

Colorado CTE Course – Scope and Sequence

Course Name	Industrial Design II		Course Details	Credit = 1.0	
			Course = 0.50 Carnegie Unit Credit	Prerequisite: Industrial Design I CTE Credential: CTE Manufacturing	
Course Description	Industrial design II prepares students to design systems and tangible artifacts and deepen understanding of manufacturing and marketing processes. Students will advance development of industry-standard tools, skills, and material usage for product manufacturing and design in Industrial Design, Packaging Design, or Design Arts industry sector.				
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 #		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
Career Development		<p>Investigate work-based learning opportunities aligned with personal and career goals.</p> <p>Understand and develop industry-desired employability skills.</p> <p>Work productively in teams while integrating cultural and global competence.</p>	<p>The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:</p> <p>(A) practice skills required to gain industry-recognized certifications;</p> <p>(B) identify employer work-based learning opportunities;</p>	<p>Explore project management techniques and identify tools and techniques associated with managing and controlling production or work schedules. Discuss how companies use project management to create effective teams.</p> <p>Research and identify work-based learning opportunities and prepare applications based on career and academic goals. Complete mock-interviews and other job-seeking activities.</p>	<p>Updates to ICAP</p> <p>SkillsUSA Personal and Employability Skills Framework</p>

			<p>(C) demonstrate the standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, positive attitude, promptness, attendance, and integrity in a work situation;</p> <p>(D) update personal career goals; and</p> <p>(E) investigate career opportunities in industrial design and manufacturing or advanced training opportunities.</p> <p>The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:</p> <p>(A) use teamwork to solve problems;</p> <p>(B) demonstrate effective communication skills with individuals from varied cultures such</p>		
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			<p>as fellow workers, management, and customers; and</p> <p>(C) use time-management techniques to develop work schedules.</p>		
Safety		<p>Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.</p> <p>Identify regulations and safety standards that are implemented within manufacturing professions.</p>	<p>Comply with standard industry and classroom safety requirements. Student is expected to:</p> <p>(A) understand and apply operational safety precautions for tools, equipment, and materials;</p> <p>(B) apply Personal Protective Equipment (PPE) precautions;</p> <p>(C) use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies; and</p> <p>(D) demonstrate skills related to health and safety in the workplace as specified by the Occupational Safety and Health Administration</p>	<p>Assess a given situation requiring the use of tools, equipment, and materials. Explain the applicability of various safety standards and procedures, and then safely demonstrate the use of the tools, equipment, and materials.</p>	

			and other appropriate agencies.		
Design Products		<p>Research, synthesize, define, ideate, design, refine, and validate mass-produced products.</p> <p>Recognize and apply contemporary manufacturing methods and materials to product design proposals.</p> <p>Organize and present evidence-based research, meaningful product concepts, and final design proposals, compellingly and convincingly.</p>	<p>The student investigates emerging and innovative applications of technology in engineering. The student is expected to:</p> <p>(A) investigate innovative applications of technology in engineering;</p> <p>(B) experiment with new technologies; and</p> <p>(C) experiment with different manufacturing materials such as plastic, composites, fiberglass, stone, and wood.</p>		
Software Design		<p>Understand and apply various technical drafting and design techniques to develop ideas and concepts.</p>	<p>Understand and apply techniques for creating product designs using computer-aided design software. Student is expected to:</p> <p>(A) Demonstrate advance software modeling features;</p> <p>(B) accurately incorporate symbols, notes, dimensioning,</p>	<p>Conduct iterations of modeling a solution to a design problem, demonstrate that design criteria are met, and select a reliable design approach.</p> <p>Use CADD software to create pictorial drawings of advancing complexity, such as isometric, oblique, and perspective drawings. Attend to detail by using proper angles and ensuring holes, cylinders, prisms, and other</p>	

			<p>and line types to CADD drawings;</p> <p>(C) use CADD software to create accurate multi-view drawings of objects of advancing complexity;</p> <p>(D) use CADD software to create pictorial drawings of advancing complexity according to industry standards;</p> <p>(E) create accurate sectional view drawings of advancing complexity (such as full, half, offset, broken-out, removed, and revolved sections);</p> <p>(F) create accurate auxiliary view drawings of advancing complexity including depth, height, or width auxiliary views; partial auxiliary views; and auxiliary section views; and</p>	<p>features are in proper alignment and relationship to each other. Incorporate symbols, notes, dimensions, and line type according to industry standards. Create accurate sectional view drawings of advancing complexity incorporating symbols, notes, and dimensions, using appropriate layout within title blocks, and appropriate drawing composition (including line weight and line type). For example, create a full section drawing of a mechanical part, hatching appropriate surfaces and using notation to indicate the cutting plane.</p>	
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			(G) draw detailed, schematic, and simplified drawings of various types of products.		
Design Business Practices		<p>Investigate and synthesize components of marketing, sales, engineering, manufacturing, servicing, and ecological needs and responsibilities and reconcile them with identified user desires and values.</p> <p>Define product-related problems, variables, and requirements; conceptualize and evaluate alternatives.</p>	<p>The student applies knowledge of the relationship between manufacturing and marketing of a product. The student is expected to:</p> <p>(A) prepare a marketing plan for a product;</p> <p>(B) analyze the effect of customer satisfaction on the image of a product; and</p> <p>(C) analyze how customer demands influence the design of an object</p> <p>(D) calculate costs associated with production of a mass-produced product; and</p> <p>(E) re-examine the manufacturing process to maximize efficiency and minimize costs without compromising the integrity and</p>	<p>Develop a design brief that will guide a design process and follow responsible ethical practices. For example, the design brief should outline a problem definition, design statement, criteria, constraints, and deliverables.</p> <p>Investigate a product market research. Summarize the research findings and the impacts on how the final product was designed or marketed.</p> <p>Demonstrate how to evaluate production costs and profit margins.</p>	

			marketability of the product.		
Product Research		Understand and apply research methods for products.	<p>Investigate how product research is conducted. Student is expected to:</p> <ul style="list-style-type: none"> (A) identify sources to investigate design product solutions; (B) ask clear, relevant questions that lead to defining a design problem; (C) investigate and define research methodologies; (D) use critical thinking to evaluate design solutions; and (E) present clear and concise evidence-based research materials and reports. 	<p>Determine the industrial designer's role in developing solutions to design problems that are justified by scientific knowledge. Research a known industrial designer or engineer and present in an informative paper, oral presentation, or other format his/her designs and explain how they influenced technology in his/her field. Include an outline of how the design process was used in his/her work.</p> <p>Analyze solutions to a real-world problem collaboratively, to identify critical factors of the steps of the design process. Explain why these factors are critical. For example:</p> <ul style="list-style-type: none"> a. Research types of prosthetics and submit a proposal for which one most effectively uses the design process in terms of feasibility, cost, safety, 	

				<p>aesthetics, and durability like a biomedical engineer.</p> <p>b. research ways a product engineer performs tests and monitors performance of processes throughout the stages of production for manufacturing chemicals and products.</p> <p>c. investigate the development and use of models such as diagrams, simulations, graphs, and equations to represent findings from either science or engineering research.</p> <p>d. Discuss the role that market research plays in product development and explain how market research is conducted.</p>	
Product Testing		<p>Test and refine solutions to identified product-related problems, variables, and requirements.</p> <p>Investigate manufacturing quality control standards.</p>	<p>Apply knowledge of product testing techniques to evaluate a product against specifications and quality control standards.</p> <p>Student is expected to:</p>	<p>Evaluate data and identify any limitations of data analysis. Using this information, determine whether a design solution is optimal or should be refined and tested again.</p>	

			<p>(A) identify sources for product data and standards;</p> <p>(B) Investigate commercial product standards; and</p> <p>(C) develop a method to check and maintain quality control throughout the manufacturing process</p>	<p>Compare and contrast the data results from testing multiple design solutions. For example, consider how well each design solution meets the design criteria and constraints.</p>	
Design Lab		<p>Design, invent, create, and construct both digital and physical artifacts in facilities appropriate for such activities.</p> <p>Manipulate wood, polymers, metals to develop physical models.</p> <p>Explore, build, design, and render digital models.</p>	<p>The student manufactures products or systems using the appropriate tools, equipment, machines, materials, and technical processes. The student is expected to:</p> <p>(A) use appropriate manufacturing tools, processes, and equipment to create a prototype;</p> <p>(B) examine prototype testing and/or validate product specifications;</p> <p>(C) examine commercial manufacturing</p>	<p>Design and develop several solution prototypes, conduct feasibility testing, and use the data to justify the solution selected.</p> <p>Discuss the final design solution and how well it meets the design criteria and constraints.</p> <p>Prepare a project report that summarized the steps taken in the project from initial design and concept to production planning and final product testing and production quality control. Identify key project/product deliverables and lessons learned. The design document can include charts, graphs, calculations, engineering drawings, as well as information regarding</p>	

