2010/2011 Principles of Engineering

PTE301 - 18 weeks

DoDEA Course Descriptions and Competencies

About the Program

Principles of Engineering prepares students for careers in Engineering and Engineering Technology. The course sequence focuses on duties and tasks performed by professionals in Engineering as well as pre-employment and employment skills.

Major Concepts/Content: The Principles of Engineering course is designed to provide students with an exposure to the various engineering and related career choices. Students will explore careers in engineering, ranging from engineer technicians to professional engineering specialties. The content includes, but is not limited to, studying the process of engineering and engineering systems. Student design teams will be involved in problem solving projects that will require formulating plans for product development; developing preliminary designs; preparing detail, assembly, and layout drawings; developing prototype models; using two- and three- dimensional CAD workstations. Students will use the Internet as one of many tools in researching their project designs. A variety of computer software programs will be used in developing a presentation of final project solutions. This course is strongly recommended for students aspiring to become engineers, architects, and engineer technicians.

Major Instructional Activities: Instructional activities are provided in the engineering technology laboratory setting, using hands-on experience with equipment and materials related to course content. Student teams will be required to plan, design, and produce projects; develop solutions through problem solving activities, present ideas and information orally and in writing. Students will investigate content-related occupations, assume leadership roles and work cooperatively.

Major Evaluative Techniques: Students will be evaluated through laboratory content and practical tests. Projects will be analyzed and evaluated for meeting the essential objectives, creativity, and presentation quality. In addition, the students will be evaluated on their ability to cooperatively work together and solve problems.

The table below is a competency list for the Principles of Engineering course. The competencies are considered essential and are required of all students.

PTE301 18 weeks	Principles of Engineering **TASKS/COMPETENCIES**
Implementing DoDEA's CTE Course Requirements	
• 001	Demonstrate DoDEA's Workplace Readiness Skills in course activities.
• 002	Identify issues relating to this field of study that affect the environment that impact local and global communities.
• 003	Identify Internet safety issues and procedures for complying with acceptable use standards.
Engineers as Problem Solvers	
• 004	Identify engineering role models, including minorities and women.
• 005	Identify problems that engineers may solve in the future.
• 006	Define attributes associated with being a successful engineer.

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Engineering Team	
• 007	Participate on an engineering team working together to solve problems.
• 008	Explain how ethics influences the engineering process.
• 009	Explain how social, environmental and financial constraints influence the engineering process.
Careers in Engineering	
• 010	Explain the difference between engineering disciplines and job functions.
• 011	Research and discover the educational requirements to become an engineer.
• 012	Become familiar with an area of engineering by preparing for and conducting an interview with an engineer in that field of engineering.
Sketching	
• 013	Use proper sketching techniques to solve a design problem.
• 014	Select the appropriate sketching styles for presentations to a group.
• 015	Use proper proportioning while producing annotated sketches.
Introduction to Engineering Drawing	
• 016	Produce 2D drawings of simple objects using Computer Automated Drawing (CAD).
• 017	Produce 3D wireframe drawings of simple objects using CAD.
• 018	Use parametric design techniques to produce drawings of simple objects using CAD.
Technical Writing	
• 019	Research, plan, and compose a written technical report describing an engineering career field.
• 020	Produce an organized outline for a technical paper.
Data Representation and Presentation	
• 021	Design and create tables, charts, and graphs to illustrate collected data.
• 022	Apply drawings, tables, charts, or graphs to accurately communicate collected data for technical reports or presentations.
• 023	Design and deliver a presentation utilizing appropriate support materials regarding conducted research.
Design Process	
• 024	Compose and diagram the product development lifecycle of an invention.
• 025	Apply the design process documenting the evolution of an invention.
Simple Machines	
• 026	Describe and demonstrate the concept of mechanical advantage as applied to simple machines.
• 027	Calculate mechanical advantage for six different types of simple machines.
• 028	Design and construct a Simple Machine Energy Transformation (SMET) device.
Hydraulic and Pneumatic Systems	
• 029	Students will select fluidic power sources to perform different functions.
• 030	Produce a schematic diagram of a sample fluidic power circuit.
• 031	Construct a sample fluidic power circuit.

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• 032	Build an electronic circuit to amplify an audio signal.
• 033	Build a circuit using NAND and NOR gates to perform a logic operation.
Automated Systems	
• 034	Design, construct, and program an automated system to solve a design problem.
• 035	Use sensors to determine a coordinated response from and automated system.
Statics and Structures	
• 036	Mathematically analyze the efficiency of a simple truss.
• 037	Design, construct and test a model truss design and test if for efficiency.
• 038	Prepare and present a mathematical analysis of a truss design.
• 039	Use CAD software to analyze a shape.
• 040	Describe the concepts of torsion, compression and tension as applied to structural members of a truss.
Production Process	
• 041	Define the major categories of the Production Processes.
• 042	Analyze a component part of a product and describe the processes used to produce it.
• 043	Interpret a drawing and produce a part.
Quality Assurance	
• 044	Utilize a variety of precision measurement tools to measure appropriate dimensions, mass, and weight.
• 045	Explain the need for quality control in engineering.
• 046	Explain the difference between process and product control.
Trajectory and Motion	
• 047	Explain the difference between distance traveled and displacement.
• 048	Design and build a device to measure acceleration, displacement, and velocity.
• 049	Explain how velocity and acceleration are calculated.
• 050	Analyze test data and utilize the results to make improvements.
Enhancing Career Exploration and Employability Skills	
• 051	Conduct a job search.
• 052	Create or update a portfolio containing representative samples of student work.