

CONSTRUCTION AND ENERGY MANAGEMENT

Natural and Applied Sciences Division

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Construction Management A.S. Degree

The Construction Management program provides education in the areas of Management, Codes and Standards, Building Performance and Efficiency, 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, consultants, 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 (Introduction to Computers and Computer Technology) and CS 1L (Technology Tools) for all students enrolling in computer-based Construction Management courses. Please refer to the Cabrillo College *Catalog* descriptions of these courses to determine if you possess equivalent knowledge.

Learning Outcomes

1. Plan, manage, and construct all phases of residential, commercial, heavy civil, and industrial buildings.

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) Units

CEM 151EL	Electrical Basics for Construction Technology ...	1
CEM 151FC	Basic Finish Carpentry	1
CEM 151PL	Plumbing Basics for Construction Technology ..	1
CEM 162BS	Building Science for Construction Technology ..	3
CEM 162HR	Home Energy Rating System	1
CEM 162LD	Green Building and LEED.....	3
CEM 162PS	Passive Solar Design and Construction	2
CEM 162SP	Solar Photovoltaic Design and Installation	3
CEM 162ST	Solar Thermal Design and Installation	3
CEM 163	Fundamentals of Renewable Energy Systems.....	3
CEM 164C	Building Fundamentals of the 2013 California Residential Code.....	3
CEM 165E	2013 California Energy Code.....	3
CEM 166A	Fundamentals of the 2015 International Building Code I Structural	3

CEM 167A	Building Code II Non-Structural.....	3
CEM 168A	Fundamentals of the 2015 Uniform Plumbing Code.....	3
CEM 169A	Fundamentals of the 2015 Uniform Mechanical Code	3
CEM 175C	2014 National Electric Code (NEC) Commercial..	3
CEM 175R	2014 National Electric Code (NEC) Residential ...	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	2

May include three units from the following:

ETECH 24	Introduction to AutoCAD	3
ETECH 60	Architecture/Green Design: Principles and Practices.....	3
ETECH 75	BIM and Sustainable Design Strategies I.....	3

Electives:

(Any Course numbered 1-199).....	5
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Total Units 60

Construction Management Certificate of Achievement

Learning Outcomes

1. Plan, manage, and construct all phases of residential, commercial, heavy civil and industrial buildings.

Required Courses 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) Units

CEM 151EL	Electrical Basics for Construction Technology ...	1
CEM 151FC	Basic Finish Carpentry	1
CEM 151PL	Plumbing Basics for Construction Technology ..	1
CEM 162BS	Building Science for Construction Technology ..	3
CEM 162HR	Home Energy Rating System	1
CEM 162LD	Green Building and LEED.....	3
CEM 162PS	Passive Solar Design and Construction	2
CEM 162SP	Solar Photovoltaic Design and Installation	3
CEM 162ST	Solar Thermal Design and Installation	3
CEM 163	Fundamentals of Renewable Energy Systems.....	3
CEM 164C	Fundamentals of the 2013 California Residential Code.....	3
CEM 165E	2013 California Energy Code.....	3
CEM 166A	Fundamentals of the 2015 International Building Code I Structural	3
CEM 167A	Fundamentals of the 2012 International Building Code II Non-Structural.....	3

CEM 168A	Fundamentals of the 2015 Uniform Plumbing Code.....	3
CEM 169A	Fundamentals of the 2015 Uniform Mechanical Code	3
CEM 175C	2014 National Electric Code (NEC) Commercial..	3
CEM 175R	2014 National Electric Code (NEC) Residential ...	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	2
May include three units from the following:		
ETECH 24	Introduction to AutoCAD	3
ETECH 60	Architecture/Green Design: Principles and Practices.....	3
ETECH 75	BIM and Sustainable Design Strategies I.....	3
One of the following:		
ENGL 100	Elements of Writing.....	3
or		
ESL 100	High Advanced Academic ESL	4-6
or		
ENGL 1A/1AH/1AMC/1AMCH	3
or		
CABT 157	Business and Technical Writing	3
Total Units		37-40

Building Inspection and Construction Codes A.S. Degree

The Building Inspection option leads to certifications in the codes that are needed by those seeking employment as Building Inspectors. Building inspection is one of the more stable areas of construction employment. Building Inspectors are employed in both the public and private sectors.

Learning Outcomes

1. Inspect and analyze a building for compliance with current building standards and sustainability sciences.

Required Courses	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 164C	Fundamentals of the 2013 California Residential Code	3
CEM 166A	Fundamentals of the 2015 International Building Code I Structural	3
CEM 167A	Fundamentals of the 2012 International Building Code II Non-Structural	3
CEM 168A	Fundamentals of the 2015 Uniform Plumbing Code.....	3
CEM 169A	Fundamentals of the 2015 Uniform Mechanical Code	3
CEM 175C	2014 National Electric Code (NEC) Commercial..	3
CEM 175R	2014 National Electric Code (NEC) Residential ...	3
Approved Electives (8 Units)		Units
CEM 151EL	Electrical Basics for Construction Technology ...	1
CEM 151PL	Plumbing for Construction Technology	1

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 162BS	Building Science for Construction Technology ..	3
CEM 162HR	Home Energy Rating System	1
CEM 162LD	Green Building and LEED.....	3
CEM 162PS	Passive Solar Design and Construction	2
CEM 162SP	Solar Photovoltaic Design and Installation	3
CEM 162ST	Solar Thermal Design and Installation	3
CEM 163	Fundamentals of Renewable Energy Systems.....	3
CEM 165E	2013 California Energy Code.....	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	2
Total Units		60

Building Inspection and Construction Codes Certificate of Achievement

Learning Outcomes

1. Inspect and analyze a building for compliance with current building standards and sustainability sciences.

Core Courses (31 units)	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 164C	Fundamentals of the 2013 California Residential Code	3
CEM 166A	Fundamentals of the 2015 International Building Code I Structural	3
CEM 167A	Fundamentals of the 2012 International Building Code II Non-Structural	3
CEM 168A	Fundamentals of the 2015 Uniform Plumbing Code.....	3
CEM 169A	Fundamentals of the 2015 Uniform Mechanical Code	3
CEM 175C	2014 National Electric Code (NEC) Commercial..	3
CEM 175R	2014 National Electric Code (NEC) Residential ...	3
Three units from the following:		
ENGL 100	Elements of Writing.....	3
or		
ESL 100	High Advanced Academic ESL	4-6
or		
ENGL 1A/1AH/1AMC/1AMCH	3
or		
CABT 157	Business and Technical Writing	3
Total Units		34 - 37

Energy Management A.S. Degree

The Energy Management program provides preparation for students to work in the construction and energy management industry. Preparation includes construction fundamentals with an emphasis on sustainability and energy management as they relate to building technology, the application of building science, and solar-derived energy. The program employs an integrated approach to construction project planning and execution as well as preparation for state and national certifications.

Learning Outcomes

1. Analyze contemporary renewable alternative energy systems and techniques as it applies to construction technology and resources. (Global Awareness, Critical Thinking, Professional Development)
2. Compare and contrast various renewable energy technologies and their relationship with energy conservation, scarce resources and the environment. (Global Awareness, Critical Thinking, Professional Development)
3. Critically assess building science as it pertains to safety, health, comfort, energy efficiency, and building durability. (Global Awareness, Critical Thinking, Professional Development)
4. Investigate solar derived active and passive systems and their relationship with energy conservation, scarce resources, and the environment. (Global Awareness, Critical Thinking, Professional Development)

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 162	Sustainable Buildings, Home Performance, and the Environment	3
CEM 162LD	Green Building and LEED.....	3
CEM 162BS	Building Science for Construction Technology ..	3
CEM 162HR	Home Energy Rating System	1
CEM 162PS	Passive Solar Design and Construction	2
CEM 162SP	Solar Photovoltaic Design and Installation	3
CEM 162ST	Solar Thermal Design and Installation	3
CEM 165E	2013 California Energy Code.....	3

Approved Electives

CEM Management Courses (6 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

CEM Code Courses (3 Units)

CEM 164C	Fundamentals of the 2013 California Residential Code.....	3
CEM 166A	Fundamentals of the 2015 International Building Code I Structural	3
CEM 167A	Fundamentals of the 2012 International Building Code II Non-Structural	3
CEM 168A	Fundamentals of the 2015 Uniform Plumbing Code.....	3
CEM 169A	Fundamentals of the 2015 Uniform Mechanical Code	3

CEM 175C	2014 National Electric Code (NEC) Commercial...3
CEM 175R	2014 National Electric Code (NEC) Residential ...3

CEM Skills Courses (3 Units)

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

ETECH Courses (3 Units)

ETECH 24	Introduction to AutoCAD	3
ETECH 60	Architecture/Green Design: Principles and Practices.....	3
ETECH 61	Architecture/Green Design: Planning and Construction.....	3
ETECH 62	Architecture/Green Design: Implementation using AutoCAD.....	3

Any of the following additional courses may be counted in the 15 units.

CEM 163	Fundamentals of Renewable Energy Systems.....	3
DMCP 401	Foundation Course.....	0
CEM 199C	Career Work Experience Education	3

Total Units 60

Energy Management Certificate of Achievement

Learning Outcomes

1. Analyze contemporary renewable alternative energy systems and techniques as it applies to construction technology and resources. (Global Awareness, Critical Thinking, Professional Development)
2. Critically assess various renewable energy technologies and their relationship with energy conservation, scarce resources, and the environment. (Global Awareness, Critical Thinking, Professional Development)
4. Investigate solar derived active and passive systems and their relationship with energy conservation, scarce resources, and the environment. (Global Awareness, Critical Thinking, Professional Development)

Core Courses (25 Units) Units

CEM 151	Construction Fundamentals: Principles and Practices.....	3
CEM 151L	Construction Fundamentals: Principles and Practices Lab	1
CEM 162	Sustainable Buildings, Home Performance, and the Environment	3
CEM 162LD	Green Building and LEED.....	3
CEM 162BS	Building Science for Construction Technology ..	3
CEM 162HR	Home Energy Rating System	1
CEM 162PS	Passive Solar Design and Construction	2
CEM 162SP	Solar Photovoltaic Design and Installation	3
CEM 162ST	Solar Thermal Design and Installation	3
CEM 165E	2013 California Energy Code.....	3

One of the following:

ENGL 100	Elements of Writing.....	3
or		
ESL 100	High Advanced Academic ESL	4-6
or		
ENGL 1A/1AH/1AMC/1AMCH	3
or		
CABT 157	Business and Technical Writing	3

Total Units 28-31

Construction Basics Skills Certificate

Learning Outcomes:

1. Demonstrate understanding of blueprints, basic estimating, and sustainability sciences.

Required Courses	Units
CEM 151 Construction Fundamentals: Principles and Practices.....	3
CEM 151L Construction Fundamentals: Principles and Practices Lab	1
CEM 151EL Electrical Basics for Construction Technology ...	1
CEM 151FC Basic Finish Carpentry	1
CEM 151PL Plumbing for Construction Technology	1
CEM 177 Fundamentals of Residential Framing	3
Total Units	10

Basic Energy Management Skills Certificate

Learning Outcomes:

1. Analyze renewable alternative energy systems, techniques, and rating systems as they apply to building construction technology.
2. Investigate the various renewable energy technologies and their relationship with energy conservation, scarce resources, and the environment.

Required Courses	Units
CEM 151 Construction Fundamentals: Principles and Practices.....	3
CEM 151L Construction Fundamentals: Principles and Practices Lab	1
CEM 162 Sustainable Buildings, Home Performance, and the Environment	3
CEM 162LD Green Building and LEED.....	3
CEM 162BS Building Science for Construction Technology ...	3
Total Units	13

Building Performance Energy Management Skills Certificate

Learning Outcomes:

1. Analyze the theory of building science for construction technology.

Required Courses	Units
CEM 151 Construction Fundamentals: Principles and Practices.....	3
CEM 151L Construction Fundamentals: Principles and Practices Lab	1
CEM 162 Sustainable Buildings, Home Performance, and the Environment	3
CEM 162BS Building Science for Construction Technology ...	3
CEM 162HR Home Energy Rating System	1
CEM 162LD Green Building and LEED.....	3
Total Units	14

Construction Building Inspection and Codes Skills Certificate

Learning Outcomes:

1. Demonstrate understanding of the basic codes and building standards in residential and commercial structures.

Required Courses	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 166A Fundamentals of the 2015 International Building Code I Structural	3
CEM 167A Fundamentals of the 2012 International Building Code II Non-Structural	3
Total Units	16

Construction Business Management Skills Certificate

Learning Outcomes:

1. Manage a construction business utilizing techniques and methodologies of construction law, good business practices, management techniques, and sustainability sciences.

Required Courses	Units
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

Construction Project Management Skills Certificate

Learning Outcomes:

1. Manage construction projects utilizing techniques and methodologies of estimating, scheduling, construction management, and sustainability sciences.

Required Courses	Units
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

Construction Plumbing/Mechanical Inspection and Codes Skills Certificate

Learning Outcomes:

1. Demonstrate understanding of the basic plumbing, mechanical codes and building standards, and sustainability sciences in residential and commercial structures.

Required Courses	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 168A Fundamentals of the 2015 Uniform Plumbing Code.....	3
CEM 169A Fundamentals of the 2015 Uniform Mechanical Code	3
Total Units	16

Solar Derived Energy Management Skills Certificate

Learning Outcomes:

1. Critically assess solar derived system applications, site evaluation, design analysis, codes and materials, and methods of installation.
2. Investigate solar derived active and passive systems and their relationship with energy conservation, scarce resources, and the environment.
3. Utilize theories of construction to construct the basic aspects of residential construction (foundations, framing, plumbing, electrical and finish).

Required Courses	Units
CEM 151 Construction Fundamentals: Principles and Practices	3
CEM 151L Construction Fundamentals: Principles and Practices Lab	1
CEM 162PS Passive Solar Design and Construction	2
CEM 162SP Solar Photovoltaic Design and Installation	3
CEM 162ST Solar Thermal Design and Installation	3
Total Units	12

Construction Career Path Skills Certificate

Learning Outcomes

1. Demonstrate understanding of the fundamentals, principles and practice of the construction industry, and the paths that can be pursued in that profession.

Required Courses	Units
CEM 151 Construction Fundamentals: Principles and Practices.....	3
CEM 151L Construction Fundamentals: Principles and Practices Lab	1
Any combination of the following totalling 4 units	
CEM 162LD Green Building and LEED.....	3
CEM 162PS Passive Solar Design and Construction	2
CG 51 Introduction to College.....	1-3
Total Units	8

Construction Electrical Inspection and Codes Skills Certificate

Learning Outcomes

1. Demonstrate understanding of the basic electrical codes and building standards in residential and commercial structures.

Required Courses	Units
CEM 151 Construction Fundamentals: Principles and Practices.....	3
CEM 151L Construction Fundamentals: Principles and Practices Lab	1
CEM 155 Blueprint Reading.....	3
CEM 175C 2014 National Electrical Code (NEC) Commercial	3
CEM 175R 2014 National Electrical Code (NEC) Residential	3
Total Units	13

Construction Trade Skills Certificate

Learning Outcomes

1. Utilize theories of construction to construct the basic aspects of residential construction (foundations, framing, plumbing, electrical and finish).

Required Courses	Units
CEM 151 Construction Fundamentals: Principles and Practices.....	3
CEM 151L Construction Fundamentals: Principles and Practices Lab	1
CEM 151EL Electrical Basics for Construction Technology ...	1
CEM 151PL Plumbing for Construction Technology	1
CEM 155 Blueprint Reading.....	3
CEM 177 Fundamentals of Residential Framing	3
or	
CEM 178A Residential Construction Skills 1:“Front End”	3
Total Units	12

Construction and Energy Management Courses

CEM 151 Construction Fundamentals: Principles and Practices

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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, roofin , insulation, drywall, plumbing, HVAC, electrical, interior and exterior carpentry and finishe , and introductions to estimating, planning and scheduling, and project management.

Transfer Credit: Non-transferable.

CEM 151L Construction Fundamentals: Principles and Practices Lab

1 unit; 3 hours Laboratory

Co-requisite: CEM 151.

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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, roofin, plumbing, HVAC, electrical, insulation, drywall, interior and exterior carpentry and finish -es.

Transfer Credit: Non-transferable.

CEM 151EL Electrical Basics for Construction Technology

1 unit; 1 hour Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Prepares students theoretically and practically in electrical basics for construction technology. Topics include electrical terminology, codes and standards, current and voltage, circuits, lighting, receptacles, conductors and conduits, grounding and bonding, and appliances.

Transfer Credit: Non-transferable.

CEM 151FC Basic Finish Carpentry

1 unit; 1 hour Lecture, 1 hour Laboratory

Repeatability: May be taken a total of 1 time.

Prepares students theoretically and practically for the basic finish carpentry skills necessary for residential construction. Topics include the installation and finish carpentry techniques and skills required for windows, doors, cabinets, floorings, moldings, and other interior and exterior finishes and projects.

Transfer Credit: Non-transferable.

CEM 151PL Plumbing Basics for Construction Technology

1 unit; 1 hour Lecture

Repeatability: May be taken a total of 1 time.

Prepares students theoretically and practically in plumbing basics for construction technology. Topics include plumbing terminology, codes and standards, piping, fitting, fixtures, installation techniques and practices, and an introduction to radiant and solar thermal systems.

Transfer Credit: Non-transferable.

CEM 154 Construction Estimating

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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.

Transfer Credit: Non-transferable.

CEM 155 Blueprint Reading

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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.

Transfer Credit: Non-transferable.

CEM 157 Construction Law

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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.

Transfer Credit: Non-transferable.

CEM 159 Construction Planning and Scheduling

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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.

Transfer Credit: Non-transferable.

CEM 160 Construction Management

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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.

Transfer Credit: Non-transferable.**CEM 161 Construction Business and Related Topics**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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, staff, recruitment, motivation, employee performance, rewards and discipline, conflict resolution, documentation, and information management systems.

Transfer Credit: Non-transferable.**CEM 162 Sustainable Buildings, Home Performance, and the Environment**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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.

Transfer Credit: Non-transferable.**CEM 162BS Building Science for Construction Technology**

3 units; 3 hours Lecture

Prerequisite: CEM 151 and CEM 151L.

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Introduces the building auditing and improvement process including energy efficiency, comfort, and safety in preparation for the Building Performance Institute (BPI) certification exam. All aspects of a building are examined: design, quality of workmanship and materials, installation procedures, proper operation practices, and the use of testing and monitoring equipment for cooling, heating, cooking, and ventilation systems. This is a fundamental course for the basic knowledge and application of the Home Energy Rating System (HERS) required in the State of California.

Transfer Credit: Non-transferable.**CEM 162CE Introduction to Commercial Energy Efficiency and Audits**

2 units; 2 hours Lecture

Prerequisite: CEM 162BS.

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Provides an overview of the energy efficiency and the auditing process for commercial buildings. Topics include energy efficiency and the various levels of audits, defining scope of work, preliminary evaluation of the building attributes, collection and assessment of building system operations data, analysis of data, developing recommendations, preparing a report, and presenting the report.

Transfer Credit: Non-transferable.**CEM 162HR Home Energy Rating System**

1 unit; 1 hour Lecture

Prerequisite: CEM 162BS.

Repeatability: May be taken a total of 1 time.

Introduces the assessment process for compliance with adopted energy related standards and validates the energy efficiency of buildings through testing by scientific instruments.

Transfer Credit: Non-transferable.**CEM 162LC Lighting and Controls for High Performance Buildings**

1 unit; 1 hour Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Prepares students theoretically and practically for energy efficiency lighting and for optimizing building performance through controls, devices, and monitoring equipment. Topics include lighting and building controls, equipment, devices, and instruments used for the operation and monitoring of high performance buildings and their relative systems.

Transfer Credit: Non-transferable.

CEM 162LD Green Building and LEED

3 units; 3 hours Lecture

Prerequisite: CEM 151 and CEM 151L.

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Introduces the US Green Building Council's Leadership in Energy and Environmental Design (LEED) building rating system as well as professional credentialing as they relate to construction, operation, and maintenance. Includes the life cycle of buildings and provides the knowledge and skills necessary for the construction of sustainable structures. Prepares the student for the LEED Green Associate's Exam administered by the Green Building Certification Institute (GBCI), a requirement for becoming a LEED Accredited Professional.

Transfer Credit: Non-transferable.

CEM 162PS Passive Solar Design and Construction

2 units; 2 hours Lecture

Prerequisite: CEM 151 and CEM 151L.

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Introduces passive solar design and construction principles for heating and cooling buildings. Topics include site evaluation, sustainable materials and methods, glazing, thermal mass, heating and cooling fundamentals, energy efficiency, air quality, health, and comfort. May be offered in a Distance-Learning Format.

Transfer Credit: Non-transferable.

CEM 162SC Integrated Sustainability in Construction

1 units; 1 hour Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Introduces the concepts of integrated project planning, construction, and management as they relate to sustainability for building construction.

Transfer Credit: Non-transferable.

CEM 162SP Solar Photovoltaic Design and Installation

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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

Transfer Credit: Non-transferable.

CEM 162ST Solar Thermal Design and Installation

3 units; 3 hours Lecture

Prerequisite: CEM 151 and CEM 151L.

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Introduces solar thermal system requirements, design and configurations, installation techniques, operation, and their application in residential and commercial construction. National certification exam from NABCEP is an option.

Transfer Credit: Non-transferable.

CEM 163 Fundamentals of Renewable Energy Systems

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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.

Transfer Credit: Non-transferable.

CEM 164C Fundamentals of the 2013 California Residential Code

3 units; 3 hours Lecture

Repeatability: May be taken a total of 1 time.

Provides training in the structural building provisions of the 2013 California Residential Code and for those seeking International Code Council Certification. Topics include concrete, masonry, and wood frame construction. Designed for architects, contractors, designers, and inspectors.

Transfer Credit: Non-transferable.

CEM 164R Building Fundamentals of the International Residential Code

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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.

Transfer Credit: Non-transferable.

CEM 165E 2013 California Energy Code

3 units; 3 hours Lecture

Repeatability: May be taken a total of 1 time.

Introduces the 2013 California Energy Code (the 2013 Building Energy Efficiency Standards) and requirements for building construction. *Transfer Credit:* Non-transferable.

**CEM 166A Fundamentals of the 2015
International Building Code I
Structural**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Provides training in the structural portions of the 2015 International Building Code, including concrete, masonry, and wood frame construction. Designed for architects, contractors, designers, inspectors, and those seeking International Code Council Certification.

Transfer Credit: Non-transferable.

**CEM 167A Fundamentals of the 2012
International Building Code II
Non-Structural**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Provides training in the non-structural design portions of the 2012 International Building Code, including occupancy classification, types of construction and exiting. Designed for architects, contractors, design-ers, inspectors, and those seeking International Code Council Certification.

Transfer Credit: Non-transferable.

**CEM 168A Fundamentals of the 2015 Uniform
Plumbing Code**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Provides training in the requirements of the 2015 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 IAPMO Certification.

Transfer Credit: Non-transferable.

**CEM 169A Fundamentals of the 2015 Uniform
Mechanical Code**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Provides training in the requirements of the 2015 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 IAPMO Certification.

Transfer Credit: Non-transferable.

**CEM 175C 2014 National Electrical Code (NEC)
Commercial**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Provides training in the selection and installation of various electrical wiring systems as specified by the 2014 National Electrical Code (NEC) for commercial construction. Topics include conductors, cables, raceways, fitting, 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.

Transfer Credit: Non-transferable.

**CEM 175R 2014 National Electrical Code (NEC)
Residential**

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

Provides training in wiring systems as specified by the 2014 National Electric Code (NEC) for residential construction. Topics include conductors, cables, raceways, fitting, 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.

Transfer Credit: Non-transferable.

CEM 177 Fundamentals of Residential Framing

3 units; 2 hours Lecture, 3 hours Laboratory

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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

**CEM 178A Residential Construction Skills 1:
"Front End"**

3 units; 2 hours Lecture, 3 hours Laboratory

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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, floor, 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. *Transfer Credit:* Non-transferable.

**CEM 178B Residential Construction Skills 2:
"Finish End"**

3 units; 2 hours Lecture, 3 hours Laboratory

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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, floor , walls and partitions, roofs, insulation, drywall, finish plumbing and electrical systems, painting, finish carpentry, tile, floor ing, materials, tools and tool use, hardware, essential techniques for assembly, and provides practical hands-on application.

Transfer Credit: Non-transferable.

**CEM 190A-Z Special Topics in Construction and
Energy Management**

0.5 – 5 units; 0.5 – 5 hours Lecture, 1.5 – 6 hours Laboratory

Recommended Preparation: Eligibility for MATH 154.

Repeatability: May be taken a total of 1 time.

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.

Transfer Credit: Non-transferable.

