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| **Subject:** | CADD |
| **Course Number:** | 23 |
| **Descriptive Title:** | Intermediate 3D Design with SolidWorks |
| **Division:** | Industry and Technology |
| **Department:** | Computer Aided Design/Drafting |
| **Course Disciplines:** | Computer Aided Design/Drafting, Drafting |
| **Catalog Description:** | This is an intermediate level course in three-dimensional (3D) modeling and assembly using SolidWorks, a professional engineering and product design software. Building on the foundational skills acquired in the introductory course (CADD-22), this is the second part in the three-course SolidWorks series. It delves into more complex 3D modeling and assembly techniques. Students explore sheet metal design, modify parametric features and equations, understand material mass properties, engage with advanced mechanical mate assemblies, rendering, and 3D printing. By course end, students will be well-versed and prepared to take the Certified SolidWorks Associate exam (CSWA) and/or the Certified SolidWorks Professional (CSWP) exam. |
| **Prerequisite:** | Computer Aided Design/Drafting 22 with a minimum grade of C |
| **Co-requisite:** | |
| **Recommended Preparation:** | |
| **Enrollment Limitation:** | |
| **Hours Lecture (per week):** | 2 |
| **Hours Laboratory (per week):** | 4 |
| **Outside Study Hours:** | 4 |
| **Total Course Hours:** | 108 |
| **Course Units:** | 3 |
| **Grading Method:** | Letter Grade only |
| **Credit Status:** | Credit, degree applicable |
| **Transfer CSU:** | Yes |
| **Effective Date:** | |
| **Transfer UC:** | Yes |
| **Effective Date:** | propose/pending |
| **General Education ECC:** | |
| **Term:** | |
| **Other:** | |
| **CSU GE:** | |
| **Term:** | |
| **Other:** | |
| **IGETC:** | |

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| **Term:** | |
| **Other:** | |
| **Student Learning Outcomes:** | **SLO #1 Design a Sheet Metal Component**<br><br>Students will be able to design a sheet metal part using SolidWorks sheet metal functionalities. The resulting comprehensive orthographic view drawings will encompass vital parameters such as K-factor, bend radius, and sheet metal thickness.<br><br>**SLO #2 Applying Mechanical Mates**<br><br>Students will gain the proficiency to establish component relationships within an assembly by applying mechanical mates that emulate genuine mechanical connections, encompassing cam-followers, gears, hinges, screws, rack and pinion, and universal joints.<br><br>**SLO #3 Rendering Parts and Assemblies**<br><br>Students will be able to employ SolidWorks' integrated tool, Photoview 360 & Visualize, to generate a high-resolution render. Add cameras, adjust lighting, and fine-tune environmental settings to craft professional-grade photorealistic image renders. |
| **Course Objectives:** | 1. Create and manipulate intermediate 3D models with SolidWorks.<br>2. Apply functional dimensions to 3D models with SolidWorks.<br>3. Analyze and assign tolerances to dimensioned models in an assembly.<br>4. Develop and set up relative motion studies.<br>5. Create basic sheet metal parts with multi-bends in different materials.<br>6. Create presentation renders of parts and assemblies with SolidWorks. |
| **Major Topics:** | **I. SolidWorks advanced customization Functions (5 hours, lecture)**<br><br>A. SolidWorks interface & custom panels<br>B. Advanced planes & reference geometric<br>C. Parametric modeling with equations<br><br>**II. SolidWorks Intermediate Sketching (10 hours, lab)**<br><br>A. Sketching on multi-planes & Surfaces<br>B. Convert Entities & Projecting Sketches<br><br>**III. SolidWorks Intermediate Sketching & Best Practices (5 hours, lecture)**<br><br>A. Adding equations and formulas to parametric dimensioning<br>B. Symbols and annotations for complex drawings<br>C. 2D sketch vs 3D sketch<br><br>**IV. Intermediate Sketching Concepts (10 hours, lab)**<br><br>A. Intermediate relationships with simple equations<br>B. Sketches using planes and line types<br>C. Applying dimensions and or geometric constraints to splines and arcs<br><br>**V. Thread & Fastener concepts (5 hours, lecture)** |

A. Hole wizard & thread wizard
B. Toolbox fasteners vs downloaded
C. Making helical threads “manually” using sweeps
D. Making springs

**VI. Creating fasteners and holes manually (10 hours, lab)**

A. Advanced 3D sweeps for threads
B. Springs
    1. Simple
    2. Conical
    3. Extension spring
    4. Variable pitch

C. Helical “manual” threads: Nut and Bolt

**VII. Intermediate Assemblies (5 hours, lecture)**

A. False-color models; changing model color
B. Mating to planes for centering parts & motion
C. Parametric issues
D. Pack and Go (P&G)

1. Reasons for use
2. Naming
3. Zip option from P&G

**VIII. Mechanical Mates & Assembly (10 hours, lab)**

A. Hinge Mates
B. Rack & Pinion Mates
C. Screw Mates
D. Slot Mates
E. Universal Slot Mates

**IX. In-Context Assembly Modeling (5 hours, lecture)**

A. Creating a new part in an assembly
B. Sub-assemblies
C. Breaking links

**X. Advanced Mates & Assembly (10 hours, lab)**

A. Four-Bar linkage assembly
B. Crank & slider assembly
C. U-Joint assembly

**XI. Sheet Metal Concepts (5 hours, lecture)**

A. Sketch to base flange/tab
B. Sheet metal library

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| | C. Convert solid to sheet metal<br><br>**XII. Sheet Metal Design (10 hours, lab)**<br><br>A. Sketched bends<br>B. Adding cut extrudes in sheet metal context<br>C. Edge flange<br>D. Solid / Shelled box to sheet metal box demo<br><br>**XIII. Rendering Techniques (6 hours, lecture)**<br><br>A. Environment and output setup<br>B. Adding cameras & lights<br>C. Quality settings & png vs jpg<br><br>**XIV. Presentation & Portfolio (12 hours, lab)**<br><br>A. Professional high-resolution renders using Photoview 360<br>B. Advanced rendering with SolidWorks Visualize<br>C. Prepare renders and mechanical drawings for portfolio |
| **Total Lecture Hours:** | 36 |
| **Total Laboratory Hours:** | 72 |
| **Total Hours:** | 108 |
| **Primary Method of Evaluation:** | 3) Skills demonstration |
| **Typical Assignment Using Primary Method of Evaluation:** | Using mechanical mates in SolidWorks assembly: Using the components provided, construct a rack and pinion mate. Be mindful of the direction the racks are moving in relation to each other. Create a motion study with the rack and pinion interacting with one another after successfully creating the rack and pinion mate. Create an animation of the motion in high resolution. Upload the animation and all associated components to the cloud or save them to a secure device. Submit the files to the instructor for evaluation. |
| **Critical Thinking Assignment 1:** | Using SolidWorks software to design a sheet metal part: Design a sheet metal part based on sufficient measurements and geometric parameters. Use the Equation feature to link dimensions to changing variables. Use the linked dimensions to create three different configurations. Upload the part and all associated components to the cloud or save them to a secure device. Submit the files to the instructor for evaluation. |
| **Critical Thinking Assignment 2:** | Create threads manually in SolidWorks. Design a two-inch length bolt with a standard 1/4-20 thread using the Sweep boss/bass 3D feature. In a new assembly, add the newly created bolt. Import an appropriate nut to match the bolt you just created using the Tool Box library. Prepare a 2D assembly drawing that includes orthographic views. Upload the drawings and all associated components to the cloud or save them to a secure device. Submit the files to the instructor for evaluation. |
| **Other Evaluation Methods:** | Class Performance, Homework Problems, Objective Exam, Other Exams, Presentation, Quizzes |
| **If Other:** | |
| **Instructional Methods:** | Demonstration, Discussion, Group Activities, Lab, Lecture |
| **If other:** | |

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| **Work Outside of Class:** | Problem solving activity, Required reading, Skill practice, Study |
| **If Other:** | |
| **Up-To-Date Representative Texts:** | Paul Tran. SOLIDWORKS 2022 Intermediate Skills (2022). SDC. |
| **Alternative Texts:** | |
| **Required Supplementary Readings:** | |
| **Other Required Materials:** | |
| **Requisite** | Prerequisite |
| **Category** | sequential |
| **Requisite course:** | Computer Aided Design/Drafting 22 |
| **Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).** | **Familiarity with the basic SolidWorks interface and menu structure.**<br><br>CADD-22: Create and manipulate basic 3D models with SolidWorks.<br><br>**Ability to create and manipulate 3D solid geometry with SolidWorks software.**<br><br>CADD-22: Create 2D fully dimensioned orthographic mechanical drawings. |
| **Requisite Skill:** | |
| **Requisite Skill and Matching skill(s): Bold the requisite skill(s). if applicable** | |
| **Requisite course:** | |
| **Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).** | |
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| **Enrollment Limitations and Category:** | |
| **Enrollment Limitations Impact:** | |
| **Course Created by:** | Vince Phamdo |
| **Date:** | 10/04/2023 |

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| **Original Board Approval Date:** | 03/21/2024 |
| **Effective Term:** | FALL 2024 |