

# ARCH 230: STRUCTURES 1

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**Originator**

macosta

**Co-Contributor(s)****Name(s)**

Bitanga, Bert

**Justification / Rationale**

Due to the upcoming 2+3 partnership with Cal Poly Pomona, this course is required for students to complete within the first 2 years.

**Effective Term**

Fall 2022

**Credit Status**

Credit - Degree Applicable

**Subject**

ARCH - Architecture

**Course Number**

230

**Full Course Title**

Structures 1

**Short Title**

STRUCTURES 1

**Discipline****Disciplines List**

Architecture

**Modality**

Face-to-Face

100% Online

Hybrid

**Catalog Description**

Theories of structural design and the relationship of structure to form, function and economics. Analysis of structural systems including statics, strength of materials and structural properties as well as the demonstration of forces and stresses.

**Schedule Description**

Theories of structural design and the relationship of structure to form, function and economics. Prerequisite: MATH 005 and PH 002A

**Lecture Units**

2

**Lecture Semester Hours**

36

**Lab Units**

1

**Lab Semester Hours**

54

**In-class Hours**

90

**Out-of-class Hours**

72

**Total Course Units**

3

**Total Semester Hours**

162

**Prerequisite Course(s)**

MATH 005 and PH 002A

**Required Text and Other Instructional Materials****Resource Type**

Book

**Author**

Silver, Pete, McLean, Will and Evans, Peter

**Title**

Structural Engineering for Architects: A Handbook

**City**

London

**Publisher**

Lawrence King Publishing, Ltd.

**Year**

2014

**College Level**

Yes

**Flesch-Kincaid Level**

14.6

**ISBN #**

9781780670553

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**Resource Type**

Book

**Author**

Ching, Francis D. K., Onouye, Barry S. and Zuberbuhler, Douglas

**Title**

Building Structures Illustrated: Patterns, Systems and Design

**Edition**

2nd

**City**

New Jersey

**Publisher**

John Wiley and Sons, Inc.

**Year**

2013

**Flesch-Kincaid Level**

14.7

**ISBN #**

978-1-118-45835-8

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**Resource Type**

Book

**Author**

Underwood, Rod and Chiuni, Michele

**Title**

Structural Design: A Practical Guide for Architects

**Edition**

2nd

**City**

New Jersey

**Publisher**

John Wiley Sons, Inc.

**Year**

2007

**Flesch-Kincaid Level**

14.4

**ISBN #**

978-0-471-78904-8

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**For Text greater than five years old, list rationale:**

These textbooks are still relevant to this date and are the most current available.

**Class Size Maximum**

26

**Entrance Skills**

Apply mathematical concepts to calculate 2D and 3D properties for structural members.

**Requisite Course Objectives**

MATH 005-Apply facts about plane geometric figures to deduce the surface area and volume of three dimensional geometric figures.

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**Entrance Skills**

Perform basic arithmetic with vectors.

**Requisite Course Objectives**MATH 005-Perform basic arithmetic with vectors both graphically and via the use of the  $a_i+b_j$  form of the vectors.

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**Entrance Skills**

Demonstrate the ability to prepare and analyze laboratory experiments using scientific methods.

**Requisite Course Objectives**

PH 002A-Demonstrate the ability to prepare and analyze laboratory experiments using scientific methods in the areas of mechanics, fluids, thermodynamics, sound and wave motion.

**Entrance Skills**

Utilize good problem solving techniques.

**Requisite Course Objectives**

PH 002A-Utilize good problem solving techniques in the areas of mechanics, fluids, thermodynamics, sound and wave motion.

**Entrance Skills**

Demonstrate an understanding of basic vector analysis.

**Requisite Course Objectives**

PH 002A-Demonstrate an understanding of basic vector analysis in the areas of mechanics, fluids, thermodynamics, sound and wave motion.

**Course Content**

1. Attendance & Participation
2. Exercises (individual and team assignments)
3. Weekly quizzes
4. Two mid-term exams (includes a short written component)
5. Final Exam (includes a short written component)

**Lab Content**

1. Application of skills and concepts learned during the lecture portion of this course.
2. Team & individual projects.

**Course Objectives**

	<b>Objectives</b>
Objective 1	Explain the magnitude and direction requirements for force-vectors and resultant force-vectors of multiple force-vectors originating from a single point in 2D and 3D.
Objective 2	Describe various structural systems, structural materials, and structural system/material based on structural performance and economics.
Objective 3	Illustrate forces in truss members based on truss graphical solutions.
Objective 4	Explain strength design allowable stress design (ASD) and load resistance factor design (LRFD).
Objective 5	Evaluate stress within structural members comparing actual stress to allowed stress.
Objective 6	Calculate specific geometric properties for various common structural member shapes.
Objective 7	Determine reactions for beam/column/wall structural combinations based on load location and load type.
Objective 8	Predict vertical and horizontal beam shear for steel and wood structural materials.
Objective 9	Demonstrated ability to calculate deflection in steel and wood structural members.
Objective 10	Design structurally with wood and steel.
Objective 11	Produce a variety of structural steel design configurations for beams, columns and steel connectors.
Objective 12	Produce a variety of structural wood design configurations for beams, columns, walls and wood connectors.

**Student Learning Outcomes**

	<b>Upon satisfactory completion of this course, students will be able to:</b>
Outcome 1	Calculate forces and loads on structures and structural members. Design structures that maintain structural stability and equilibrium.
Outcome 2	Demonstrated ability to recall and explain stress, strength and Load and Resistance Factor Design (LRFD) Design.
Outcome 3	Evaluate the structural performance of various materials used in buildings.

**Methods of Instruction**

Method	Please provide a description or examples of how each instructional method will be used in this course.
Lecture	Lectures are held in a typical classroom setting for face-to-face modalities. For hybrid or online modalities lectures will be held in the current Management Learning System (MLS). Lectures include: 1. Calculations on white board 2. Power Point (or equivalent). 3. Videos 4. Simulations
Demonstration, Repetition/Practice	Physical demonstrations with structural models to reinforce the material learned.

**Methods of Evaluation**

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
Other	Projects/Exercises (individual & team assignments).	In and Out of Class
Tests/Quizzes/Examinations	Weekly quizzes, Mid-term Exam & Final Exam (multiple-choice and short answer questions on structural design and the relationship of structure to form, function and economics)	In and Out of Class

**Assignments**
**Other In-class Assignments**

1. Draw a free body diagram of a simple point load beam spanning between two supports.
2. Calculate the size of a foundation footing based on a uniformity distributed wall load.
3. Determine force vectors for a simple truss.

**Other Out-of-class Assignments**

1. Assigned reading.

**Grade Methods**

Letter Grade Only

**Distance Education Checklist**

Include the percentage of online and on-campus instruction you anticipate.

**Online %**

50

**On-campus %**

50

**Instructional Materials and Resources**

**If you use any other technologies in addition to the college LMS, what other technologies will you use and how are you ensuring student data security?**

SkyCiv Structural Design Software will be used by the students to resolve structural design problems assigned for the lab portion of this course. This software can be used online by the students.

**If used, explain how specific materials and resources outside the LMS will be used to enhance student learning.**

This software will allow the student to resolve structural design problems by using graphic representations of structural members and the loads being applied to them.

## Effective Student/Faculty Contact

Which of the following methods of regular, timely, and effective student/faculty contact will be used in this course?

### Within Course Management System:

Chat room/instant messaging  
Discussion forums with substantive instructor participation  
Online quizzes and examinations  
Private messages  
Regular virtual office hours  
Timely feedback and return of student work as specified in the syllabus  
Video or audio feedback  
Weekly announcements

### External to Course Management System:

Direct e-mail  
Posted audio/video (including YouTube, 3cm mediasolutions, etc.)  
Synchronous audio/video  
Teleconferencing  
Telephone contact/voicemail

### For hybrid courses:

Field trips  
Orientation, study, and/or review sessions  
Scheduled Face-to-Face group or individual meetings

**Briefly discuss how the selected strategies above will be used to maintain Regular Effective Contact in the course.**

These strategies will enhance the learning opportunities and provide students with a variety of ways in which active communication can be achieved.

## Other Information

### Comparable Transfer Course Information

#### Campus

California State Polytechnic University, Pomona

#### Course Number

ARC 3210

#### Course Title

Structures 1

#### Catalog Year

2021-2022

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#### Campus

California Polytechnic State University, San Luis Obispo

#### Course Number

ARCE 211

#### Course Title

Structures 1

#### Catalog Year

2021-2022

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## MIS Course Data

**CIP Code**

15.0101 - Architectural Engineering Technology/Technician.

**TOP Code**

020100 - Architecture and Architectural Technology

**SAM Code**

C - Clearly Occupational

**Basic Skills Status**

Not Basic Skills

**Prior College Level**

Not applicable

**Cooperative Work Experience**

Not a Coop Course

**Course Classification Status**

Credit Course

**Approved Special Class**

Not special class

**Noncredit Category**

Not Applicable, Credit Course

**Funding Agency Category**

Not Applicable

**Program Status**

Stand-alone

**Transfer Status**

Transferable to CSU only

**General Education Status**

Y = Not applicable

**Support Course Status**

N = Course is not a support course

**Allow Audit**

No

**Repeatability**

No

**Materials Fee**

No

**Additional Fees?**

No

## Approvals

**Curriculum Committee Approval Date**

11/18/2021

**Academic Senate Approval Date**

12/09/2021

**Board of Trustees Approval Date**

01/21/2022

**Chancellor's Office Approval Date**

04/20/2022

**Course Control Number**

CCC000631135