DRAF G170: ADVANCED 3D MECHANICAL DESIGN

Item	Value
Curriculum Committee Approval Date	10/18/2022
Top Code	095300 - Drafting Technology
Units	3 Total Units
Hours	90 Total Hours (Lecture Hours 36; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)

Course Description

This course is advanced solid modeling design for mechanical drafters, designers, and engineers. Students will use the most current 3D software to develop advanced solid models, final projects, and professional portfolios. ADVISORY: DRAF G110. Transfer Credit: CSU; UC: Credit Limitation: DRAF G101, DRAF G105, and DRAF G170 combined: maximum credit, 8 units.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Design a 3D solid/surface model.
3. Evaluate a finished design to create 3D Prototypes and presentation.
4. Assess cost-efficient use of 3D printing technology.

Course Objectives

- 1. Solve design problems in 3D parts and assemblies.
- 2. Formulate mass property analysis, including creating and using a coordinate system.
- 3. Create a CAD project and presentation.
- 4. Analyze designs and modify them for 3D printing.

Lecture Content

Create Parametric Models using: Advanced Sketch entities Advanced Sketch tools Advanced spline tools Relations and references 3D sketching Sketching in drawings Curves Advanced Concepts in Part Modeling A Lofted and Shelled Part Parts Created with Swept Geometry Parts Created with a 3D Sketch as the Sweep Path Create Assembly Models from Part Models Creating the Part Models Creating a Simple Assembly of Parts Creating a Complex Assembly of Subassemblies and Parts Advanced Assembly Operations Adding Features at the Assembly Level Adding Fasteners to the Assembly Creating an Exploded View Detecting Interferences and Collisions Creating Advanced Assembly Drawings Creating an Assembly Drawing Adding an Exploded View Creating a Bill of Materials Using 3D Software for 2D Layouts A Simple Floor Plan Layout Architecture in 3D Design 3D Software Manufacturing Mold Design and Sheet Metal Parts Two-Part Mold Core and Cavity Mold Sheet Metal Part 3D Design in the Product Development Cycle Rapid Prototyping Reverse Engineering Finite Element Analysis Additive Manufacturing Processes Stereo lithography Material Jetting Material Extrusion Powder Bed Fusion Powder Bed Fusion II Binder Jetting Sheet Lamination Directed Energy Deposition Industry Case Studies Tooling and Product Development Supply Chain Evolution Product Evolution Business Model Evolutio n Additive Manufacturing for Small Business Economics of Additive Manufacturing The Future of Additive Manufacturing Resources to Stay Current

Lab Content

Sketching for Surfaces Planes for Surfaces Spline Creation 3D Curve Creation Tools for Surface Creation Extrude Surface Tool Revolved Surfaces Swept Surface Build a Lofted Surface Filled Surface Tool Make a Planar Surface Free-form Surface Command Offset a Surface Modify a Surface Extending Surfaces Trimming Surfaces Untrimming Surfaces Knit Surface Tool Add Fillets Thicken a Surface Surfaces with Solids Fix Corners Fillet Problems Up to Surface Command Cut the Surface Making a Thickened Cut Advanced Animations Terminology Using the Wizard Manual Animations Physics-Based Motion Animation and Basic Motion Adding Gravity and Contact Motors and Contact and Gravity 3D Printer Advanced Settings Repair, Maintenance and Parts Slicer and Host Programs Slicer Settings for Print Quality Print Adhesion Speed Temperature and Cooling Start and End G-Codes Choosing the Best Additive Manufacturing Technique Printing with Filament Printing with Resin Printing With Powder Benefits of 3D Printing Reduce Part Count and Leightweighting Eliminate or Reduce Tooling Bridge and Surge Manufacturing Molds and Casting Medical and Dental 3D Printing Professional Portfolio Professional Resume Professional Cover Letter Portfolio of Completed Work Final Project and Professional Design Critique Final Pro fessional Design Project Project Presentation Professional Certification Test Preparation AutoCAD Certification Certified Solidworks Expert (CSWE or equivalent)

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Instructional Techniques

The primary mode of instruction is lecture/demonstration with Gradual Release of Responsibility (GRR).

Reading Assignments

Textbook Required Reading Websites Instructing CAD Techniques

Writing Assignments

Professional Resume and Cover Letter

Out-of-class Assignments

1. Explore a Library Media Center or MakerSpace Equivalent.

Demonstration of Critical Thinking

1. Compare 3D printing to other manufacturing methods. 2. Analyze designs and modify them for 3D printing. 3. Design a 3D part model with the correct dimensional and geometric sizes and constraints.

Required Writing, Problem Solving, Skills Demonstration

1. Construct a short paper that includes writing for analysis, description, explanation, and evaluation of the specified final project. 2. Apply industry standards, symbols and rules for dimensioning and tolerancing to detailed and assembly drawings. 3. Create a Bill of Materials and relate to the exploded views.

Eligible Disciplines

Drafting CADD (computer -aided drafting/ design), CAD (computer- aided desi...: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required Giesecke, Goodman, Mitchell, Spencer, Hill, Dygdon, Novak, Loving, Lockhart Johnson. Technical Drawing with Engineering Graphics, 15th ed. Prentice Hall, 2017 Rationale: .