

MONTE VISTA CHRISTIAN SCHOOL
INTD 2521, Introduction to Engineering Design
Course Syllabus

Course Description:

Students dig deep into the engineering design process; applying math, science, and engineering standards to hands-on projects. They work both individually and in teams to design solutions to a variety of problems using 3D modeling software, and learn the standard for precise technical communication.

Curricular Mapping:

This course will introduce students to sketching techniques, emphasis elements of design, and practice with 3D modeling through software designed for industry. Students will learn how to use reverse engineering to re-create parts that already exist and make design improvements on them. In addition, students will exercise their creativity to create brand new models and use structures to solve problems. This course will draw upon the skills learned in Geometry and Physical Science. The projects in this course will reinforce concepts that are taught in Physics and Principles of Engineering. This is a foundation course to engineering design and will prepare them for future design courses in high school (PLTW) and in college.

Course Objectives:

Upon the successful completion of this course the students will be able to:

1. Understand and describe the design process in theory and in application as it is applied to specific design problems.
2. Understand and be able to use a variety of sketching techniques to communicate ideas when brainstorming solutions to a given problem.
3. Use 3D modeling software to create precise parts for fabrication using, at times, advanced modeling skills .
4. Communicate technical specifications for parts through drawings, dimensioning, and tolerance.
5. Calculate tension and compression forces on members within a truss and make design decisions based on those calculations.
6. Understand the importance of communication within the field of engineering and improve in the ability to communicate ideas and solutions verbally, visually, and in writing.
7. Apply math and science in real-world and hands-on projects that are fun and engaging.

Text:

There is no textbook for this course.

Prerequisite:

Geometry

Course Outline:

1. Design Fundamentals
 - a. Introduction to Design Process
 - b. Technical Sketching and Drawing
 - c. Measurement and Statistics
2. Introduction to Modeling
 - a. Puzzle Cube
 - b. Dimensioning
 - c. Documentation
 - d. Toy Modeling Project
 - e. Christmas Ornaments
3. Civil Engineering and Statics
 - a. Strength of Materials
 - b. Calculation of Tension/Compression
 - c. Bridge Project
4. Reverse Engineering
 - a. Analyzing Design using Aesthetics/Structure/Function
 - b. Improvement on Design
 - c. Reverse Engineering Project
5. Advanced Modeling Techniques
 - a. Loft and Sweep
 - b. Diverse use of Constraints
 - c. Building on a Curved Surface
 - d. Trophy Project
 - e. Lego Set Project

Grading:

<u>Grade Book Categories</u>		<u>Semester Weighted Grading Configuration</u>	
Communication	20%	Quarter	40%
Classwork	40%	Quarter	40%
Projects	40%	Final Exam	20%

All student quarter grades will be weighted as follows:

1. Communication 20%: An important aspect of engineering which is often overlooked is the importance of communication. A significant component of this course is the ability to communicate technical information with precision and clarity.
2. Classwork 40%: Activities with 3D modeling software will be employed to increase modeling skills. Most students should have enough time to complete all assignments and tasks in class. If not, the software can be downloaded at home free of charge.
3. Projects 40%: Projects will give students the opportunity to apply what they have learned to solve problems and be creative. Projects will be assessed based on the successful ability to meet the constraints and the creativity of their solutions.

High School Standard Grading Policy:

Please refer to the policy and procedures posted online in our Parent-Student Handbook.

Class Policies:

The following class policies are non-negotiable. Please see the instructor if you have any concerns with your ability to follow these policies.

1. Tardiness: Class starts at the bell. Students are expected to arrive on time and be prepared to begin class. In many cases, we will be working on projects and we need to take advantage of all of the time that we have.
2. Absences: Making up classwork is the responsibility of the student. The policies set forth in the Parent-Student Handbook will be followed regarding make-up work for any excused absence. It is critical that each student find out what has been missed as soon as possible and plan accordingly.

School Policies and Expected Student Learning Results (ESLRs):

Students are subject to all academic policies of the school as found in the Parent-Student Handbook. Furthermore, it is each student's responsibility to read and follow all academic policies of Monte Vista Christian School. In addition to addressing each ESLR every year, we target a specific ESLR each academic year for particular focus

Tips for the Students:

1. Work together to come up with solutions to specific problems. We are smarter in a group than we are alone. Take advantage of the skills and strengths of the people in your group.
2. Be creative. God is the ultimate creator and He created us in His own image. Creativity is a gift from God. Take advantage of it.
3. Have fun! With each project, find your angle and go for it.