2010/2011 Engineering Design and Development PTE603 - 36 weeks DoDEA Course Description and Competencies

About the Program

Engineering Design and Development prepares students for careers in Engineering. 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 Engineering Design and Development course forms the capstone project for the Pre-Engineering curriculum. In this course, students will work in teams of two to four individuals to design and construct the solution to an original engineering problem. Each design problem is taken from a database of design problems offered to all DoDEA students enrolled in the course. As students work on their capstone project they will develop technical writing skills and use a variety of CAD, CAM, GIS, fabrication, manufacturing, and robotics technologies. Students will also maintain an engineering journal and develop a portfolio. This course is the culmination of the pre-engineering curriculum and is intended as an opportunity for students to utilize all the skills acquired through the pre-engineering strand of courses.

Major Instructional Activities: Instructional activities are provided in the laboratory setting, using hands-on experiences with tools, equipment, and materials related to course content. Students will be required to work in teams as they plan, design, and produce projects. They will also develop solutions to problem solving activities, maintain a technical journal, produce a portfolio, and present ideas and information orally and in writing. Students will assume leadership roles and work cooperatively.

Major Evaluative Techniques: Students will be evaluated through laboratory practices, safety, and procedural equipment tests. Projects will be analyzed and evaluated for successful solution, originality, creativity, accuracy, and understanding of concepts. Written and oral reports will be graded for content and form. In addition, the students will be evaluated regarding how successfully they work together to design solutions to engineering problems.

PTE603	Engineering Design and Development	
36 weeks	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.	
Research Journaling		
• 004	Explain the need for retaining project research in one location.	
• 005	Select appropriate information for inclusion in the research journal.	
• 006	Format the journal so it is well-organized and easy to use.	

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

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Joweeks	IASKS/COMPETENCIES	
Use Con	ventional Library Resources	
• 007	Use conventional library resources as a starting point for all research.	
• 008	Choose the appropriate media to obtain the desired information.	
Using the Computer as a Research Tool		
• 009	Distinguish relevant from irrelevant web sites.	
• 010	Manipulate search engines to find specific information.	
• 011	Create strategies for identifying key terms that narrow their search topic.	
• 012	Examine on-line databases to search for patents, people, business, Government and	
	Academic information.	
• 013	Correspond by E-mail including the use of attachments.	
Contacting The Experts		
• 014	Compose an introduction and a thank you letter.	
• 015	Define the positive characteristics for personal interviewing. (e.g. courtesy,	
	professionalism, listening skills, personal hygiene, etc.)	
• 016	Develop communication skills that will allow them to converse over the phone and	
	conduct a face-to-face interview.	
Demonst	rate Methods of Brainstorming	
• 017	Use a decision matrix in narrowing a topic of research.	
• 018	Develop and define constraints and specifications for use in a decision matrix.	
• 019	Decision matrix to rank order alternatives.	
• 020	Decision matrices to develop a concise problem statement.	
Research	n the Topic	
• 021	Discuss and explain key issues and terminology within their topic area.	
• 022	Narrow a topic focus using the decision matrix.	
• 023	Give an oral presentation.	
Writing	A Problem Statement	
• 024	Based on their research, develop a problem statement.	
• 025	Apply the decision matrix to a problem, justifying their problem statements based on	
	previous research findings and decision matrices.	
Research	ning, Redefining & Justifying Alternative Solutions	
• 026	Generate a list of existing solutions to their research problem.	
• 027	Using decision matrices, evaluate the advantages and disadvantages of present	
021	solutions to their research problem.	
• 028	Following a review of the specifications and constraints identified in their decision	
020	matrices, develop a list of alternative solutions to their stated problem.	
• 029	Conduct preliminary patent searches to determine the originality of their alternative	
0_2	choices.	
• 030	Conduct research to determine the merit of their alternative choices based on the state	
	of the art in the field.	
Presenta	tion Methods	
• 031	Identify techniques for delivering formal presentations.	

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36 weeks	TASKS/COMPETENCIES	
• 032	Choose an appropriate formal presentation format and prepare their presentation.	
• 033	Construct and deliver a PowerPoint presentation centered on their topic of research.	
Independent Research		
• 034	Define and demonstrate time management planning skills as they pertain to their	
	project.	
• 035	Identify methods and sources for obtaining materials and supplies.	
• 036	Complete an independent research project.	
Develop A Prototype		
• 037	Provide a detailed set of instructions for producing a testable prototype based upon	
	their research and the information gained through their research.	
• 038	Identify safe practices for the use of tools and equipment.	
• 039	Create and justify a process for testing a prototype design that will yield valid data	
	concerning the design's attempt at solving their problem statement.	
• 040	Review testing procedures to determine the validity of the testing procedures.	
• 041	Apply the appropriate statistical analysis tools to test results to ensure their validity and significance.	
• 042	Identify, define, and implement needed modifications to their design based upon their	
	ongoing research.	
• 043	Evaluate and explain the effectiveness of their design at solving the problem that they have defined.	
Write a l	Research Paper	
• 044	Arrange the data and information compiled throughout the project and compose a	
	technical research paper.	
• 045	Use a standardized format for composing their research papers.	
Make a I	Formal Presentation	
• 046	The student will be able to discuss their findings in a formal presentation before an	
	audience.	
Develo	ping Career Exploration and Employability Skills	
• 047	Describe and define the purpose and rationale of the course and the skills and	
	knowledge base it is designed to present.	
• 048	Describe the characteristics of a successfully completed project based on previously	
	completed projects.	
• 049	Distinguish the differences between the goals of this class and the type of projects	
0.7.0	done in other classes.	
• 050	Describe and define the structure for evaluating a research project.	
• 051	Create or update a portfolio containing representative samples of student work.	