Course Name	CAD for Civil Engineering	Course Details	Credit = 0.5
		Course = 0.50 Carnegie Unit Credit	
Course Description	This overview of the fields of civil engineering and architecture emphasizes the inter-relationship and mutual dependence of both fields. Students use state-of-the-art software to solve real world problems and apply knowledge to hands-on projects and activities. By developing and implementing plans, students will experience firsthand job responsibilities of architects and civil engineers. By the end of the course, students will be able to give a complete three-dimensional rendering of buildings and improvements, zoning and ordinance constraints, infrastructure requirements, and other essential project plans. (This course covers all competencies of CAD 233.)		
Note:	This is a suggested scope and sequence for the course content. The content will work with any textbook or instructional resource. If locally adapted, make sure all essential knowledge and skills are covered.		
SCED Identification #	21104	Schedule calculation based on 60 calendar days of a 90-day semester. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.	

All courses taught in an approved CTE program must include Essential Skills embedded into the course content. The Essential Skills Framework for this course can be found at **https://www.cde.state.co.us/standardsandinstruction/essentialskills**

Instructional Unit Topic	Suggested Length of Instruction	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
Overview of Civil Engineering		Understand the role of civil engineering in society. Investigate civil engineering careers, training, and associated opportunities. Identify the regulatory requirements and the environmental ethical considerations for civil engineering design and construction activities.	Understand the role of civil engineering and processes related to civil engineering design. A) Investigate civil engineering careers, training, and associated opportunities; B) Define Civil Engineering; C) Identify civil engineering applications; D) Demonstrate knowledge of OSHA		

			and its role in workplace safety; E) Identify the design process used in civil engineering; F) Identify the activities that occur during each phase of the civil engineering design process; and G) Describe how social, environmental, and financial constraints influence the design process.	
Structural Design and Materials		Identify common construction products and materials used in civil construction projects. Understand survey techniques and other measuring skills used in the drafting and design of civil construction projects. Understand physical and chemical considerations of materials for constructing civil projects. Identify design considerations related to environmental and other factors for drafting and designing civil construction projects.	Understand the structural and material design considerations for civil engineering design and drafting, and the construction of civil projects. Student is expected to: A) Understand survey concepts and terminology; B) Identify basic construction materials used in civil construction; C) Differentiate between the various types of material properties and their applications; D) Understand the lifecycle of a product	

			and its impacts for civil engineering; E) Understand measuring and scaling techniques for materials and as applied to design conventions; F) Discuss the impact of material usage on the environment; G) Describe the various forms of stress (i.e., compression, tension, torque, and shear); H) Calculate material properties relating to a stress strain curve; I) Analyze the principles of statics and dynamics to calculate the strength of various engineering materials used to build a structure; J) Explore site consideration for civil construction projects related to soil and water.		
Civil CAD Design **I. Software components and program interface.**		Use commercial design concepts for civil engineering applications.	Use CADD software for civil engineering applications. Student is expected to:	Civil CAD Design I. Software components and program interface.	

II. Points, point styles, point systems, groups, display and key sets. **III. Civil 3D geometry and components** **IV. Advanced 3D surface modeling techniques.** **V. Profiles and sections** **VI. Corridor design** **VII. Grading plans.** **VIII. Storm sewer and drainage design** **IX. 3D renderings** **X Survey concepts interfaced with Civil 3D documents**		Understand computer-aided design and drafting software configurations and techniques for civil engineering applications.	A) Recognize the software components and program interface. B) Explain points and point styles, systems, groups, display and key sets. C) Differentiate Civil 3D geometry and components used to create and generate 2D and 3D Civil documents. D) Produce drawings of advanced 3 dimensional surface modeling techniques. E) Create profiles and sections. F) Construct and develop corridor design also known as roadways. G) Prepare site grading plans. H) Create and illustrate storm sewer and drainage design. I) Produce 3D renderings. J) Apply survey concepts and operations in Civil 3D documents.	A. Understand the software's new philosophies, interfaces and capabilities. B. Perform basic Civil 3D functions. II. Points, point styles, point systems, groups, display and key sets A. Create, edit, report and label point objects with Civil 3D. B. Create and use point styles. C. Create and use point groups. D. Create and use description key sets. E. Set appropriate point settings for aesthetic purposes. III. Civil 3D geometry and components A. Apply mathematics using the Civil 3D geometry tools. B. Understand bearings, distances, traverses and formulas applied to objects. C. Create and edit geometry using Civil 3D tools. D. Develop parcels and include appropriate labeling and edit alignments techniques. IV. Advanced 3D surface modeling techniques	

			A. Develop terrain models using Civil 3D mathematics operations. B. Compute information from the Civil 3D terrain models and contours using manual calculations and software mathematical calculations. C. Understand the TIN process and TIN data. D. Analyze surface model data. V. Profiles and sections A. Produce, label and edit profiles and sections. B. Compute profiles using formulas and algorithms built into the Civil 3D program. C. Prepare horizontal alignments associated with ground profiles and sectional data. D. Design, label and edit alignments. VI. Corridor design A. Define corridor design in roadway construction terminology. B. Develop and customize assemblies and subassemblies. C. Create and edit roadways. D. Create multiple assembled roadways.	

			E. Apply local city and county safety regulations when designing a roadway. F. Prepare reconstruction documents for existing roadways. VII. Grading plans. 　A. Prepare and understand grading plans. 　B. Apply appropriate linework to grading plans. 　C. Develop earthwork theories and applications using Civil 3D. VIII. Storm sewer and drainage design 　A. Perform piping layout and drafting for utilities and storm sewers. 　B. Understand basic hydrology and hydraulic concepts. IX. 3D renderings. 　A. Visualize designs in order to prepare renderings to display to local city and county planning and zoning boards. 　B. Prepare renderings. X. Survey concepts interfaced with Civil 3D documents 　A. Understand how the surveying interface operates in Civil 3D. 　B. Apply surveying objects.	

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				C. Perform traverse balancing tasks. D. Manage field data collection files.	