

Mt. San Jacinto College  
Integrated Course Outline of Record

Form B

|               |           |       |            |
|---------------|-----------|-------|------------|
| Submitted by: | James Bae | Date: | 11/12/2020 |
|---------------|-----------|-------|------------|

| Department                | Subject                        | Course Number | Title                                                   |
|---------------------------|--------------------------------|---------------|---------------------------------------------------------|
| Engineering: Technologies | Engineering: Technologies ENGR | 124           | Civil Engineering and Architecture (formerly ENGR-524 ) |

Units/Hours

Each lecture unit requires 1 hour per week of class time, and 2 hours per week of study outside of class.  
Each laboratory unit requires 3 hours per week of class time.  
Each activity unit requires 2 hours per week of class time and 1 hour per week of study outside of class.

|                               |                           |                            |
|-------------------------------|---------------------------|----------------------------|
| <b>Lecture Units</b>          | <b>Lab Units</b>          | <b>Total Units</b>         |
| 2.00                          | 1.00                      | 3.00                       |
| <b>Lecture Contact Hours</b>  | <b>Lab Contact Hours</b>  | <b>Total Contact Hours</b> |
| 32.00 - 36.00                 | 48.00 - 54.00             | 80.00 - 90.00              |
| <b>Lecture Homework Hours</b> | <b>Lab Homework Hours</b> |                            |
| 64.00 - 72.00                 | 0                         |                            |

Stand Alone:

|                    |
|--------------------|
| Program Applicable |
|--------------------|

AA/AS Degree General Ed Breadth Area(s):

|        |
|--------|
| -none- |
|--------|

General Education Justification:

|  |
|--|
|  |
|--|

Maximum Enrollment:  
Maximum Enrollment  
Justification:

|                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 32                                                                                                                                                                                                                                                                                                                                            |
| Course requires significant individualized instruction or assessment “ check all that apply:<br>* Course requires graded class discussion and graded class participation.<br>* Course requires 3 or more oral presentations by each student per semester.<br>* Course relies on small group dynamics as a means of instruction or assessment. |

**\* Course requires that each student be evaluated individually on a set of skills more than twice per semester.**

**Justification: Computer programs are used. Specialized equipment is used. The course is heavily project and skill based. The course has group and individual projects that are presented orally in class, individual skill based demonstrations are performed and graded in class.**

**Grading Method:**

Letter Grade or P/NP

**TOP code:**

0953.00\*

**Can be Taken**

1

**time(s) for credit** (max 4)

- Visual or Performing Arts course that is required to meet major requirements for UC/CSU

- Intercollegiate athletics course

- Academic/vocational competition course

**Catalog Description:**

(Please do not refer to transferability or degree, certificate, or employment concentration applicability. Please only describe the course).  
(75 words or less in gray box below).

This course includes a lab and lecture component and will explore the integration of engineering technology principles with civil and architectural applications. Topics include historical understandings, career fields, residential design, commercial applications, commercial building design and public applications.

**Schedule Description:**

(Please do not refer to transferability or degree, certificate, or employment concentration applicability. Please only describe the course).  
(25 words or less in gray box below).

This course explores Civil and Architectural Engineering, covering topics such as residential and commercial design, and commercial and public applications.

**Need for the course:**

This course provides the new to Engineering student with foundational skills to be immediately able to join an engineering company at an entry level or to pursue further opportunities in Engineering including more advanced job-skills training or pursuit of transfer pathways to a 4-year institution. It is one course of a series of courses required for a student to be awarded an Engineering Technologist Support Certificate. The Center of Excellence for Labor Market Research (California Community Colleges) estimates that entry-level Engineering Technology jobs (Civil, Electrical, Industrial, Mechanical, amongst other Technicians) will continue to grow in the Inland Empire/San Bernardino area from 2018-2023 by 3%, while offering positions earning above estimated “living wage” rates. This estimated 300 annual jobs outpaced the awards given at the time by local community colleges. This indicates a major opportunity for MSJC to continue to provide entry level Engineering job training, while growing the program to more advanced training to support professional training in the future. This course is in support of and is attached to: ENGR - Engineering Technologist Support - Certificate (Active) ENGR - Engineering Technologist Support - Certificate, ENGR - Engineering: Drafting Technology - Certificate (Elective)

**Prerequisite(s):**

Prerequisites go through a separate approval process. See Forms E1-E6 for details.  
(For further clarification, contact the Prerequisite Subcommittee)

- ENGR 120 with a Grade of C or better. and
- ENGR 121 with a Grade of C or better.

**Corequisite(s):**

Corequisites go through a separate approval process. See Forms E1-E6 for details.

-none-

**Recommend Preparation:**

Recommended Preparation goes through a separate approval process. See Forms E1-E6 for details.

-none-

**Other Enrollment Criteria:**

-none-

**Learning Objectives:**

(please number each objective and express in behavioral terms)

Upon the completion of the course the student will be able to do the following:

1. Compare three general categories of structural systems used in historical buildings.
2. Identify the primary duties and attributes of a civil engineer and an architect, along with the traditional path for becoming a professional civil engineer or architect.
3. Document the typical components of a residential framing system.
4. Calculate the heat loss for a building envelope with given conditions appropriate for the project.
5. Design a home using 3D architectural design software and construction drawings.
6. Compare common commercial wall systems and building materials and differentiate between load-bearing and non load-bearing walls.
7. Analyze maximum moments of a simply supported beam subjected to a given loading condition using beam formula to calculate end reactions.
8. Identify typical utility services for a commercial building, typical transmission/distribution methods for each utility, and methods for measuring usage.
9. Use differential leveling to complete a control survey to establish a point of known elevation for a project.
10. Develop an understanding of how software is used as a tool to aid in the solution and then the communication of a project.
11. Conduct an oral presentation to present a proposal for the design and development of a commercial building project.

**Course Content:**

(please number the outline of main topics and subtopics)

1. Overview of Civil Engineering and Architecture
  1. History of Civil Engineering and Architecture
    1. Architectural style and aesthetic customs from historical architecture
    2. Evolving requirements and design elements from people, society, technology
    3. Principles and elements of visual design
  2. Careers in Civil Engineering and Architecture
    1. Knowledge and skill applicatons from academic and practical disciplines
    2. Problem solving in the design and construction process
    3. Career opportunities
2. Residential Design
  1. Building Design and Construction
    1. Standard practices and municipal codes
    2. Framing systems, roof shapes, materials and designs

- 3. Architectural software
  - 4. Standard documentation and notations
- 2. Cost and Efficiency Analysis
  - 1. Residential foundations
  - 2. Electrical and plumbing system integration
  - 3. Landscape design
  - 4. Environmental controls and home efficiency
  - 5. R-value and U-factor measurements
  - 6. Cost estimates and contingencies
- 3. Residential Design
  - 1. Universal design concepts
  - 2. Environmental impact
  - 3. Health and safety codes
- 3. Commercial Applications
  - 1. Commercial Building Systems
    - 1. Codes and building regulations
    - 2. Zoning to control land use and development
    - 3. Community standards and design requirements
  - 2. Structural Engineering
    - 1. Wall, roof, floor and framing system choice
    - 2. Load bearing and transfer
    - 3. Building codes
    - 4. Mathematics and physical science principles
  - 3. Mechanical and Electrical system design - Services and Utilities
    - 1. Properly sizing systems to minimize cost
    - 2. Responsible design to anticipate needs and community impact
    - 3. Energy codes designed for conservation
  - 4. Site Considerations
    - 1. Land surveying to establish project features
    - 2. Site design considerations
    - 3. Soil characteristics and impact on design
    - 4. Surface conditions and topography
    - 5. Surrounding community impacts and regulations
    - 6. Traffic controls, mass transit
- 4. Commercial Building Design
  - 1. Design process and definition
    - 1. Planning, documentation and management
    - 2. Teamwork for solutions to complex problems
    - 3. Legal description of property
  - 2. Design proposals and presentations
    - 1. Critiques, reviews and suggestions for improvement
    - 2. Presentations and displays to promote and implement
    - 3. Enhancing the quality of a team's project

**Lab Content:**

(please number the outline of main topics and subtopics)

- 1. Orientation and Safety
- 2. Safety, reliability, and cost effectiveness
- 3. Research Methods
  - 1. Problem statement
  - 2. Formal research - Guided and Independent
  - 3. Information sources - library, internet, experts, others
  - 4. Expectations and time management

4. Prototype Development
  1. Design
  2. Simulation
  3. Rapid-prototyping
  4. Construction
  5. Testing and evaluation
5. Engineering Project
  1. Documentation exercise
  2. Reliability exercise
  3. Teamwork and delegation
6. Project Construction
  1. Component construction
  2. Construction and Tool use exercises
  3. Project assembly
  4. Testing and evaluation
7. Project Presentation & Demonstration
  1. Formal reports and presentations - formats and software
  2. Inclusion of multimedia -
    1. Sketches, models and drawings
    2. Model simulation data and charts
    3. Project photos, digital images
  3. Daily engineering journals

## **Methods of Instruction:**

Methods of instruction may include, but are not limited to the following:

- **Method:** Lecture  
**Integration:** Multimedia presentation and computer simulations introducing careers and safety, residential and commercial design and applications, and related civil engineering and architecture course topics/materials.
- **Method:** Observation and Demonstration  
**Integration:** Demonstration and supporting visual materials and computer programs, introducing topics such as framing, foundations, roofs, codes and regulations.
- **Method:** Projects  
**Integration:** Analysis and description of the Civil and Architectural Engineering design process including research and data collection, with the findings presented to the class. Conducted individually and within a group.
- **Method:** Directed Study  
**Integration:** Problem solving design projects in individual and team exercises including the incorporation of design principles for efficiency and environmental impact, application of residential and commercial regulations, and structural/mechanical construction and material requirements.

## **Methods of Evaluation:**

A student's grade shall be determined by the instructor using multiple measures of performance related to the course objectives. Methods of evaluation may include but are not limited to the following:

- **Method:** Class Participation  
**Integration:** Participation in topical discussions, problem solving activities and demonstrations (computational and non-computational), and simulated exercises within the engineering and architectural design process.
- **Method:** Exams/Tests  
**Integration:** Quizzes will be periodic short objective tests of course related concepts. A mid-term and final exam will be given to demonstrate understanding of course learning outcomes. Format may include multiple choice, short answer/essay and diagram identification.
- **Method:** Group Projects  
**Integration:** Group oral presentations of problem solving exercises regarding civil engineering/architecture and the engineering design process. Projects will be graded on skill assessment, appropriate mechanistic choice,

organization and thoroughness.

- **Method:** Oral Presentation

**Integration:** Presentation to the class of a Civil Engineering and Architecture research topic that includes a written report on a student chosen and instructor approved topic in a specified format. Presentation topics may address emerging design methods or challenges to Civil Engineers and Architects agreed to with the instructor. Topics may include, but are not limited to: professional development, construction methods; environmental or societal impacts; regulation; novel materials; extreme challenges. Individual projects will demonstrated and presented orally to the class and will be graded on skill assessment, appropriate mechanistic choice, organization and thoroughness.

- **Method:** Projects

**Integration:** Project based learning will be evaluated on an individual basis through problem solving activities that produce a residential building design, a commercial building design and a civil engineering design application. will be graded on skill assessment, appropriate mechanistic choice, organization and thoroughness.

**Examples of Assignments:**

Students will be expected to understand and critique college level texts or the equivalent. Reading and writing, as well as out of class assignments are required. These assignments may include but are not limited to the following:

1. Design a residential building plan that meets specified (specifications will vary each semester) client needs and requirements. Submit your work to the instructor for evaluation.
2. Design a commercial building plan that meets speciied (specifications will vary each semester) client needs and requirements. Submit your work to the instructor for evaluation.
3. Design a civil engineering plan for a public park that meets safety and code requirements. Submit your work to the instructor for evaluation.

**Textbooks:**

- Allen, E., J. Iano (2013). *Fundamentals of Building Construction: Materials and Methods* Wiley. ISBN: 9781118138915
- Mehta, M., W. Scarborough, D. Armpriest (2018). *Building Construction: Principles, Materials, and Systems, 3rd Edition* Pearson. ISBN: 9780134454177

**Other Resources:**

**Minimum Qualification**

- Engineering (Masters Required) **or**
- Engineering Support **or**
- Engineering Technology (Masters Required)