FREEHOLD REGIONAL HIGH SCHOOL DISTRICT

OFFICE OF CURRICULUM AND INSTRUCTION

INTERNATIONAL BACCALAUREATE PROGRAM

IB DESIGN TECHNOLOGY SL: YEAR 2

Grade Level: 12

Credits: 5

BOARD OF EDUCATION ADOPTION DATE:
AUGUST 27, 2018

FREEHOLD REGIONAL HIGH SCHOOL DISTRICT

Board of Education

Mr. Michael Messinger, President
Mr. Peter Bruno, Vice President
Mr. Carl Accettola
Mrs. Diana Cappiello
Mr. Samuel Carollo
Mrs. Amy Fankhauser
Mrs. Kathie Lavin
Mr. Heshy Moses
Mrs. Jennifer Sutera

Central Administration

Mr. Charles Sampson, Superintendent
Dr. Nicole Hazel, Chief Academic Officer
Ms. Shanna Howell, Director of Curriculum and Instruction
Mr. Oscar Diaz, Administrative Supervisor of Curriculum & Instruction
Ms. Stephanie Mechmann, Administrative Supervisor of Curriculum & Instruction
Ms. Renee Schneider, District Supervisor of Instruction

Curriculum Writing Committee

Ms. Megan Zummo

Supervisor

Mr. Michael Dillon

IB DESIGN TECHNOLOGY SL, YEAR 2
COURSE PHILOSOPHY
The International Baccalaureate Organization provides the following philosophy: “Diploma Programme Design Technology aims to develop internationally-minded people whose enhanced understanding of design and the technological world can facilitate our shared guardianship of the planet and create a better world. Both science and technology have a fundamental relationship with design. Technology preceded science, but now most technological developments are based on scientific understanding. Traditional technology comprised useful artifacts often with little understanding of the science underpinning their production and use. In contrast, modern technology involves the application of scientific discoveries to produce useful artifacts. The application of scientific discovery to solve a problem enables designers to create new technologies and these new technologies, in turn, can impact on the rate of scientific discovery. The aim of the DP Design Technology course is to foster the skill development in students required to use new and existing technologies to create new products, services and systems.”
COURSE DESCRIPTION
The International Baccalaureate Organization provides the following course description: “Design Technology focuses on analysis, design development, synthesis and evaluation. The creative tension between theory and practice is what characterizes Design Technology within the DP sciences subject group. Inquiry and problem-solving are at the heart of the subject. DP Design Technology requires the use of the DP design cycle as a tool, which provides the methodology used to structure the inquiry and analysis of problems, the development of feasible solutions, and the testing and evaluation of the solution. In Diploma Programme Design Technology, a solution can be defined as a model, prototype, product or system that students have developed independently. It achieves a high level of design literacy by enabling students to develop critical-thinking and design skills, which they can apply in a practical context. While designing may take various forms, it will involve the selective application of knowledge within an ethical framework. A well-planned design programme enables students to develop not only practical skills but also strategies for creative and critical thinking.”

COURSE SUMMARY	
COURSE GOALS	
CG1: Students will communicate and present technological information of their design for client approval. CG2: Students will construct, analyze and evaluate design briefs, problems, specifications and plans for creating a final product, prototype, or model. CG3: Students will analyze and evaluate methods, techniques, products, information and technological explanations in order to produce the best possible product, model, or prototype. CG4: Students will demonstrate the appropriate research, experimentation, modeling, and interpersonal skills in order to carry out innovative, insightful, ethical, and effective designing.	
COURSE ENDURING UNDERSTANDINGS	**COURSE ESSENTIAL QUESTIONS**
CEU1: Designers consider human factors to ensure products meet ergonomic needs.	CEQ1a: How do we design something that is comfortable for humans to use?
CEU2: As our Earth's resources are slowly depleted, ethical use of resources and the use of clean technology worldwide should be on every designer's mind.	CEQ2a: What role does ethics play in the adoption of new technologies? CEQ2b: How can we reduce the negative impact of humans on our environment?
CEU3: Dimensioned and rendered CAD creations are used by modern industry to create prototype models of new products.	CEQ3a: How do drawings influence a final product?
CEU4: Communicating an engineering design requires effective visual representation and presentation skills that are audience appropriate.	CEQ4a: How does the way you communicate with a client vary by audience? CEQ4b: Why is it important for an engineer or designer to communicate their solution to a client?
CEU5: The design process is an iterative series of steps taken in order to create a product or solve a problem while simultaneously engaging in self-evaluation and redesign.	CEQ5a: How do we know that we've developed the best solution to a problem?

UNIT GOALS AND PACING		
UNIT TITLE	**UNIT GOALS**	**DURATION**
1: Innovation and Design (Criterion A)	Students will describe an appropriate real world problem, explain real world findings, develop a detailed design brief, develop marketing specifications, and apply these concepts to analysis of a design opportunity.	14 sessions
2: Human Factors and Ergonomics (Criterion A)	Students will develop design specifications from the design brief and research which specifications justify the requirements of design opportunity analysis.	14 sessions
3: Modelling (Criterion B)	Students will explore possible solutions, use concept modelling, and justify the most appropriate idea to meet the requirements of conceptual design.	25 sessions
4: Resource Management and Sustainable Production (Criterion C)	Students will choose appropriate materials and manufacturing techniques to meet the requirements of development of a detailed design.	21 sessions
5: Final Production (Criterion C & Criterion D)	Students will research, analyze and test various properties of materials then apply material analysis to various manufacturing processes in a detailed design proposal and manufacturing plan of their final prototype to meet requirements.	28 sessions
6: Classical Design (Criterion D)	Students will synthesize the characteristics of classical design and how it relates to the success of the solution and explain how the solution could be improved to meet the requirements of testing and evaluating.	18 sessions

IB DESIGN TECHNOLOGY SL 2	DURATION:
UNIT 1: INNOVATION AND DESIGN	14 SESSIONS

UNIT OVERVIEW	
UNIT LEARNING GOALS	
Students will describe an appropriate real world problem, explain real world findings, develop a detailed design brief, develop marketing specifications, and apply these concepts to analysis of a design opportunity.	
ENDURING UNDERSTANDINGS	**ESSENTIAL QUESTIONS**
CEU5: The design process is an iterative series of steps taken in order to create a product or solve a problem while simultaneously engaging in self-evaluation and redesign.	CEQ5: How do we know that we've developed the best solution to a problem?

UNIT LEARNING SCALE	
4	In addition to score 3 performances, the student can assist a peer in applying the concepts and/or use the concepts learned in class in another setting.
3	The student can: ● describe an appropriate problem, which leads to a design opportunity; ● supply evidence of the key findings from relevant market and user research; ● identify the expected outcome and broad requirements determined from the market and user research; ● clearly state the design problem using supporting materials; ● develop a detailed design brief including marketing specifications; ● create an analysis of the design opportunity and its solution; ● identify and discuss all related concepts and principles; ● identify parameters and requirements to develop feasible solutions to the design opportunity.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of score 3 performances.
1	The student needs assistance to avoid major errors in attempting to reach score 3 performances.
0	Even with assistance, the student does not exhibit understanding of the performances listed in score 3.

COMMON ASSESSMENT	
ALIGNMENT	**DESCRIPTION**
8.2.12.A.1, 2 8.2.12.C.7 8.2.12.D.1 8.2.12.E.4 DOK4	Students will independently follow Criterion A (Analysis of a Design Opportunity) to accomplish the following through research and documentation: ● Describe an appropriate problem, which leads to a design opportunity including, but not limited to photographs, extracts from letters, magazines and news articles. ● Explain the key findings from relevant market and user research that shows evidence of quantitative and qualitative data, an analysis of competing products, etc.

TARGETED UNIT STANDARDS		
DECLARATIVE KNOWLEDGE	**PROCEDURAL KNOWLEDGE**	**NEW STANDARDS TO INTRODUCE**
innovation relevant parameters stakeholders in invention and innovation strategies for innovation	Describe an appropriate problem that leads to a design opportunity (DOK 2) Identify the relevant parameters of the problem (DOK 1) Develop a detailed design brief which identified these parameters of the problem (DOK 3) Develop a design specification, which justified the requirements (DOK 3)	8.2.12.A.1 Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation.
design and marketing specifications innovation	Explain key findings from relevant market and user research (DOK 2)	8.2.12.A.2 Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
functionality growth maturity obsolescence product life cycle Rogers' Characteristics of Innovation and Consumers style	Develop an accurate and detailed design proposal (DOK 3)	8.2.12.C.7 Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials.

DECLARATIVE KNOWLEDGE	PROCEDURAL KNOWLEDGE	NEW STANDARDS TO INTRODUCE
marketing specifications Rogers' Characteristics of Innovation and Consumers	Synthesize a detailed plan for the manufacture of the prototype (DOK 4) Develop a marketing specification which justified the requirements (DOK 3)	8.2.12.D.1 Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
design and marketing specifications innovation	Use appropriate terms to develop a marketing specification which justifies the requirements (DOK 1)	8.2.12.E.4 Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).

IB DESIGN TECHNOLOGY SL 2	DURATION:
UNIT 2: HUMAN FACTORS AND ERGONOMICS	14 SESSIONS

UNIT OVERVIEW	
UNIT LEARNING GOALS	
Students will develop design specifications from the design brief and research which specifications justify the requirements of design opportunity analysis.	
ENDURING UNDERSTANDINGS	**ESSENTIAL QUESTIONS**
CEU1: Designers consider human factors to ensure products meet ergonomic needs.	CEQ1: How do we design something that is comfortable for humans to use?

UNIT LEARNING SCALE	
4	In addition to score 3 performances, the student can assist a peer in applying the concepts and/or use the concepts learned in class in another setting.
3	The student can: ● consider human factors to meet ergonomic needs; ● identify psychological and physiological factors; ● develop a detailed design brief, which identifies the relevant parameters of the problem; ● develop a marketing specification, which justifies the requirements; ● develop a design specification, which justifies the requirements.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of score 3 performances.
1	The student needs assistance to avoid major errors in attempting to reach score 3 performances.
0	Even with assistance, the student does not exhibit understanding of the performances listed in score 3.

COMMON ASSESSMENT	
ALIGNMENT	**DESCRIPTION**
8.2.12.A.1, 2 8.2.12.B.3 8.2.12.C.3 8.2.12.D.1, 6 8.2.12.E.4 DOK4	Students will independently follow Criterion A (Analysis of a Design Opportunity) to accomplish the following through research and documentation: ● Develop a detailed design brief which identifies the relevant parameters of the problem and expected outcome found through market and user research. ● Develop a marketing specifications, which justifies the requirements including, but not limited to target market, target audience, market analysis, user need and competition. ● Develop a design specification, which justifies the requirement including, but not limited to aesthetics, cost, size, environment, safety, materials, performance and manufacturing.

TARGETED UNIT STANDARDS		
DECLARATIVE KNOWLEDGE	**PROCEDURAL KNOWLEDGE**	**NEW STANDARDS TO INTRODUCE**
aesthetics comfort durability innovation	Analyze a product in order to evaluate its viability and effectiveness (DOK 3) Present ideas and finding to a focus group to critique and evaluate proposed solutions (DOK 4)	8.2.12.A.3 Research and present information on an existing technological product that has been repurposed for a different function.
adjustability anthropometrics clearance dynamic percentile range static	Analyze the ergonomic features of an object (DOK 3)	8.2.12.C.3 Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).
design constraints physiological factors psychological factors	Conduct research prior to creating a prototype to establish a base of knowledge and understanding of the design constraints (DOK 3)	8.2.12.D.6 Synthesize data, analyze trends and draw conclusions regarding the effect of a technology on the individual, society, or the environment and publish conclusions.

DECLARATIVE KNOWLEDGE	PROCEDURAL KNOWLEDGE	PREVIOUSLY COVERED STANDARDS TO DEVELOP FURTHER
anthropometrics comfort design process fatigue iterations percentile tables physiological factors psychological factors working drawing	Compare the capabilities of current and emerging technology resources as they apply to a specific design issue (DOK 2)	8.2.12.A.2 Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
design constraints physiological factors psychological factors	Evaluate the strengths and limitations of materials and technologies in the creation of a design solution (DOK 3)	8.2.12.B.3 Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.
aesthetics comfort durability innovation	Design an appropriate solution to an engineering design challenge involving a real world problem utilizing ergonomic principles (DOK 4)	8.2.12.D.1 Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
anthropometrics comfort design process fatigue iterations percentile tables physiological factors psychological factors working drawing	Use terms related to ergonomics and human resources (DOK 1)	8.2.12.E.4 Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).

IB DESIGN TECHNOLOGY SL 2	DURATION:
UNIT 3: MODELLING	25 SESSIONS

UNIT OVERVIEW	
UNIT LEARNING GOALS	
Students will explore possible solutions, use concept modelling, and justify the most appropriate idea to meet the requirements of conceptual design.	
ENDURING UNDERSTANDINGS	**ESSENTIAL QUESTIONS**
CEU3: Dimensioned and rendered CAD creations are used by modern industry to create prototype models of new products.	CEQ3a: How do drawings influence a final product?

UNIT LEARNING SCALE	
4	In addition to score 3 performance, the student can help assist another student who is having difficulty with CAD software or CNC machines.
3	The student can: ● create conceptual models to outline the principles, processes and basic functions of a design; ● create 2D and 3D graphical models to communicate design ideas; ● create a three-dimensional physical model of a design or system; ● understand a apply concepts of Computer Aided Design (CAD) for the analysis of a design; ● use three dimensional CAD data to simulate rapid prototyping; ● develop feasible ideas to meet appropriate specifications, which explore solutions to the problem; ● use concept modelling to gude design development; ● justify the most appropriate idea for detailed development.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of score 3 performances.
1	The student needs assistance to avoid major errors in attempting to reach score 3 performances.
0	Even with assistance, the student does not exhibit understanding of the performances listed in score 3.

COMMON ASSESSMENT	
ALIGNMENT	**DESCRIPTION**
8.2.12.B.1 8.2.12.C.3, 5 8.2.12.D.1, 5 8.2.12.D.5 DOK4	Students will independently follow Criterion B (Conceptual Design) to accomplish the following through research, modelling and documentation: ● Develop ideas to meet appropriate specifications which explore solutions to the problem. ● Use concept modelling in the form of sketches, CAD, 2D and 3D models to guide design development that provides feedback from testing. ● Justify the most appropriate idea for detailed development by evaluating ideas and models against design specifications and presenting the best idea.

TARGETED UNIT STANDARDS		
DECLARATIVE KNOWLEDGE	**PROCEDURAL KNOWLEDGE**	**NEW STANDARDS TO INTRODUCE**
assembly drawing conceptual modelling exploded isometric drawing flow charts isometric drawings orthographic drawings physical modelling product design rapid prototyping service design	Develop ideas to meet appropriate specifications which explore solutions to the product (DOK 3) Create conceptual models of possible solutions using everyday materials (DOK 4)	8.2.12.B.1 Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.
3d printing aesthetic models computer numerical control (CNC) computer-aided design (CAD) mock ups systems design virtual models	Justify the choice of appropriate manufacturing techniques for prototype production (DOK 3) Determine and use the best method of creating the prototype for the design solution (DOK 2)	8.2.12.D.3 Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.

DECLARATIVE KNOWLEDGE	PROCEDURAL KNOWLEDGE	PREVIOUSLY COVERED STANDARDS TO DEVELOP FURTHER
conceptual modelling design mock ups	Create conceptual models of possible solutions using everyday materials (DOK 4)	8.2.12.C.3 Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).
computer-aided design (CAD) graphical modelling	Create working drawings of their designs using manual drafting and/or using computer aided design (DOK 4)	8.2.12.C.5 Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.
prototypes rapid prototyping scale models	Develop ideas to meet appropriate specification which explore solutions to the product (DOK 3)	8.2.12.D.1 Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.

IB DESIGN TECHNOLOGY SL 2	DURATION:
UNIT 4: RESOURCE MANAGEMENT AND SUSTAINABLE PRODUCTION	21 SESSIONS

UNIT OVERVIEW	
UNIT LEARNING GOALS	
Students will choose appropriate materials and manufacturing techniques to meet the requirements of development of a detailed design.	
ENDURING UNDERSTANDINGS	**ESSENTIAL QUESTIONS**
CEU2: As our Earth's resources are slowly depleted, ethical use of resources and the use of clean technology worldwide should be on every designer's mind.	CEQ2a: What role does ethics play in the adoption of new technologies? CEQ2b: How can we reduce the negative impact of humans on our environment?

UNIT LEARNING SCALE	
4	In addition to score 3 performances, the student can safely intervene and assist a peer who is not following appropriate safety protocols.
3	The student can: ● develop innovative solutions to meet basic human needs for renewable and sustainable resources; ● apply waste mitigation strategies to reduce or eliminate the volume of materials disposed; ● identify how energy conservation and efficient energy impact the environment; ● explain how clean technology reduces pollution in a production process; ● apply green and eco design considerations into the design of a product; ● justify the choice of appropriate materials and components for a prototype; ● justify the choice of appropriate manufacturing techniques for prototype production; ● develop and accurate and detailed design proposal; ● produce a detailed plan for the manufacturing of the prototype.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of score 3 performances.
1	The student needs assistance to avoid major errors in attempting to reach score 3 performances.
0	Even with assistance, the student does not exhibit understanding of the performances listed in score 3.

COMMON ASSESSMENT	
ALIGNMENT	**DESCRIPTION**
8.2.12.B.1, 2 8.2.12.C.7 8.2.12.D.5 DOK4	Students will independently follow Criterion C (Development of a Detailed Design) to accomplish the following through research and documentation: ● Justify the choice of appropriate materials and components for prototype through cost, supply, physical and mechanical properties. ● Justifies the choice of appropriate manufacturing techniques for prototype production including jointing, cutting, etc. ● Develop an accurate and detailed design proposal taking into account materials, components, manufacturing techniques sizes, materials, assembly, production methods, etc. ● Use appropriate techniques and methods to finalize the details of the design (CAD, hand drawings, paper models, etc).

TARGETED UNIT STANDARDS		
DECLARATIVE KNOWLEDGE	**PROCEDURAL KNOWLEDGE**	**NEW STANDARDS TO INTRODUCE**
material processing properties of materials resources and reserves	Justify the choice of appropriate materials and components for a prototype (DOK 3)	8.2.12.D.5 Explain how material processing impacts the quality of engineered and fabricated products.
eco-design energy utilization green design non-renewable resource storage and distribution	Evaluate and discuss the ethical considerations of using resources that are finite or harmful versus those that are sustainable and green (DOK 3)	8.2.12.B.2 Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.

DECLARATIVE KNOWLEDGE	PROCEDURAL KNOWLEDGE	PREVIOUSLY COVERED STANDARDS TO DEVELOP FURTHER
carbon footprint circular economy clean technology cradle-to-cradle cradle-to-grave dematerialization	Analyze limitations of technology to determine the implications of their use (DOK 3)	8.2.12.B.1 Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.
precautionary principle prevention principle renewable resources resource reserves waste mitigation strategies	Analyze a design solution for environmental concerns to ensure there is no excess waste or environmental concerns (DOK 3)	8.2.12.C.7 Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials.
carbon footprint circular economy clean technology cradle-to-cradle cradle-to-grave dematerialization	Use domain specific vocabulary when explaining the procedures for manufacturing a product (DOK 2)	8.2.12.E.4 Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).

IB DESIGN TECHNOLOGY SL 2	DURATION:
UNIT 5: FINAL PRODUCTION	28 SESSIONS

UNIT OVERVIEW	
UNIT LEARNING GOALS	
Students will research, analyze, and test various properties of materials then apply material analysis to various manufacturing processes in a detailed design proposal and manufacturing plan of their final prototype to meet requirements.	
ENDURING UNDERSTANDINGS	**ESSENTIAL QUESTIONS**
CEU3: Dimensioned and rendered CAD creations are used by modern industry to create prototype models of new products.	CEQ3a: How do drawings influence a final product?
CEU4: Communicating an engineering design requires effective visual representation and presentation skills that are audience appropriate.	CEQ4a: How does the way you communicate with a client vary by audience? CEQ4b: Why is it important for an engineer or designer to communicate their solution to a client?

UNIT LEARNING SCALE	
4	In addition to score 3 performances, the student can assist a peer in applying the concepts and/or use the concepts learned in class in another setting.
3	The student can: ● identify and apply strategies for protecting intellectual properties (IP); ● define and explain invention and innovation; ● identify the strategies for innovation; ● define three key roles stakeholders hold in invention and innovation; ● identify and apply the key stages in the product life cycle; ● interpret the impact of Rogers' characteristics; ● establish clear parameters for a marketing specification; ● evaluate the success of the solution against the marketing specification; ● evaluates the success of the solution against the design specifications.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of score 3 performances.
1	The student needs assistance to avoid major errors in attempting to reach score 3 performances.
0	Even with assistance, the student does not exhibit understanding of the performances listed in score 3.

COMMON ASSESSMENT	
ALIGNMENT	**DESCRIPTION**
8.2.12.B.7 8.2.12.C.6 8.2.12.D.3 8.2.12.E.4 DOK 4	Students will independently follow Criterion C (Development of a Detailed Design) and D (Testing and Evaluating) to accomplish the following through research, testing, and documentation: ● Produce a detailed plan for the manufacturing of the prototype such as Gantt Charts, flow diagrams, tables, etc. ● Evaluate the success of the solution against the marketing specification by testing the prototype against Criterion A target market, target audience, market analysis, user need and competition. ● Evaluate the success of the solution against the design specification by testing the prototype against design specifications in Criterions A such as cost, environment, size, safety, materials, performance, manufacturing, etc.

TARGETED UNIT STANDARDS		
DECLARATIVE KNOWLEDGE	**PROCEDURAL KNOWLEDGE**	**NEW STANDARDS TO INTRODUCE**
design characteristics innovation manufacturing processes scales of production	Analyze how a product changes over time to meet human needs (DOK 3)	8.2.12.C.2 Analyze a product and how it has changed or might change over time to meet human needs and wants.

DECLARATIVE KNOWLEDGE	PROCEDURAL KNOWLEDGE	PREVIOUSLY COVERED STANDARDS TO DEVELOP FURTHER
automated production craft production mechanized production production systems	Analyze limitations of technology to determine the implications of their use (DOK 3)	8.2.12.B.1 Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.
constraints design process sketching	Create a prototype using the design process to solve an everyday problem (DOK 4)	8.2.12.C.7 Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials.
constraints manufacturing processes production systems prototype	Develop ideas to meet appropriate specification which explore solutions to the product (DOK 3)	8.2.12.D.1 Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
composites glass metals and metallic alloys plastics properties of materials textiles timber	Justify the choice of appropriate materials and components for a prototype (DOK 3)	8.2.12.D.5 Explain how material processing impacts the quality of engineered and fabricated products.
composites glass metals and metallic alloys plastics properties of materials textiles timber	Use domain specific vocabulary when explaining the procedures for manufacturing a product (DOK 2)	8.2.12.E.4 Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).

IB DESIGN TECHNOLOGY SL 2	DURATION:
UNIT 6: CLASSICAL DESIGN	18 SESSIONS

UNIT OVERVIEW	
UNIT LEARNING GOALS	
Students will synthesize the characteristics of classical design and how it relates to the success of the solution and explain how the solution could be improved to meet the requirements of testing and evaluating.	
ENDURING UNDERSTANDINGS	**ESSENTIAL QUESTIONS**
CEU5: The design process is an iterative series of steps taken in order to create a product or solve a problem while simultaneously engaging in self-evaluation and redesign.	CEQ5a: How do we know that we've developed the best solution to a problem?

UNIT LEARNING SCALE	
4	In addition to score 3 performances, the student can assist a peer in applying the concepts and/or use the concepts learned in class in another setting.
3	The students can: ● explain characteristics of designed products in order to determine whether a design is considered classic; ● compare form vs function of a product; ● define practical function vs psychological function; ● evaluate the success of the solution against the design specifications; ● explains how the solution could be improved.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of score 3 performances.
1	The student needs assistance to avoid major errors in attempting to reach score 3 performances.
0	Even with assistance, the student does not exhibit understanding of the performances listed in score 3.

COMMON ASSESSMENT	
ALIGNMENT	**DESCRIPTION**
8.2.12.B.7 8.2.12.C.6 8.2.12.D.3 8.2.12.E.4 DOK 4	Students will independently follow Criterion D (Testing and Evaluating) to accomplish the following through research, testing, and documentation ● Evaluate the success of the solution against the design specification by testing the prototype against design specifications in Criterions A such as cost, environment, size, safety, materials, performance, manufacturing, etc. ● Explain how the solution could be improved by addressing weaknesses identified through evaluation against marketing and design specifications. Improvements should be presented in the form of revised specifications, annotated photographs and drawings, or CAD.

TARGETED UNIT STANDARDS		
DECLARATIVE KNOWLEDGE	**PROCEDURAL KNOWLEDGE**	**NEW STANDARDS TO INTRODUCE**
characteristics of classic design classic design function and form	Research and redesign an existing product to improve the overall use of the product (DOK 4)	8.2.12.C.6 Research an existing product, reverse engineer and redesign it to improve form and function.
DECLARATIVE KNOWLEDGE	**PROCEDURAL KNOWLEDGE**	**PREVIOUSLY COVERED STANDARDS TO DEVELOP FURTHER**
conceptual design constraints design process mock up modelling	Create a prototype using the design process to solve an everyday problem (DOK 4)	8.2.12.C.7 Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials.
3d printing computer numerical control (CNC) computer-aided design (CAD)	Justify the choice of appropriate manufacturing techniques for prototype production (DOK 3) Determine and use the best method of creating the prototype for the design solution (DOK 2)	8.2.12.D.3 Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.
characteristics of classical design classical design form and function	Use domain specific vocabulary when explaining the procedures for manufacturing a product (DOK 2)	8.2.12.E.4 Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).