

CONSTRUCTION AND ENERGY MANAGEMENT

Natural and Applied Sciences Division

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Program Description:

The Construction and Energy Management program provides education in the areas of Management, Inspections, Energy and Construction Skills (hands-on) training. Students will find employment in the broad spectrum of opportunities available in the construction industry. The program also provides continuing education, degrees, and certificates for those already employed as contractors, owner/builders, inspectors, managers, supervisors, estimators, planners and schedulers, support staff, craft workers and other areas related to construction. Note: We strongly recommend CS 1 and CS 1L for all students enrolling in computer-based Construction and Energy Management courses. Please refer to the Cabrillo College *Catalog* descriptions of these courses to determine if you possess equivalent knowledge.

A.S. Degree: Construction and Energy Management

A.S. General Education **21 Units**

Core Courses (25 units)

CEM 151	Construction Fundamentals: Principles and Practices	3
CEM 151L	Construction Fundamentals: Principles and Practices Lab	1
CEM 154	Construction Estimating	3
CEM 155	Blueprint Reading	3
CEM 157	Construction Law	3
CEM 159	Construction Planning and Scheduling	3
CEM 160	Construction Management	3
CEM 161	Construction Business and Related Topics . . .	3
CEM 162	Sustainable Buildings, Home Performance, and the Environment	3

Approved Electives (9 units)

CEM 163	Fundamentals of Renewable Energy Systems . .	3
CEM 164R	Building Fundamentals of the International Residential Code	3
CEM 165R	Electrical, Mechanical, and Plumbing Fundamentals of IRC	3
CEM 166	Fundamentals of the International Building Code I.	3
CEM 167	Fundamentals of the International Building Code II	3
CEM 168	Fundamentals of the Uniform Plumbing Code .	3
CEM 169	Fundamentals of the Uniform Mechanical Code	3
CEM 170	Foundation Layout	3
CEM 175A	Electric Code and Materials 1: Residential . . .	3
CEM 175B	Electric Code and Materials 2: Commercial . . .	3
CEM 177	Fundamentals of Residential Framing	3
CEM 178A	Residential Construction Skills 1: "Front End".	3
CEM 178B	Residential Construction Skills 2: "Finish End"	3
CEM 199C	Career Work Experience Education.	1 - 3

May include three units from the following:

ETECH 24	Introduction to AutoCAD	3
ETECH 60	Architecture I	3
ETECH 61	Architecture II	3
ETECH 62	Architecture III	3
ETECH 71	ArchiCAD I	3

Electives:

(Any Course Numbered 1-199) 5

Total Units **60**

Certificate of Achievement: Construction and Energy Management

Core Courses (18 units)

CEM 154	Construction Estimating	3
CEM 155	Blueprint Reading	3
CEM 157	Construction Law	3
CEM 159	Construction Planning and Scheduling	3
CEM 160	Construction Management	3
CEM 161	Construction Business and Related Topics . . .	3

One of the following:

ENGL 100	Elements of Writing	3
or		
ENGL 1A/1AH/1AMC/1AMCH		3
or		
CABT 157	Business and Technical Writing	3

Total Units **21**

A.S. Degree: Building Inspection and Construction Codes

A.S. General Education 21 Units

Core Courses (34 units)

CEM 151	Construction Fundamentals: Principles and Practices	3
CEM 151L	Construction Fundamentals: Principles and Practices Lab	1
CEM 155	Blueprint Reading.	3
CEM 162	Sustainable Buildings, Home Performance, and the Environment	3
CEM 164R	Building Fundamentals of the International Residential Code	3
CEM 165R	Electrical, Mechanical, and Plumbing Fundamentals of IRC	3
CEM 166	Fundamentals of the International Building Code I.	3
CEM 167	Fundamentals of the International Building Code II	3
CEM 168	Fundamentals of the Uniform Plumbing Code.	3
CEM 169	Fundamentals of the Uniform Mechanical Code	3
CEM 175A	Electric Code and Materials 1: Residential	3
CEM 175B	Electric Code and Materials 2: Commercial	3

Approved Electives (5 units)

CEM 154	Construction Estimating.	3
CEM 157	Construction Law.	3
CEM 159	Construction Planning and Scheduling	3
CEM 160	Construction Management.	3
CEM 161	Construction Business and Related Topics	3
CEM 163	Fundamentals of Renewable Energy Systems	3
CEM 170	Foundation Layout	3
CEM 177	Fundamentals of Residential Framing	3
CEM 199C	Career Work Experience Education.	1 - 3

Total Units 60

Certificate of Achievement: Building Inspection and Construction Codes

Core Courses (34 units)

CEM 151	Construction Fundamentals: Principles and Practices.	3
CEM 151L	Construction Fundamentals: Principles and Practices Lab	1
CEM 155	Blueprint Reading.	3
CEM 162	Sustainable Buildings, Home Performance, and the Environment	3
CEM 164R	Building Fundamentals of the International Residential Code	3
CEM 165R	Electrical, Mechanical, and Plumbing Fundamentals of IRC	3
CEM 166	Fundamentals of the International Building Code I.	3
CEM 167	Fundamentals of the International Building Code II	3
CEM 168	Fundamentals of the Uniform Plumbing Code	3
CEM 169	Fundamentals of the Uniform Mechanical Code	3

CEM 175A	Electric Code and Materials 1: Residential	3
CEM 175B	Electric Code and Materials 2: Commercial	3

3 units from the following:

ENGL 100	Elements of Writing	3
or		
ENGL 1A/1AH/1AMC/1AMCH		3
or		
CABT 157	Business and Technical Writing	3

Total Units 37

Skills Certificate: Construction Basics

Required Courses

CEM 151	Construction Fundamentals: Principles and Practices	3
CEM 151L	Construction Fundamentals: Principles and Practices Lab	1
CEM 154	Construction Estimating	3
CEM 155	Blueprint Reading.	3
CEM 162	Sustainable Buildings, Home Performance, and the Environment	3
CEM 163	Fundamentals of Renewable Energy Systems	3

Total Units 16

Skills Certificate: Construction Business Management

Required Courses

CEM 154	Construction Estimating.	3
CEM 157	Construction Law.	3
CEM 160	Construction Management.	3
CEM 161	Construction Business and Related Topics	3
CEM 162	Sustainable Buildings, Home Performance, and the Environment	3

Total Units 15

Skills Certificate: Construction Building Inspection and Codes

Required Courses

CEM 151	Construction Fundamentals: Principles and Practices	3
CEM 151L	Construction Fundamentals: Principles and Practices Lab	1
CEM 155	Blueprint Reading.	3
CEM 162	Sustainable Buildings, Home Performance, and the Environment	3
CEM 166	Fundamentals of the International Building Code I.	3
CEM 167	Fundamentals of the International Building Code II	3

Total Units 16

Skills Certificate: Construction Career Path

Required Courses

CEM 151	Construction Fundamentals: Principles and Practices	3
CEM 151L	Construction Fundamentals: Principles and Practices Lab	1
and		
Any combination of the following courses totaling 4 units:		
CEM 190A-Z	Special Topics in Construction and Energy Management	0.5 - 5
or		
CG 51	Introduction to College	1 - 3
Total Units		8

Skills Certificate: Construction Electrical Inspection and Codes

Required Courses

CEM 151	Construction Fundamentals: Principles and Practices	3
CEM 151L	Construction Fundamentals: Principles and Practices Lab	1
CEM 155	Blueprint Reading	3
CEM 165R	Electrical, Mechanical, and Plumbing Fundamentals of IRC	3
CEM 175A	Electric Code and Materials 1: Residential	3
CEM 175B	Electric Code and Materials 2: Commercial	3
Total Units		16

Skills Certificate: Construction Project Management

Required Courses

CEM 154	Construction Estimating	3
CEM 155	Blueprint Reading	3
CEM 159	Construction Planning and Scheduling	3
CEM 160	Construction Management	3
CEM 162	Sustainable Buildings, Home Performance, and the Environment	3
Total Units		15

Skills Certificate: Construction Specialty Inspection and Codes

Required Courses

CEM 151	Construction Fundamentals: Principles and Practices	3
CEM 151L	Construction Fundamentals: Principles and Practices Lab	1
CEM 155	Blueprint Reading	3
CEM 162	Sustainable Buildings, Home Performance, and the Environment	3
CEM 168	Fundamentals of the Uniform Plumbing Code	3
CEM 169	Fundamentals of the Uniform Mechanical Code	3
Total Units		16

Skills Certificate: Construction Trade

Required Courses

CEM 151	Construction Fundamentals: Principles and Practices	3
CEM 151L	Construction Fundamentals: Principles and Practices Lab	1
CEM 155	Blueprint Reading	3
CEM 178A	Residential Construction Skills 1: "Front End"	3
CEM 178B	Residential Construction Skills 2: "Finish End"	3
Total Units		13

Construction and Energy Management Courses

CEM 151

Construction Fundamentals: Principles and Practices

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Covers the sequence of events for residential construction from both an owner's and a builder's point of view. Topics include categories and phases of construction, planning and permitting processes, analysis of contract documents, safety, tools, equipment, material selection and use, foundations, framing, roofing, insulation, drywall, plumbing, HVAC, electrical, interior and exterior carpentry and finishes, and introductions to estimating, planning and scheduling, and project management.

CEM 151L

Construction Fundamentals: Principles and Practices Lab

1 unit; 3 hours Laboratory

Corequisite: CEM 151.

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Covers the methodology and techniques for residential construction from a skills and vocational point of view. Topics include safety, tools, equipment, materials, foundation layout, framing, sheathing and siding, roof layout, roof framing, roof sheathing, roofing, plumbing, HVAC, electrical, insulation, drywall, interior and exterior carpentry and finishes.

CEM 154

Construction Estimating

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Covers basic methods of construction estimating and cost preparation for material, labor, overhead and equipment costs and its relationship to project budgets and management. Includes the use of the CSI Division Format, cost indexes, and computer estimating techniques to prepare, organize, and track costs.

CEM 154A

Estimating for Construction Professionals

1 unit; 1 hour Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Provides an overview of basic methods of construction estimating and cost preparation for material, labor, overhead and equipment costs and its relationship to project budgets and management. Includes the use of the CSI Division Format and cost indexes.

CEM 155

Blueprint Reading

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Teaches the analysis and interpretation of construction drawings. Topics include the alphabet of lines, symbols, plot plans, foundation plans, floor plans, elevations, sectionals, framing details, and dealing with incomplete and inaccurate drawings. New construction and remodels both residential and commercial are covered.

CEM 157

Construction Law

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Introduces complex legal principles and issues confronted in the construction profession in both the public and private sectors. Topics include insurance (workers' compensation, general liability, automobile liability and builders' risk coverage), bonds and bonding, construction documents, construction contract terms and conditions, laws, standards, practices, mechanics' liens, stop notices, public agency orders, notices, claims, dispute resolution, arbitration, and litigation.

CEM 159

Construction Planning and Scheduling

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Covers project planning and scheduling fundamentals including software applications applied to the construction profession. Topics include: developing network modeling, network diagrams, Gantt charts, resources allocation and leveling, cash flow analysis, project budgeting, and project control.

CEM 159A

Planning and Scheduling for Construction Professionals

1 unit; 1 hour Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Covers project planning and scheduling fundamentals including an overview of software applications applied to construction professions.

CEM 160

Construction Management

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Introduces construction management principles, practices, and associations. Topics include roles and responsibilities, delivery methods, management styles, contract types and documents, budgeting, scheduling, safety and risk management, documentation, human relations, leadership, resource allocation and leveling, project monitoring and control, close-out, measuring project success, and software applications which articulate the benefit of computer aided construction management.

CEM 161

Construction Business and Related Topics

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Introduces business fundamentals, principles, practices, procedures, and topics related to construction. Topics include business ethics, organization behavior, management by objectives, planning and goal setting, safety, risk management, business/economic cycles, financing, accounting, marketing, and advertising, leadership, management styles, communication, teamwork, delegation, time management, staffing, recruitment, motivation, employee performance, rewards and discipline, conflict resolution, documentation, and information management systems.

CEM 162

Sustainable Buildings, Home Performance, and the Environment

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Introduces sustainable building resources and applications, LEEDS certification requirements, home performance concepts, California energy codes, green building, and their relationships to the environment and residential construction.

CEM 162SP

Solar Photovoltaic Design and Installation

3 units; 2 hours Lecture, 3 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Introduces solar photovoltaic system requirements, design and configurations, installation techniques, and their application in residential and commercial construction. Entry-level Certification Exam from NAB-CEP is an option.

CEM 163

Fundamentals of Renewable Energy Systems

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Introduces renewable and alternative energy sources including grid interactive, stand-alone systems, wind, active and passive solar energy collection, site evaluation, design analysis of various systems and materials and methods of construction.

CEM 164R**Building Fundamentals of the International Residential Code**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Provides training in the structural building provisions of the International Residential Code, including concrete, masonry, and wood frame construction. Designed for architects, contractors, designers, inspectors and those seeking IRC Certification.

CEM 165R**Electrical, Mechanical, and Plumbing Fundamentals of IRC**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Provides training in the electrical, mechanical, and plumbing portions of the International Residential Code. Designed for architects, contractors, designers, inspectors and those seeking IRC Certification.

CEM 166**Fundamentals of the International Building Code I**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Repeatability: May be taken a total of 2 times.

Provides training in the structural portions of the International Building Code, including concrete, masonry, and wood frame construction. Designed for architects, contractors, designers, inspectors and those seeking International Code Council Certification.

CEM 167**Fundamentals of the International Building Code II**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Repeatability: May be taken a total of 2 times.

Provides training in the non-structural design portions of the International Building Code, including occupancy classification, types of construction and exiting. Designed for architects, contractors, designers, inspectors and those seeking International Code Council Certification.

CEM 168**Fundamentals of the Uniform Plumbing Code**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Repeatability: May be taken a total of 2 times.

Provides training in the requirements of the Uniform Plumbing Code including plumbing systems for waste, indirect and special wastes, venting, fresh water, gasses, fuels, solar, fire protection, and water heaters and is designed for contractors, architects, designers, and those seeking ICBO Certification.

CEM 169**Fundamentals of the Uniform Mechanical Code**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Repeatability: May be taken a total of 2 times.

Provides training in the requirements of the Uniform Mechanical Code, including mechanical systems for heating and cooling systems, combustion air, venting, ducting, refrigeration, and commercial kitchen vent hood and is designed for contractors, architects, designers, and those seeking ICBO Certification.

CEM 170**Foundation Layout**

3 units; 2 hours Lecture, 3 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Repeatability: May be taken a total of 2 times.

Introduces foundations and concrete work fundamentals typical of residential construction including layout, forming, and reinforcement. Additional topics include inspection, pouring, and finishing of slab and stemwall structures as well as materials, tools and tool use, hardware, essential techniques for assembly taught by practical hands-on application.

CEM 175A**Electric Code and Materials 1: Residential**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Repeatability: May be taken a total of 2 times.

Provides training in the selection and installation of various electrical wiring systems as specified by the National Electric Code (NEC) for residential construction. Topics include conductors, cables, raceways, fittings, boxes, panels, devices, hazardous locations, special equipment and environments, high voltage wiring methods, and electrical blueprint reading and is designed for contractors, architects, designers, and those seeking certification.

CEM 175B**Electric Code and Materials 2: Commercial**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Provides training in the selection and installation of various electrical wiring systems as specified by the National Electric Code (NEC) for commercial construction. Topics include conductors, cables, raceways, fittings, boxes, panels, devices, hazardous locations, special equipment and environments, high voltage wiring methods, and electrical blueprint reading in a commercial environment or context, and is designed for contractors, architects, designers, and those seeking certification.

CEM 177

Fundamentals of Residential Framing

3 units; 2 hours Lecture, 3 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Repeatability: May be taken a total of 2 times.

Introduces the student to layout and framing fundamentals typical of residential construction including floors, walls and partitions, roofs, safety, structural materials, tools and tool use, hardware, essential techniques for assembly and provides practical hands-on application.

CEM 178A

Residential Construction Skills 1: “Front End”

3 units; 2 hours Lecture, 3 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Repeatability: May be taken a total of 2 times.

Introduces “front end” construction: foundation layout, framing fundamentals, rough plumbing, rough HVAC, and rough electrical basics typical of residential construction. Additional topics include safety, foundations, floors, walls and partitions, roofs, fire protection systems, insulation, drywall, materials, tools and tool use, hardware, essential techniques for assembly and provides practical hands-on application.

CEM 178B

Residential Construction Skills 2: “Finish End”

3 units; 2 hours Lecture, 3 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Repeatability: May be taken a total of 2 times.

Introduces “finish end” construction: foundation layout, framing fundamentals, insulation, drywall, finish plumbing, finish HVAC, finish electrical, and finish carpentry basics typical of residential construction. Topics include safety, foundations, floors, walls and partitions, roofs, insulation, drywall, finish plumbing and electrical systems, painting, finish carpentry, tile, flooring, materials, tools and tool use, hardware, essential techniques for assembly and provides practical hands-on application.

CEM 190A-Z

Special Topics in Construction and Energy Management

0.5 - 5 units; 0.5 hour Lecture, 1.5 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100; Eligibility for MATH 154.

Repeatability: May be taken a total of 4 times.

Selected topics in construction not covered by regular course offerings. Each special topic course will be announced, described, and given its own title and letter designation in the *Schedule of Classes*. The structure and format of the classes will vary depending upon the subject matter.