# Office of the President California State University, Chico

# **Executive Memorandum 21-033**

November 15, 2021



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From: Gayle E. Hutchinson, President

Subject: Approval of the New Minor in Heavy Construction

Upon the recommendation of the Academic Senate and with the concurrence of the Provost, I approve the new Minor in Heavy Construction within the Department of Construction Management, College of Engineering, Computer Science, and Construction Management. The new minor will be effective fall 2022 and will require 18 units.

Policy Title:	EM 21-033 Minor in Heavy Construction
Contact:	Department of Construction Management
Supersedes:	
Revision:	
Enabling Legislation or	
<b>Executive Order:</b>	

# **New Minor Signature Form**

Minor Name: <u>Minor in Heavy Construction</u>

# **Department Contact(s) w/phone #(s):**

Chris Souder CMGT 530-518-2656 Steffen Mehl CIVL smehl@csuchico.edu

# **Required Signatures**

The Department of CMGT	
has reviewed and approved this new minor	
alea DEL	4-14-21
Chair, Department Curriculum Committee	Date
ChSl	4/14/21
Department Chair	Date
The College of <u>ECC</u> has reviewed and approved this new minor	
Clarke Steinback	5/13/2021
Chair, College Curriculum Committee	Date
College Dean	5-13-21 Date

# Send signature page with proposal attached to Curriculum Services at zip 128

Curriculum Review Completed

8/16/2021 15 cd Gray

Date

Note: The department will be notified of the dates for EPPC and Academic Senate review.

#### October 7, 2021

The rationale for creating a Minor in Heavy Construction is the following:

- Heavy Civil Construction is the part of the construction industry that builds Dams, Bridges, Treatment plants, Industrial, Power facilities, Heavy Highway and other infrastructure needs. This part of the industry covers 30-35% of the companies that recruit our CMGT and CIVL students. CMGT, as a whole, falls short in California and across the US of providing enough graduates to fit the demands of this sector.
- 2. Having a program that is academically distinct, providing an opportunity that does not exist in other CSUs leading to more job opportunities for graduates going into heavy Construction.
- 3. The Heavy Construction industry needs more graduates. Currently, CMGT programs in California meet only approximately 30-40% of the demand in Heavy Construction. We have several letters from industry asking for this minor.
- 4. Chico State Civil Engineering does not teach Scheduling, Estimating, Equipment production, Temporary Structures, project cost budgeting and controlling of project documents.

The following will explain the rationale for each course in the Minor.

CMGT 335 Construction Equipment – Following CIVL 411 or CMGT 330, a civil engineer will use this knowledge analyzing and determining the most efficient productivity methods for heavy equipment. The civil engineer will learn earthmoving techniques, crane capacities and utilization and the importance of equipment maintenance and how it controls productivity.

CMGT 440 Temporary Structures – Following CIVL 311 or CMGT 440, the civil engineer will learn how to design temporary structure systems that are required to build permanent structures and projects. The civil engineer will utilize the skills learned in statics and strength of materials and apply them to real world conditions found in almost all construction projects.

CMGT457 Project Scheduling and Controls – With instructor approval, the civil engineer will learn the fundamentals of project scheduling. Included in this experience will be the understanding of resource utilization and allocation, levelling of crews and equipment and cost loading a project schedule for cost accounting purposes.

CMGT 455 Construction Cost Management – With instructor approval, the civil engineer will be exposed to the techniques used to analyze and track project cost and compare them back to the project budget. During this course the student will study project billings, schedule of values and other methods used for monthly payments.

CMGT 458 Heavy Construction Estimating – Following CMGT 335 the civil engineer with learn how to estimate the costs anticipated for a particular project. A solid estimate is the back-bone of our industry and its accuracy and completeness is paramount to the success of any project. With a dependable estimate, a budget can be prepared and will be used to measure project success.

CMGT 389 Internship with a Heavy Construction Company (Approved by CMGT) – In CMGT, our students complete 2-3 internships during their summer while at Chico State. We feel this "out-of-class" experience is extremely important to a student in order to truly understanding the construction industry. We expect a civil engineer to spend one summer working for one of our vetted heavy construction contractors.

Chris Souder

Chair CMGT

## **Proposal for a New Minor**

- I. Proposed title of new minor. Minor in Heavy Construction (HCON)
- II. Academic year of intended implementation. 2022/2023
- III. Name of the department and college submitting the proposal; identify unit with primary responsibility for the minor. **Construction Management (CMGT)**
- IV. Statements on questions of need and demand.

## The rationale for creating a Minor in Heavy Construction is the following:

- A. Heavy Civil Construction is the part of the construction industry that builds Dams, Bridges, Treatment plants, Industrial, Power facilities, Heavy Highway and other infrastructure needs. This part of the industry covers 30-35% of the companies that recruit our CMGT and Civil Engineering (CIVL) students. CMGT, as a whole, falls short in California and across the US of providing enough graduates to fit the demands of this sector.
- **B.** Having a program that is academically distinct, providing an opportunity that does not exist in other CSUs leading to more job opportunities for graduates going into Heavy Construction.
- C. The Heavy Construction industry needs more graduates. Currently, CMGT programs in California meet only approximately 30-40% of the demand in Heavy Construction. We have several letters from industry asking for this minor (attached, pages 12-15).
- **D.** Chico State Civil Engineering does not teach Scheduling, Estimating, Equipment production, Temporary Structures, project cost budgeting and controlling of project documents.

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CMGT 335 Construction Equipment – Following CIVL 411 or CMGT 330, a civil engineer will use this knowledge analyzing and determining the most efficient productivity methods for heavy equipment. The civil engineer will learn earthmoving techniques, crane capacities and utilization and the importance of equipment maintenance and how it controls productivity.

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- E. Relation of the minor to the University Strategic Plan. Academically distinct, providing an opportunity that does not exist in other CSUs leading to more job opportunities for graduates
- F. Need for the proposed minor. The Heavy Construction industry is in need of more graduates, CMGT programs in California meet only approximately 30-40% of the demand in Heavy Construction. See attached Industry letters (pages 12-15).
- G. Identify other closely related curricula currently offered by the campus.
  - 1. Explain the impact the proposed minor will have on these programs. CMGT Major, but this minor is not offered to them.
  - 2. Explain how current programs do not meet the proposed minor's objectives. Civil Engineering does not teach Scheduling, **Estimating, Equipment production, Temporary Structures,** project cost budgeting and controlling of project documents
- H. Student demand for the minor. Civil Engineering performed a survey and 35% of the major said they would consider the Minor.
- V. Resources
  - A. List the faculty members for the required courses in the minor by Name No additional Faculty needed Rank
    - Appointment status

Highest degree earned Date and Field of highest degree Professional experience

B. List the faculty members for the elective courses in the minor by Name No elective courses
Rank N/A
Appointment status

Highest degree earned

- C. List the resources needed to sustain the program for the first five years, including cost and funding source. The existing CMGT curriculum would facilitate these additional students. If we have to add sections, we will have funds to pay for additional instruction in other CMGT courses to allow current faculty to add section/WTUs. This would not be paid for by ECC. External funds committed to supporting this minor are in the range of \$40-60K per year. Companies that have expressed interest include:
  - Teichert
  - Granite
  - Q&D
  - McGuire Hester
  - Shimmick
    - 1. Faculty N/A
    - 2. Staff We have two staff members already. Half of Carley DeLuca's pay comes from outside sources already. This endowment would have funds to backfill ASC and Assistant's wages.
    - 3. Facilities No additional facilities would be needed
    - 4. Library resources; provide evidence of consultation with the Library Dean indicating that the program can be supported by the library. See attached, page 10
  - 5. Equipment N/A
  - 6. Specialized material N/A

D. Additional support resources required, including source of support. N/A VI. Curriculum

Note: Proposed curriculum should take advantage of courses already offered in other departments when subject matter would otherwise overlap or duplicate existing course content. **YES**, this is the case, all courses are existing courses.

- A. Total number of units required for the minor (maximum 30 units of which
- B. at least 6 will be upper-division). **YES-SEE BELOW**
- C. List all new courses for the proposed program. NONE
  - 1. Identify the new courses needed to initiate the program. NONE
  - 2. Identify the new courses needed during the first two years after implementation. **NONE**
- D. List all required courses for the minor. **SEE BELOW**
- E. List all elective courses for the minor. **SEE BELOW**

- F. Explain provisions for articulation of the proposed minor with community college courses. CMGT has lower division courses that articulate to various CC. However, this has no effect on minor.
- G. Complete catalog copy, including admission and completion requirements. See the current University Catalog for correct format; please follow it exactly. Before the proposal is submitted to Curriculum Services, it may be helpful to review catalog copy with Academic Publications. See attached, page 8.

Attach the <u>New Minor *signature* form</u> to the front of the proposal and submit to Curriculum Services after all department and college reviews are complete.

CMGT	Description	Units
335	Equipment	3
440	Temporary Structures	3
455W	Cost Management	3
457	CPM Scheduling (Project)	3
458	Unit Price Estimating	3
389	Internship	3
Upper		
Division	Σ	18

Pre	requisite Requirements	Units	CIVL Equivalent Substitution	Description
110	Construction Graphics	3	130/140	Surveying/Graphics
135	Construction Matls	3	212	CIVL materials
330	Soils	3	411	Soil Mechanics
350	Static/Strength	3	311	Strengths
460	Legal Aspects	3	495	Professional Issues
		Σ 15		
		Σ 30		

#### Data from ECC Senior Exit Survey

Term	Respondents listing job info	# in construction	%
2017	23	8	35%
2018	14	6	43%
2019	9	1	11%
2020	6	3	50%
		Avorago	250/

Average 35%

# **The Minor in Heavy Construction** Course Requirements for the Minor: 18 units

The following courses, or their approved transfer equivalents, are required of all candidates for this minor. This minor is intended for declared Chico State Civil Engineering majors with junior standing.

## 6 courses required:

CMGT 335	<b>Construction Equipment</b>	3.0	FS	
<i>Prerequisites: CMGT 330, CIVL 411, or Instructor Approval</i> This course includes a study of the equipment used in the construction industry. Included are the types, capabilities, selection, purchase/lease/rent options, and balancing of equipment. 3 hours discussion. This course requires the use of a laptop computer and appropriate software.				
CMGT 389 <i>Prerequisite: Dep</i> This course explor heavy construction	Internship in Construction Management <i>artment Approval</i> res the student doing one summer internship fo n company.	3.0 r a minimum of 10 week	SMF as with an approved	
CMGT 440	Temporary Structures	3.0	FS	
<i>Prerequisite: CMGT 350, CIVL 311, or Instructor Approval</i> This course includes a study of temporary structures used in construction, including scaffolding, support of excavations, decking and ramps, temporary bridges and trestles, concrete shoring formwork, and support of existing structures. The engineering basis for design is studies, with an emphasis placed on factors affecting cos and risks. 3 hours discussion. This course requires the use of a laptop computer and appropriate software.(002079)				
CMGT 455	Construction Cost Management	3.0	FS	
<i>Prerequisite: CMGT 450, CIVL 302, or Instructor Approval</i> This course studies construction cost monitoring and analysis techniques. The industry tools of budgets, billing instruments, earned value, forecasting and cost data collection are reviewed. Students create a schedule of values, including development of overhead allocation.				
2 hours discussion, 2 hours activity. This course requires the use of a laptop computer and appropriate software. (002072)				

CMGT 457 Project Scheduling and Control 3.0 FS

## Prerequisites: CMGT 360, CIVL 495, or Instructor Approval

This course involves the study of the methods used to plan and control construction projects. Critical path scheduling techniques, project planning processes, Lean practices of scheduling, and schedule diagramming are developed. Students create and update cash and resource loaded digital schedules using current industry scheduling software. Schedule update reports are analyzed and narratives produced. 2 hours discussion, 2 hours activity. This course requires the use of a laptop computer and appropriate software. (002078)

#### CMGT 458 Heavy Construction Estimating

3.0 FS

#### Prerequisite: CMGT 335 or Instructor Approval

This course explores the process involved in creating a heavy construction estimate. Direct costs are formulated using production rates developed from cycle time analyses, burdened labor rates, quantity takeoff, equipment rates, and material pricing. Estimates are prepared using industry standard unit-price computer applications. Distribution of indirect, overhead, and markup into bid items are applied to complete a unit-price estimate. 2 hours discussion, 2 hours activity. This course requires the use of a laptop computer and appropriate software. (002072)

#### **Meriam Library**

#### California State University, Chico

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#### MEMORANDUM

To: Chris Souder

From: Jodi Shepherd

Date: May 21, 2021

#### Subject: Library materials support for the new Minor in Heavy Construction.

The Meriam Library currently holds just under 2,000 titles (print and ebook books) and 5,000 ebooks in the subject of Construction Management. The library also subscribes to 22 journals in the subject of Construction Management. Databases which cover Construction Management literature include:

- •ABI/INFORM
- ASCE
- •Compendex
- Ebsco
- •Elsevier Science Direct
- Emerald
- Proquest
- •Sage
- Springer
- •Wiley

On the specific topic of Heavy Construction, the library does not have many books nor journals. Specific research needs for this subject should discussed with the subject librarian in order to explore options in additional coverage for this discipline. By using existing courses, the library will be able to support the proposed changes outlined in the proposal, however investigation into more research journals should be examined.





# The Beavers Charitable Trust

A 501(c)(3) Non-Profit Foundation FEIN #95-3605104 2053 Grant Road, Suite 370, Los Altos, CA 94024 Telephone: 650.694.4834 - Fax 650.694.4836 www.thebeavers.org - www.HeavyConstructionCareers.com

April 14, 2021

## TRUSTEES

Ronald M. Fedrick *Chairman* 

Wilford W. Clyde Vice Chairman

Sam E. Baker, Jr. Paul A. Cocotis David J. Miles Michael T. Traylor

Tony R. Ames Ex-Officio

Gary A. Johnson *Ex-Officio* 

David W. Woods Executive Director Chris Souder, Chair Construction Management Department College of Engineering, Computer Science and Construction Management California State University - Chico 400 West First St. Chico, CA 95929-003

Dear Chris:

We are very much in support of your efforts to create a heavy construction minor, especially since this is available to Civil Engineering majors.

With established scholarship endowments at 46 colleges in both civil engineering and construction management programs, we have a broad exposure to the majors. Construction management programs tend to be vertical building oriented since commercial building contractors were the driving force behind the formation of the CM programs and their work primarily involves managing subcontractors who perform the actual construction. In the heavy construction sector of the market, contractors self-perform the majority of their work, which calls for different skills.

Civil Engineering programs tend to be oriented towards design versus the actual construction process, although heavy construction projects typically require a certain amount of engineering such as for temporary structures during the construction process. Estimating for heavy construction is much more involved than for building construction, which basically involves collecting bids from various subcontractors.

As you know, we are involved with the new heavy construction minor at Cal Poly San Luis Obispo, which is a joint venture of the Civil Engineering and Construction Management program. This is a unique arrangement since the two programs are in different colleges. This minor will "cross-train" CE and CM majors so that civil students will take classes in estimating, cost management, equipment production, temporary structures and scheduling.

We are optimistic about this new minor since it will attract students specifically interested in heavy construction and the subject matter will be geared to heavy construction.

Sincerely,

Dave Woods Executive Director



## CONSTRUCTION CO.



3911 Laura Alice Way • CONCORD, CALIFORNIA 94520-8544 (925) 686-1780 • FAX: (925) 686-1499 • INDYCC.COM

April 15, 2021

GRADING - PAVING

Chris Souder Professor and Department Chair Construction Management California State University, Chico csouder@csuchico.edu

Dear Chris,

Independent Construction Company is in support of the development of a minor in Heavy Construction at California State University, Chico. As a large heavy civil construction firm, Independent Construction Co. hires individuals with Construction Management and Civil Engineering degrees. While we are not a design firm or a design build firm, we often encounter young professionals who are wanting to make a shift from the design aspect of Civil Engineering into the Construction Management field as they transition from their college work into the working world. Quite often we encounter Civil Engineering students who say they thought they wanted to be an engineer on a design team, however progressing through the program, they feel it is not what they intended, and many feel it was too late to make a switch.

Creating the opportunity for Chico State Civil Engineering graduates to have more options as they work to find their place in the industry would surely be an added benefit for your students as well as companies within the industry. This minor would allow students to look at alternate possibilities early in their college courses to see if they would prefer to work in civil engineering or the construction management aspect of heavy civil construction. The additional course work would lay the groundwork for these students and provide them with an understanding of what they will encounter working with a construction firm as they manage the progression of projects from start to finish.

As a contractor in the civil construction industry, we would see a lot of value in a graduate with a major in Civil Engineering and a minor in Heavy Construction as opposed to graduates without said minor. While there are some overlapping courses between Civil Engineering and Construction Management Degrees, the minor would allow the student to take additional courses with a direct correlation to the heavy civil aspect.

Respectfully,

Zach Neu Independent Construction Co. Operations Manager/Senior Estimator



April 19, 2021

Chris Souder, Chair – <u>csouder@csuchico.edu</u> Construction Management Department College of Engineering, Computer Science and Construction Management California State University, Chico 400 West First Street Chico, CA 95929

RE: Minor in Heavy Construction

Dear Chris,

McGuire and Hester (M&H) is honored to be a part of the developmental stages of Chico State's proposed Heavy Construction Minor for Civil Engineering students and 100% supports this Minor. McGuire and Hester is a large Heavy Civil Contractor with offices in Alameda and Sacramento, California. We employ a large number of Chico State graduates, from both the Construction Management and Civil Engineering programs.

It has been clear that Civil Engineering students, in general, are lacking specific skill sets, compared to students that complete the Construction Management Program which are necessary to the Heavy Construction Industry. Civil Engineering tends to focus more on the design side of the industry rather than the management side. The availability of a Minor in Heavy Construction for Civil Engineering students will allow those students to be better-rounded upon graduation. These additional courses will help lay the foundation for these students on what they will encounter working for a Heavy Civil Construction Company, managing projects from inception to completion.

As you are aware, McGuire and Hester is involved with the newly developed Granite Heavy Civil Minor (GHCM) at Cal Poly San Luis Obispo. Though Cal Poly's CM and CE majors are in different colleges, the interest in the GHCM has been outstanding, with approximately 20 students the first year to approximately 60 applicants for the second year, tripling in size in its first year. The GHCM cross-trains CM and CE majors so that CE students are exposed to classes designed around Heavy Construction, such as estimating, equipment, temporary structures, cost management, and CPM scheduling.

As a contractor in the heavy civil construction industry, M&H sees huge value in this minor which will allow Chico State's CE students to gain the necessary knowledge in heavy construction. This knowledge will only help those students be more valuable to the heavy construction industry upon graduation.

We are extremely optimistic and excited about the new minor as it will help better differentiate Chico State students who are passionate for the heavy construction side of the industry. Offering this minor will ultimately increase the value of all students who elect to pursue this minor which will add value to our industry as a whole.

Sincerely

Jeff Hoebel Vice President, Area Manager

www.McGuireandHester.com

CORPORATE OFFICE 2810 HARBOR BAY PKWY ALAMEDA CA 94502 💿 OAKLAND OFFICE 9009 RAILROAD AVENUE OAKLAND CA 94603 💿 PH 510 632 7676

SACRAMENTO OFFICE 1016 N. MARKET BLVD # 20 SACRAMENTO CA 95834 • PH 916 372 8910



April 13, 2021

Chico State University 400 W 1st St, Chico, CA 95929

Attn: Mr. Chris Souder Re: Minor in Heavy Construction

Dear Chris,

As you know the construction industry right now has seen an increase in the amount of work that is being put in place. We are constantly looking to find good young people to work in our company yet with the demand for Construction Management employees, we are turning to people with Engineering degrees and then having to teach them Construction Management practices. We would love to see a minor in Heavy Construction for these Engineering students to help get them a little bit of knowledge about what our work entails.

If you should have any question, please feel free to call me at 775-302-6420 or email me at lsemenko@qdconstruction.com.

Very Truly Yours,

Mie

Lance Semenko President