



ARTICULATION TEMPLATE

General Course Title:

ENGT 105: Product Design, Development, and Prototype Fabrication (2 Units)
Cerritos College
11110 Alondra Blvd.
Norwalk, CA 90650

Norwalk High School Course:

Engineering Design and Development (Project Lead the Way)
Norwalk High School
11356 Leffingwell Rd.
Norwalk, CA 90650

General Course Description:

This is a capstone course in the engineering design technology program. In this course, students work in teams to design and develop an original solution to a valid openended technical problem by applying the engineering design process. Utilizing the activity-project-problem-based teaching and learning pedagogy, students will perform research to choose, validate, and justify a technical problem. After carefully defining the problem, students will design, build, and test their solution.

College Prerequisite(s):
Advisories/Recommendations

See

HS/ROCP Prerequisite(s): Introduction to Engineering, Principles of Engineering, Third level Engineering Program

Advisories/Recommendations: This course is taught at the 12th grade level and students must have taken at least two of the three Project Lead the Way foundation courses (i.e. Principles of Engineering, Introduction to Engineering Design and Digital Electronics). In addition, most students are expected to have taken a full college-prep course sequence throughout high school.

Course Content:

- Engineering Career Awareness
- Social responsibility and ethics
- Safety practices and standards in the engineering design environment
- Communication, presentation skills and teamwork
- Historical review of engineering design
- Visualization and sketching techniques
- Engineering components, symbols, drawings and measurement standards used in engineering design
- Research skills using Internet
- Engineering units, measurement instruments and construction/assembly tools
- Use of statistical analysis of measurements

- Engineering design tools used in engineering design
- Data Collection Analysis and Documentation
- Use of Engineering Design Software such as Autodesk Inventor
- How to perform self-directed, meaningful activities to arrive at solutions to engineering problems
- Self management skills
- Use of engineering note books
- Coordinate systems
- Geometric relationships
- Isometric and orthographic projections
- Properties of various 2D and 3D geometric shapes
- Use of multi-disciplinary teamwork and brainstorming to solve problems in the shortest time
- Development of 2D and 3D sketching skills use to communicate ideas
- Use of Powerpoint and Excel presentations
- Use of CAD and Solid Modeling programs used by industry
- Use design briefs to define problem, identify solutions within design constraints
- Properties of materials

Competencies and Skill Requirements (Use additional pages as necessary.) Where appropriate, please incorporate standards being used (e.g. CTE standards).

At the conclusion of this course, the student should be able to:

- Demonstrate an understanding of social, economical, environmental and ethical impacts of Engineering
- Demonstrate safety practices and standards in an engineering design environment
- Use the Internet to find EPA (Environmental Protection Agency) and OSHA (Occupational safety and Health Administration) rules and regulations
- Demonstrate ability to effectively communicate verbally, visually and in written format
- Collaborate in a diverse environment, especially with an assortment of outside engineers as required to perform the design project.
- Identify problems that need solving and determine market suitability of the proposed design.
- Use internet to do patent search
- Demonstrate use of the Design Process
- Apply visualization and sketching techniques in solving engineering design problems
- Create and interpret engineering design drawings utilizing industry standards
- Use Internet search to determine technical specifications of components
- Use Internet search to determine safety and environmental codes
- Understand, explain and use software such as Autodesk Inventor to design, edit, model and test 3D designs
- Demonstrate proper use of dimensions
- Explain and demonstrate various terms such as Basic Constraints, Work Features, Extruding, Hole Features, Sweeping, Assembly Constraints, Sub-Assemblies as applied to CAD software
- Reverse engineer an assembled product and use CAD software to generate set of design drawings (Parts, 3d Assembly, 3dD Animated Assembly and 3D Animated Exploding views)
- When given a paper design problem use hand made pictorial sketches to present the concept of a solution
- Given paper design sketches use 2D and 3D software to formulate a solution
- Use a decision matrix to evaluate preliminary design approaches

- Conduct design reviews.
- Write detailed construction and testing procedures
- Prepare a materials and cost analysis
- Use charts to guide and manage project
- Given a design problem organize a team effort to put together an engineering design solution. As a team effort develop, build, test and prepare a Capstone Project supported with both written and oral presentations
- Present and defend the design solution to a review panel
- Demonstrate the ability to work as a team member and collaborate in a diverse environment.
- Use of electrical, mechanical and fluid power along with simple machines and mechanisms.
- Perform structural analysis as required to determine which materials may be used and what size is required to provide acceptable structural strength.
- Program microprocessors as needed for the project.
- Design, assemble and test electrical circuits as required by the project.
- Collaborate with professional engineers in various disciplines.

Measurement Methods (include any industry certification or licensure):

- Daily work
- Participation
- Engineering notebook
- Portfolio
- Teamwork
- Weekly Progress Reports
- Final Written Report
- Display Board
- Presentation
- Tests
- Quizzes
- Vocabulary

Textbooks or Other Support Materials (including Software): The entire curriculum is supplied in electronic format by Project Lead the Way along with all required support and evaluation materials.

Software:

- AutoCAD
- Revit
- Inventor
- Robot C
- Google Sketchup

Procedures for Course Articulation:

Cerritos College credit for the articulated course listed above may be received when the following criteria are met:

1. The student has completed the articulated course listed above with a "B" grade or higher in *Engineering Design and Development (EDD)*
2. The student must enroll at Cerritos College within two (2) years from the semester date in



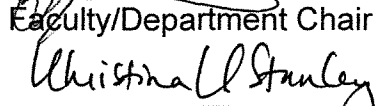


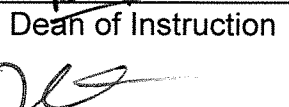
which the course was completed.

3. The student will present verification of successful completion of the articulated course by presenting a *Cerritos College Petition for Credit by Examination* to a Cerritos College Engineering Technology Instructor. The *Cerritos College Petition for Credit by Examination* should be completed and signed by the Instructor, Dean, and Admissions & Records.
4. No more than 12 units of credit may be accepted for credit by examination.

This Agreement will be reviewed annually and will remain in effect until cancelled by either party giving 30 days written notice.

High School/ROP District Signatures

Cerritos College Signatures

	12/8/16		9/29/16
Faculty/Department Chair	Date	Instructor/Division Chair	Date
	12/07/16		9/29/16
Principal	Date	Dean of Instruction	Date
	12-9-2016		9/29/16
Superintendent	Date	Vice President	Date

DWG Facilitator's Signature:

Date:

[Office use only.]

[Office use only.]

TOPs Code:

Internal Tracking Number:

Date Accepted by Steering Committee: