

Departmental Syllabus

Prepared by the Department of Engineering Sciences and Applied Technology

Date of Departmental Approval: August 28, 2017

Date approved by Curriculum and Programs: November 29, 2017

Effective: Fall 2018

1. **Course Number:** ENR106
Course Title: 3D Design and Analysis I
2. **Description:** This introductory course explores careers in engineering, architecture, and design. Principles associated with 3D design, visualization, documentation, and product simulation are taught through hands-on use of Computer Aided Design (CAD) modeling software. In addition, student designed parts are fabricated using both additive (3D printing) and subtractive (CNC milling, laser cutting) techniques to enhance the understanding of the design to manufacturing process
3. **Student Learning Outcomes** (instructional objectives, intellectual skills):
Upon successful completion of this course, students are able to do the following.
 - Demonstrate an understanding of Coordinate Systems, Geometric Relationships, Isometric, Diametric, Trimetric Views, and 2D Orthographic Projections.
 - Utilize Geometric Dimensioning and Tolerancing (GD&T) to define and communicate engineering and manufacturing requirements in product designs.
 - Utilize Constructive Solid Geometry (CSG) to create a complex object.
 - Explain how Scaling Design and Parametric Modeling are used to define design intent versus design response.
 - Choose appropriate engineering drawing standards for incorporation in part and assembly drawings.
 - Demonstrate understanding of the principles of design and testing of mechanisms.
 - Apply, categorize, and justify the process steps to develop a product's design.
 - Explain how principles of design (additive and subtractive manufacturing, molds, vacuum forming) are utilized to enhance product manufacturability.
 - Explain how principles of design for sustainability (material selection and manufacturing intent) impact the sustainability of a design.
4. **Credit(s):** 3 credits
5. **Satisfies General Education Requirement:** Natural or Physical Science
6. **Prerequisite(s):** MAT035 (Algebra for Non-STEM) or MAT041 (Elementary Algebra for STEM), ENL108 (Critical Reading & Thinking) or satisfactory basic skills assessment scores
7. **Semester(s) Offered:** Fall
8. **Suggested General Guidelines for Evaluation:** The course grade is based on homework assignments; class work and participation; exam(s); a final examination; and a final project. The project involves assessing requirements to develop a design, fabricating the design, and unambiguously documenting the design.
9. **General Topical Outline:**
 1. Coordinate systems, geometric relationships (such as tangents, concentric, coincident, collinear, symmetric)
 2. Isometric, Diametric, and Trimetric Views, 2D Orthographic Projections
 3. Geometric Dimensioning and Tolerancing (GD&T)
 4. Constructive Solid Geometry (CSG)
 5. Scaling Design and Parametric Modeling
 6. Engineering drawing standards
 7. Principles of design and testing of mechanisms
 8. Introduction to the principles of engineering design process
 9. Principles of design for manufacturability (additive and subtractive manufacturing, molds, vacuum forming)
 10. Principles of design for sustainability