Introduction to Engineering					
Course Description					
Introduction to Engineering (IE) is a high school entry level course that is appropriate for 9th or 10th grade students who are interested in design and engineering. The major focus of the IE course is to expose students to design process, research and analysis, teamwork, communication methods, engineering standards, and technical documentation. IE gives students the opportunity to develop skills and understanding of course concepts through activities, projects, and problem-based (APPB) learning. Used in combination with a teaming approach, APPB-learning challenges students to continually hone their interpersonal skills, creative abilities and understanding of the design process. It also allows					
Program of Study to which the course applies	**Course Code**				
STEM-Engineering	103191				
	Course Content	**Reference Standards**	**Crosswalk to Common Core Academic Standards**	**Crosswalk to Nebraska Academic Standards**	**Comments**
Standard 1	Students will survey Engineering disciplines.	CCC			
Benchmark 1.1	Investigate mathematical requirements for success in Engineering.	NCS 2	ELA.WHST.11-12.7-9	LA.12.1.6.j LA.12.4.1.a-c	
Sample Performance Indicator 1.1.1	Analyze formulated engineering problems.				

Benchmark 1.2	Apply basic algebraic concepts to solve problems	NCS 2	MTH.A.CED.4 MTH.A.REI.3	MA.12.3.2.a MA.12.3.3.f SC.12.1.1.l	Alignment presumes that students will use technology to draw designs using geometric objects to solve engineering problems (CC: MTH.A.CED.4, MTH.A.REI.3; NE: MA.12.3.2.a, MA.12.3.3.f).
Sample Performance Indicator 1.2.1	Apply their knowledge of science, technology, engineering, and mathematics when solving practical problems.				
Sample Performance Indicator 1.2.2	Solve formulated engineering problems.				
Sample Performance Indicator 1.2.3	Use contemporary engineering tools, such as, computer-aided drawing (CAD), computer aided manufacturing (CAM), calculators, and spreadsheets to communicate and demonstrate their use of science, technology, and mathematics knowledge.				
Standard 2	Students will properly apply safety procedures, practices, and equipment operation.	OSHA			
Benchmark 2.1	Practice required safety standards according to industry.	OSHA	ELA.RST.11-12.3	LA.12.1.6.k LA.12.3.2	Alignment presumes that students must comprehend oral or written instructions to complete the task (CC: ELA.RST.11-12.3; NE: LA.12.1.6.k, LA.12.3.2)

Sample Performance Indicator 2.1.1	Successfully complete written safety assessment.				
Sample Performance Indicator 2.1.2	Student and parent/guardian sign and abide by safety contract.				
Standard 3	Student will demonstrate basic design process principles.	IED 1			
Benchmark 3.1	Use the design process to define a problem and research a solution.	IED 1	ELA.RST.11-12.3	LA.12.1.6.k LA.12.3.2 MA.12.2.4.a SC.12.1.3.a SC.12.1.3.b	Alignment presumes that students must comprehend oral or written instructions to complete the task (CC: ELA.RST.11-12.3; NE: LA.12.1.6.k, LA.12.3.2). Alignment presumes that students will use technology to draw designs using geometric objects (NE: MA.12.2.4.a)
Sample Performance Indicator 3.1.1	Apply Engineering notebook standards and protocols during documentation.				
Sample Performance Indicator 3.1.2	Gather information using various sites and resources.				
Sample Performance Indicator 3.1.3	Sketching possible solutions to problem stated.				
Sample Performance Indicator 3.1.4	Use of oblique and isometric sketching techniques to represent solution.				
Benchmark 3.2	Using design teams to brainstorm possible solutions.	IED 4.2, NCS D4	ELA.SL.11–12.1	LA.12.3.3 MA.12.2.4.a SC.12.1.3.a	Alignment presumes that students will use technology to draw designs using geometric objects (NE: MA.12.2.4.a)
Sample Performance Indicator 3.2.1	Sketching possible solutions to problem stated.				

Sample Performance Indicator 3.2.2	develop a set of team norms or guidelines to follow.				
Benchmark 3.3	Introduction to technical sketching and drawing.	NCS D4	ELA.WHST.11-12.6 MTH.G.MG.3	LA.12.3.1.c MA.12.2.4.a MA.12.2.5.b	Alignment presumes that students will use drawings to explain mathematical equations and will select and apply appropiate methods of computation to make technical sketches and drawings (CC: MTH.G.MG.3; NE: MA.12.1.2.a, MA.12.1.3.d, MA.12.2.4.a).
Sample Performance Indicator 3.3.1	Use of oblique,isometric and multiview sketching techniques to represent the solution.				
Sample Performance Indicator 3.3.2	Use measurement and statistics.				
Sample Performance Indicator 3.3.3	Engineers use universal standardized symbolic languages to communicate, such as, mathematical equations, drafting standards, American Society of Heating, Refrigerating, and Air-condition Engineers, Inc. (ASHRAE) Handbook, American National Standards Institute (ANSI) Standards, and related professional codes.				
Sample Performance Indicator 3.3.4	Engineered outcomes must be documented to accepted standards with precision in order to aid in avoiding unnecessary harm.				
Standard 4	Student will demonstrate basic 3D modeling software skills.	IED			

Benchmark 4.1	Use geometric and numeric constraints to define the shape and size of objects in Computer Aided Design (CAD) modeling systems.	IED 1.4		MA.12.2.4.a MA.12.2.4.b	
Sample Performance Indicator 4.1.1	Create simple extruded solid Computer Aided Design (CAD) models from dimensioned sketches.				
Sample Performance Indicator 4.1.2	Apply geometric and numeric constraints to CAD sketches.				
Benchmark 4.2	Design and construct a complex 3-dimensional object.	IED 1.4		MA.12.2.4.a MA.12.2.4.b	
Sample Performance Indicator 4.2.1	Students will derive Three-dimensional forms from two-dimensional shapes.				
Sample Performance Indicator 4.2.2	Brainstorm and sketch possible solutions to an existing design problem.				
Sample Performance Indicator 4.2.3	Select an approach that meets or satisfies the constraints given in a design brief.				
Sample Performance Indicator 4.2.4	Create simple extruded solid Computer Aided Design (CAD) models from dimensioned sketches.				
Standard 5	Students will produce a product/project for evaluation.	NCS 1, NCS 3			
Benchmark 5.1	Logically segment problems and opportunities from an engineering perspective to derive effective solutions (use Engineering Design Process).	NCS 3		SC.12.1.3.a SC.12.1.3.b SC.12.1.3.c SC.12.1.3.d SC.12.1.3.e	Alignment presumes that students will propose a technical design, implement the solution, evaluate it, and then communicate the process to derive effective solutions (NE: SC.12.1.3.a, SC.12.1.3.c, SC.12.1.3.d, SC.12.1.3.e).

Sample Performance Indicator 5.1.1	Use engineering notebook documentation or worksheet to log the Engineering Design Process (1. Define the problem. 2. Research the problem. 3. Create possible solutions. 4. Choose the best solution. 5. Create a prototype. 6. Test and evaluate. 7. Communicate. 8. Redesign.)				
Sample Performance Indicator 5.1.2	Brainstorm and discuss the product process.				
Sample Performance Indicator 5.1.3	Create a flowchart of the product process.				
Benchmark 5.2	Create a [computer model] product on the computer.	CIM 2.3		MA.12.2.4.b	
Sample Performance Indicator 5.2.1	Model product/project on computer in 2D.				
Sample Performance Indicator 5.2.2	Model product/project on computer in 3D.				
Benchmark 5.3	Create parts using the machines demonstrated by the instructor.	CIM 2.3	ELA.RST.11-12.3	LA.12.1.6.k LA.12.3.2 SC.12.1.3.c	Alignment presumes that students must comprehend oral or written instructions to complete the task (CC: ELA.RST.11-12.3; NE: LA.12.1.6.k, LA.12.3.2).
Sample Performance Indicator 5.3.1	Prototype [create] product/project using common office supplies.				
Sample Performance Indicator 5.3.2	Prototype [create] product/project using hand tools.				
Sample Performance Indicator 5.3.3	Prototype [create] product/project using 3D printer.				

Sample Performance Indicator 5.3.4	Plot the product/project.				