

## INTRODUCTION TO DESIGN PROCESSES

*Introduction to Design Processes* is a course that specializes in modern design and engineering processes with a focus on creative problem solving in developing, testing, communicating, and presenting post-evaluation of products. Students use the design process to analyze research, develop ideas, and produce products solutions. This process gives a framework through which they design, manufacture tests present their ideas. Students will demonstrate and utilize design principles and elements for visual presentation. Designing aspects will also cover aesthetics, ergonomics, the environment, safety, and production. The design process is a core-learning tool for many courses enabling the student to solve problems in a systematic, logical and creative manner. Students develop a good understanding of the way the process helps them think creatively and developing aesthetic ideas. The design process encourages the students to engage in higher level thinking to create solutions too many problems.

- DOE Code: 4794
- Recommended Grade Level: Grade 10
- Recommended Prerequisites: None
- Credits: 2 semester course, 2 semesters required, 1 credit per semester, maximum of 2 credits
- Fulfills a Directed Elective or Elective requirement for all diploma types

### **Application of Content and Multiple Hour Offerings**

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences.

## Content Standards

### **Domain – The Design Process**

**Core Standard 1** Students create solutions using the design process steps for solving problems.

#### **Standards**

- IDP-1.1 Identify and describe the steps in the design process
- IDP-1.2 Compare the design processes specific to the subject matter
- IDP-1.3 Apply and adapt the design loop as a guide in problem solving
- IDP-1.4 Discuss the importance of the design process and how the process affects the outcome
- IDP-1.5 Discuss the impact technology and innovation has had on our world

### **Domain – Problems and Opportunities**

**Core Standard 2** Students examine problems to identify opportunities for innovative solutions.

#### **Standards**

- IDP-2.1 Identify needs of human beings
- IDP-2.2 Explain how problems can create opportunities
- IDP-2.3 Describe and apply the faultfinding process
- IDP-2.4 Create a design brief

IDP-2.5 Describe and apply scientific truth finding

IDP-2.6 Describe and apply problem solving techniques

### **Domain – Documenting Design Work**

**Core Standard 3** Student prepare organized and relative documentation of the design process for their solutions of final products.

#### **Standards**

IDP-3.1 Explain the importance of a portfolio

IDP-3.2 Develop sketching and principles of visualization skills to document work

IDP-3.3 Prepare working drawings including orthographic projections, isometrics, and perspective – using appropriate drawing styles and techniques

IDP-3.4 Use CAD workstations and appropriate software

IDP-3.5 Prepare graphs and explain how they relate information

IDP-3.6 Develop a portfolio

### **Domain – Investigation and Research**

**Core Standard 4** Students synthesis information obtained through appropriate resources that are in direct relation to the problem's solution.

#### **Standards**

IDP-4.1 Collect data and information to be used to solve a problem

IDP-4.2 Apply questions in a proper way to collect information

IDP-4.3 Describe and conduct an interview process

IDP-4.4 Apply appropriate investigative strategies

IDP-4.5 Identify and describe good sources for research and appropriately document all resources

IDP-4.6 Evaluate resources with regards to the identified problem

### **Domain – Designing Systems**

**Core Standard 5** Students design solutions using their knowledge of technological systems for developing innovative solutions.

#### **Standards**

IDP-5.1 Identify and describe the basic parts of a technological system

IDP-5.2 Describe and design a structural system

IDP-5.3 Describe and design a mechanical system

IDP-5.4 Describe and design an electronic system

IDP-5.5 Describe and design a pneumatic system

### **Domain – Generating and Developing Ideas**

**Core Standard 6** Student choose techniques to foster creative solutions to a design problem.

#### **Standards**

IDP-6.1 Define and describe types of cognitive thinking

IDP-6.2 Apply cognitive techniques of thinking to identified problems

IDP-6.3 Define and describe brainstorming techniques

- IDP-6.4 Use research to formulate ideas
- IDP-6.5 List and describe the components of a design
- IDP-6.6 Apply brainstorming techniques to develop many possible solutions
- IDP-6.7 Explain the human, social and environmental issues that affect the design solutions
- IDP-6.8 Analyze ethical issues in choosing design solutions
- IDP-6.9 Apply decision techniques to choose solutions based on appropriate criteria

**Domain – Materials, Prototyping and Testing**

**Core Standard 7** Students validate solutions through material selection, modeling, prototyping and testing of their final product or system.

**Standards**

- IDP-7.1 Differentiate the major physical properties of materials
- IDP-7.2 Identify and describe the major classifications of materials
- IDP-7.3 Define and illustrate modeling and prototyping
- IDP-7.4 List five materials that can be used for modeling
- IDP-7.5 Produce ways to present test results
- IDP-7.6 Apply and adapt methods of evaluating design work
- IDP-7.7 Conduct and document product tests

**Domain – Presenting Design Solutions**

**Core Standard 8** Students prepare presentations of final design solutions to be critiqued by others.

- IDP-8.1 Compare methods that are used to communicate a design solution
- IDP-8.2 Create a presentation showing the steps used in the design process
- IDP-8.3 Present a product for critique
- IDP-8.4 Demonstrate professional presentation techniques

**Domain – Aesthetic Design**

**Core Standard 9** Students demonstrate artistic fundamentals which are utilized throughout the design process to solve visual problems and communicate ideas for a product or system.

- IDP-9.1 Identify the knowledge and skills gained in art experiences that transfer to the design process
- IDP-9.2 Analyze the effective use of symbols, elements, principles, and media using appropriate terminology
- IDP-9.3 Construct insightful, convincing interpretations of products or systems by identifying problematic features, forming theories, and evaluating alternative theories
- IDP-9.4 Engage in critical reading, writing, and discourse to improve understanding of own work and that of others
- IDP-9.5 Demonstrate skill in perception from real life to present convincing representation of objects or subject matter
- IDP-9.6 Select subject matter, symbols, and ideas to communicate statements to the consumer
- IDP-9.7 Engage in philosophical inquiry into the nature aesthetic issues independently or with others
- IDP-9.8 Make informed choices about specific subject matter or concepts and defend those

- choices when given a range of objects or spaces
- IDP-9.9 Appropriate symbols and metaphors from art and design and describe their origin, function, and value in the solutions
  - IDP-9.10 Demonstrate thoughtful revision and refinement of original design solutions based upon reflection, critique, practice, and research
  - IDP-9.11 Examine and establish criteria for judging excellence in work and revise and refine work through analysis, synthesis, peer critique, and self-evaluation, utilizing established criteria for the purpose of creating portfolio level work
  - IDP-9.12 Evaluate the effectiveness of elements and principles in other design solutions and use this evaluation to inform personal work
  - IDP-9.13 Create multiple solutions in works that demonstrate competence in producing effective relationships between elements, media, and function
  - IDP-9.14 Create design solutions that use specific elements, principles, and functions to solve problems and communicate ideas
  - IDP-9.15 Create design solutions that demonstrate skill and understanding of different media, processes and communicate ideas
  - IDP-9.16 Begin, define, and solve challenging visual problems, demonstrating skill and in-depth understanding of media and processes

### **Career and Technical Student Organizations**

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in a Career and Technical Student Organization, such as the **Technology Student Association (TSA)**.