5) BCN3521 (CLO 4) BCN 3431 (CLO 3) BCN 4423 (CLO 4, 5, 6, 7) BCN 4510 (CLO 3) BCN 4787 (CLO 3)
			7	Analyze construction documents for planning and management of construction processes.	BCN 4720 Assignment Alumni Survey	BCN 1251 (CLO 1, 2, 3, 4, 5, 6, 7) BCN 3255 (CLO 1) BCN3431 (CLO 5) BCN3521 (CLO 3) BCN4510 (CLO 6) BCN 4787 (CLO 4)
			19	Understand the basic principles of structural behavior.	AIC Exam BCN 4423 Assignment Employer Survey	BCN 2405 (CLO 1, 2, 3, 4, 5) BCN 3223 (CLO7) BCN 3431 (CLO 4, 6) BCN 4423 (2, 3) BCN 4787 (CLO 1)
			20	Understand the basic principles of mechanical, electrical and plumbing systems.	BCN 3521 Final Exam BCN 4510 Submittal Lab Employer Survey	BCN 3521 (CLO 1) BCN 4510 (CLO 1, 2, 4, 5)

Assessment Tools for the Program

Learning Outcome

- PLO 1. BCN 4787 Assignment 6; AC Exam Sections 2, 4, 8, and 9
- PLO 2. BCN 4787 Assignment 7; AC Exam Sections 5 and 6
- PLO 3. BCN 4787 Assignment 8; AC Exam Section 7
- PLO 4. BCN 4787 Assignments 9, 10, 11, and 12; AC Exam Sections 3 and 10
- PLO 5. BCN 4787 Project Presentation; AC Exam Section 1

Course No.	Course Title														
		SLO 1	SLO 2	SLO 3	SLO 4	SLO 5	SLO 6	SLO 7	SLO 8	SLO 9	SLO 10	SLO 11	SLO 12	SLO 13	SLO 14
		written	oral	safety	estim.	sched.	ethics	docum.	meth.	team	IT	survey	delivery	risk	accoun.
BCN 1001	Intro to Building Const.												I		
BCN 1210	Const. Materials								I						
BCN 1251C	Const. Drawing							I			I				
BCN 1582	Inter. Sustainable Devel.							I							
BCN 2405C	Const. Mechanics														
ENC 3254	Prof. Writing in Const.	I	I												
BCN 3027C	Intro to Const. Mgmt.		R					I					I	I	
BCN 3223C	Soils and Concrete	R								I					
BCN 3224C	Const. Techniques			I						I					
BCN 3255C	Graphic Comm. In Const.							I			I				
BCN 3281C	Const. Surveying										I	I, A			
BCN 3431C	Structures			R				R	R						
BCN 3521C	Electrical Systems			R				R	R						
BCN 3611C	Const. Estimating 1				I			R			I				
BCN 3700	Const. Contracts	R						R						R	
BCN 3730	Const. Safety, Health & Envir.			I, A				R							
BCN 4423C	Temporary Structures			R					R						
BCN 4510C	Mechanical Systems								R	R					
BCN 4612	Const. Estimating 2				I, A			R			I				
BCN 4720	Const. Planning and Control	R	R			I, A			R, A		I				I
BCN 4753	Const. Finance													R	I, A
BCN 4709	Const. Project Mgmt. (DA)	A						R, A		R	R		R, A	R, A	
BCN 4787C	Const. Capstone Proj. (DA)	R	R, A	R	R	R		R	R	R, A	R, A		R		
AIC Exam	70% of students pass (DA)	A-1		A-8	A-5	A-7			A-4			A-9			A-6
Employer S.	min 4 on 1 to 5 scale (IA)	A	A	A	A	A	A		A	A	A	A			A
Alumni S.	min 3.5 on 1 to 5 scale (IA)								A				A	A	

I = Introduced R = Reinforced A = Assessed DA = Direct Assessment IA = Indirect Assessment

Course No.	Course Title					
		SLO 1	SLO 2	SLO 3	SLO 4	SLO 5
		Written	Oral	Safety	Estim.	Sched.
ENC 3254	Prof. Writing in Const.	I	I			
BCN 3027C	Intro to Const. Mgmt.	R	R			
BCN 3223C	Soils and Concrete	R				
BCN 3224C	Const. Techniques			I		
BCN 3431C	Structures			R		
BCN 3611C	Const. Estimating 1				I	
BCN 3700	Const. Contracts	R				
BCN 3730	Const. Safety, Health & Env.			R, DA		
BCN 4423C	Temporary Structures			R		
BCN 4612	Const. Estimating 2				DA	
BCN 4720	Const. Planning and Control	R	R			I, DA
BCN 4787C	Const. Capstone Proj. (DA)	DA	DA	R	R	
AIC Exam	70% of students pass (DA)	DA-1		DA-8	DA-5	DA-7
Employer Sur.	min 4 on 1 to 5 scale (IA)	IA	IA	IA	IA	IA
Alumni Sur.	min 3.5 on 1 to 5 scale (IA)	IA	IA	IA	IA	IA

Course No.	Course Title	
		SLO 20
		MEP
BCN 3521C	Electrical Systems	I, DA
BCN 4510C	Mechanical Systems	I, DA
BCN 4709	Const. Project Mgmt.	
BCN 4787C	Const. Capstone Project	
AC Exam	70% of students pass	
Employer Survey	min 4 on 1 to 5 scale	IA
Alumni Survey	min 3.5 on 1 to 5 scale	IA

Undergraduate Program Implementation and Review

Measure	Target	Person responsible for data collection	Due Date for data collection	Review by the Undergrad Committee - met target?	Suggest action items	Review and approve by BCN faculty	Implement changes (minor)	Implement changes (major)
			30-May	10-Jun	20-Jun	20-Aug	This academic year	Next academic year
% of students from underrepresented groups		Registrar Officer						
Evaluation of curriculum by industry		Undergrad Director						
Student learning outcome assessments		Undergrad Director						
AIC exam results		Undergrad Director						
Student evaluation of teaching		Undergrad Secretary						
J1, J2, S1, S2 feedback		Director						
S2 exit survey		Job Placement						



Timeline for Transition from POA to OBA

- Board Approval of OBS - 7/2014
- Completion of Documents 102 and form A-3 - 8/2014
- Training for preparation of self-study – 2/2015
- Training of visiting team members for OBA – 7/2015
- Pilot testing of OBA – Fall 2015
- Programs may choose POA or OBA - Spring 2016
- Switch to OBA – Fall 2016

Thank You



Questions?

