SOUTH PACIFIC BOARD FOR EDUCATIONAL ASSESSMENT

PACIFIC SENIOR SECONDARY CERTIFICATE

Design Technology

Effective from January 2008

CONTENTS

1. RATIONALE

Technology is the means by which people turn ideas into reality. It involves using materials and tools skillfully to produce or maintain objects and artifacts. People have developed the ability to change or modify the environment by creating technologies that are now central to our way of living and quality of life. They represent design solutions, usually created in response to specific practical problems.

Technology with its applied focus has a potential to contribute to a range of general educational goals as well as provide some specific vocational and training outcomes.

If students can develop their technological skills and knowledge in a design context it will equip them with a logical problem solving approach. A designing process provides a framework for:

- solving problems and producing objects or artifacts;
- the development of students' knowledge and skills in a real life context.

The Design Process

The design process in technology is similar to what teachers see as a problem solving approach in a theoretical subject.

In technology-the design process results in a 'product'. In a theoretical or academic subject, the design process results in a 'decision' or a 'solution' to a problem. The design process is often cyclic and can be described in 3 or 4 stages. For this course a 3 stage cycle is used. The cycle is:

Designing
Making
Evaluating

Depending on the problem or task being considered, one part of the cycle may be more extensive or lengthy than another. In addition the feedback loops will often occur to modify the actual design or the use of materials, or a decision to use different tools than previously determined.

Knowledge and Skills

The design process does not exist in a vacuum, it exists in a context. This course offers a range of teaching areas which will provide a skills and knowledge base for students. This skills and knowledge base will provide students with the appropriate understanding of the procedures, materials, tools and equipment, concepts and systems used in the chosen area. Important safety issues will be addressed as well as any industry required standards.

2. GENERAL COURSE AIMS

At the end of a program in Design Technology, students should be able to:

1. demonstrate active, confident participation in the learning process (*confidence*).
2. take responsibility for his or her own learning and training (*responsibility, self-direction*).
3. respond to challenging learning opportunities, pursue excellence, and achieve in a diverse range of learning and training situations (*challenge, excellence, achievement*).
4. work and learn individually and with others in and beyond school to achieve personal, team, or community goals (*independence, collaboration*).
5. apply logical, critical, and innovative thinking to a range of problems and ideas (*thinking, enterprise, problem-solving*).
6. demonstrate positive attitudes towards further education and training, employment, and lifelong learning (*lifelong learning*).

3. PREREQUISITES

Although there are no formal prerequisites for this course some previous experience in the major areas of study: Wood Technology, Metal Technology, Technical Graphics, Food and Nutrition, or Textiles and Garment Construction is expected. Some experience in using a design process or a problem solving approach will be an advantage.

4. TIME ALLOCATION

PSSC is a one year programme.
All PSSC subjects are designed to require a minimum of 120 hours tuition in the year of the PSSC examination for which students are to be entered. In Design Technology some additional home work time to support the completion of the project requirements is assumed.

5. COURSE STRUCTURE

The Areas of Study are described in terms of Majors and Minors. A major area of study is an area of specific study determined by the SPBEA on advice from member countries.

Students must study one Major area and one Minor area.

Major areas are:

Wood Technology
Metal Technology
Technical Graphics
Food and Nutrition
Textiles and Garment Construction

(Future Development – Family Studies)

Each major area requires 2 full terms of study within a 3 term academic year.

Minor areas are:

Small Engines and Automotive Mechanics
Electricity and Electronics
Catering and Hospitality
Welding and Fabricating
Textile Printing and Design
Craft and Design
Building and Construction
Shipboard Safety and Navigation
Plastics
Graphic Design

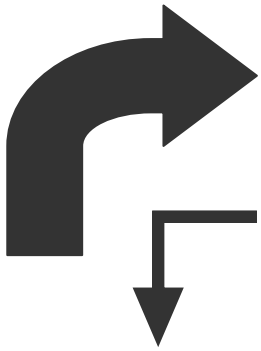
Each minor area requires one full term of study within a 3-term academic year.

Programming Structure for a 3 term year program in Design Technology

Minor	**Major**	
Term 1	**Term 2**	**Term 3**

THE DESIGN PROCESS

The design process is an approach used in technology to help students identify, manage and resolve problems.
In the diagram below, the large arrows indicate the main direction of activities in the process. The small arrows indicate the usual and expected movement backwards and forwards between the stages as students evaluate what they have done and make changes as a result of their evaluation.



DESIGNING

INVESTIGATING

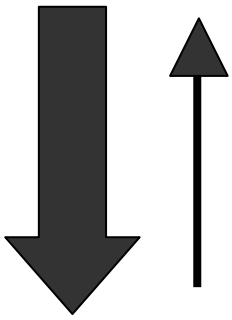
- Investigate the design brief:
  - Clarify the problem
  - Note expectations about solution
  - Explore issues about the problem
- Investigate ideas for solutions
- Identify the most likely idea

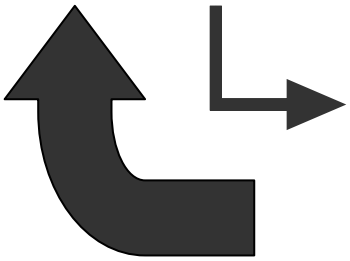
DEVISING

- Develop and refine the idea
- Devise the proposed solution
- Model or trial the proposal
- Evaluate and document.

EVALUATING

- Think about the outcome
- Does it meet the design brief?
- How well does it work?
- Could it be improved?
- What remains to be done?
- Document and prepare report.





MAKING

Produce the solution that can involve any “making” activity e.g:

- Build and test a prototype
- Implement a decision
- Construct, establish, build etc.
- Repair tasks
- Evaluate and document.

6. LEARNING OUTCOMES

Learning Outcomes

At the end of a program in Design Technology, students should be able to:

1. use mathematical, graphical, oral and written communication skills to clarify and express ideas in a range of situations
2. use a designing process to produce an appropriate solution to a design brief in the area of study
3. apply knowledge and understanding of various materials processes and systems in the area of study
4. judge the appropriateness of materials and systems in area of study for a given product or procedure
5. demonstrate a broad range of practical skills and techniques relevant to the area of study
6. discuss the use of relevant technologies.

7A. AREAS OF STUDY – MAJORS

Wood Technology

Wood technology is a practical subject designed to give students the opportunity to experience aspects of designing, making and evaluating an article, usually furniture and made primarily from wood. This subject can focus on methods of construction and includes the use of common materials, basic hand and power tools and simple construction techniques.

Students will investigate existing designs, develop and refine their own design ideas prior to making a product using simple framed or carcass constructions. They will evaluate the finished product against the criteria of their design brief and make recommendations for improvement.

Students will be able to demonstrate the safe use and maintenance of appropriate tools, equipment and machines relative to the design and construction of simple wooden articles. It will involve students in the investigation of the structure and properties of a broad range of materials and the functional and aesthetic requirements necessary when constructing articles made of wood to satisfy cultural traditions. Using a structured review format, students are able to evaluate their product against a range of performance criteria.

By undertaking programs in Wood Technology students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills, techniques and systems to create a product that they test and evaluate, both during the process of designing and making and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Wood Technology**
Materials have characteristics and properties	Identifies and explains characteristics of materials such as: • Strength • Grain • Direction of grain Identifies and explains properties of materials such as • the nature, quality, use of materials • the characteristics of hardwood, softwood • moisture content • seasoning of timber • preservation and timber treatment
Manufactured materials	Explains the processes of construction of types of manufactured materials, such as veneers, particle board, plywood, masonite, and identifies their appropriate use.
Manufacturing processes	Identifies the processes for manufacture of: • Laminates • Wood forming products • Wood turning products
Interpreting working drawings	Applies drawing interpretations
Selecting appropriate materials	Selects the right material for the job
Costing and quantifying materials	Is able to: • Accurately measure • Calculate quantities • Cost materials • Order materials

Skills – Technical	**Wood Technology**
Preparing materials	Applies appropriate methods of • Measuring • Marking • Planing • Cutting • Testing for squareness • Levelling (square and flat)
Assembly	Plans and executes the order of assembling a project correctly
Joints and construction	Accurately constructs woodworking joints used in framed and carcase constructions to stated proportions and dimensions.
Safe and correct use of tools	Demonstrates correct and safe procedures when using tools and common woodworking machinery
Safe storage of tools and materials	Demonstrates safe storage of tools Demonstrates safe storage and waste disposal practices of materials
Fastenings and fittings	Demonstrates fitting of appropriate • Hinges • Cabinet fittings
Timber finishing	Competently applies appropriate finishes.

Skills – Design	**Wood Technology**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Clarifies the problem • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

Metal Technology

Metal Technology teaches students to design, manufacture and evaluate a number of projects created from bar, tube and sheet metals. Students will learn and apply safe workshop practices in the use of tools, machines and equipment. Students will learn skills and techniques in the areas of marking, cutting, shaping and joining metal in a variety of ways. Emphasis will be placed on accuracy and the need to work to fine tolerances in a manner which complies with industry standards.

Students will investigate and devise solutions to problems, and evaluate the finished product against a range of performance criteria and make recommendations for improvement.

By undertaking programs in Metal Technology, students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills, techniques and systems to create a product that they will test and evaluate, both during the process of designing and making, and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Metal Technology**
Safe workshop practices	Recognises and uses general workshop safety procedures including: • Personal safety • Care and Maintenance of tools and equipments • Material Storage • Tools and equipment storage
Metal classification	Describes the classifications of metals and the processes applied to producing metals: • Ferrous - Iron, Steel, Alloys • Non-ferrous – Aluminium, Copper, Tin, Zinc.
Molecular structure of metals	Explains the molecular structure of metals in relation to, distortion, expansion, and contraction.
Characteristic of metals	Describes and compares the structures and properties of metals such as: tensile, ductile, brittleness, malleability, fatigue, corrosion, hardness, toughness, elasticity
Effects of heat treatment on metals	Describes and understands the use of heat in processing metals: hardening; annealing; normalizing; tempering; stress relieve; quenching
Forging processes	Identifies and explains the uses of appropriate forging processes such as upsetting; drawing; wages
Uses of tools	Classifies and explains the uses of tools for • Marking • Measuring • Testing • Cutting • Drilling • Holding and supporting • Impelling • Dismantling and assembling

Knowledge and Understanding	**Metal Technology**
Types of equipment and their use	Classifies and explains the uses of equipment: • Spanners • Wrenches • Lathe • Band Saw • Press drill • Power Hand-saw • Circular saw • Guillotine • Folding machine • Rollers, rotary machine
Use of fasteners	Compares and discusses the uses of: • Rivets, • Bolts and nuts, • Screws, glue • Soldering
Use of welding	Identifies and explains appropriate welding processes, such as: • Arc • Oxy-acetylene/gas • Spot welding
Metal Turning Processes	Identifies appropriate uses of lathe tools and turning processes such as: • Setting out • Facing • Longitudinal • Taper • Drilling/boring • Thread-cutting
Sheet metal processes	Identifies appropriate uses for sheet-metal processes such as • Soldering • Riveting • Seaming • Edges • Wire edge • Folds • Bends
Metal finishing processes	Identifies appropriate uses for metal finishing processes: • Surface texture • Roughness standards • Metal colouring • Painting • Coating

Skills – Technical	**Metal Technology**
Sheet metal processes	Uses appropriate sheet-metal processes such as • Soldering • Riveting • Seaming • Edging • Wire edge • Folding • Bending
Welding processes	Uses appropriate welding processes such as: • Arc • Oxy-acetylene/gas • Spot welding
Metal finishing processes	Implements metal finishing processes such as: • surface texture • roughness standards • metal colouring • painting • coating
Safe and appropriate use of tools and machines	Selects and safely uses tools and machines Selects and appropriately uses tools and machines
Appropriate selection and use of fasteners	Selects and uses appropriate fasteners
Metal turning processes	Selects and uses appropriate turning processes

Skills – Design	**Metal Technology**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
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Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness.

Skills – Design	**Metal Technology**
	Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

Food and Nutrition

Food and Nutrition teaches students to design and produce food products using appropriate materials, and equipment safely and competently. Students will apply the principles of nutrition, food preparation and presentation skills, and explore the relationship between food selection, health and nutrition related diseases.

Students will demonstrate safe food practices and investigate the effect technology has on production and preservation of food. Students are able to show skills in decision-making and problem solving by applying knowledge of food nutrients and their relevance in situations that individuals and families face in everyday life. This could include analysing nutritive value of foods for individuals with special dietary requirements or making recommendations for improvement in the nutritive value of menus.

Students investigate and devise solutions to problems and make informed decisions that reflect efficient use of resources in their community, such as planning and analysing a menu to meet a budget. Through reflection students can evaluate products against a range of criteria and make recommendations for improvement.

By undertaking programs in Food and Nutrition students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills and techniques to create a product that they will test and evaluate, both during the process of designing and making and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Food and Nutrition**
Essential nutrients are needed for good health	For the macronutrients (carbohydrates, protein and lipid) • explains the functions in the human body; • lists the main food sources; • shows an understanding of recommended daily intake and how to use the information; • identifies and explains nutrition-related diseases; • explains digestion, absorption and metabolism. For the micronutrients (vitamins and minerals) • explains the functions in the human body; • lists the main food sources; • shows an understanding of recommended daily intake and how to use the information; • identifies and explains nutrition-related diseases; • explains digestion, absorption and metabolism.
The nutritional requirements of individuals may change over the course of one's life	Identifies the nutritional requirements of: • children • pregnant and lactating women • the elderly • sports people • active/passive workers • invalids • people with metabolic conditions

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The nutritional requirements of individuals may change over the course of one's life	Identifies the nutritional requirements of: • children • pregnant and lactating women • the elderly • sports people • active/passive workers • invalids • people with metabolic conditions
Food quality is affected intentionally and unintentionally	Describes the function and nutritional consequences of intentional and unintentional food changes that may result from: • freezing • drying • preserving – e.g .smoking salting • processing – e.g. fermenting and cooking
Safe food preparation and hygiene	Describes and explains in a given context the standards and techniques for safe food handling and preparation: • personal hygiene • kitchen hygiene • food hygiene • thawing, cooking times and temperatures
Investigating contemporary food issues to make informed decisions and respond appropriately	Demonstrates and evaluates the relationship between food, its production, consumption, promotion and health. Investigates and discusses contemporary food issues relevant to self and/or community. Explains the need for regulations in the food industry

Skills – Technical	**Food and Nutrition**
Quality of food products result from safe and hygienic handling of food. Analysing and applying the nutritional needs of the community.	Selects appropriate equipment, applies suitable techniques and uses safe and hygienic practices when handling and preparing food. Handles food to regulated standards Produces solutions for specific food situations.

Skills – Design	**Food and Nutrition**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
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Textiles and Garment Construction

Textiles and Garment Construction teaches students to design and make textiles based products using appropriate tools and equipment safely and competently. Students will apply the principles of structural and decorative design, selection of fabric and construction techniques.

Students evaluate the role of technology in fibre and fabric development. They investigate of the properties of textiles and how this affects their use and care. This enables students to develop skills in choosing appropriate materials to satisfy design briefs. Creativity is applied in interpretation of design needs and in decision-making about the specifications of projects. Students are able to investigate and compare domestic and commercial production techniques.

Knowledge of cultural traditions and career opportunities is developed through research and investigation into the manufacture of textile items. Students are able to apply appropriate construction techniques and management processes for practical projects, and through reflection evaluate outcomes.

By undertaking programs in Textiles and Garment Construction students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills, techniques, and systems to create a product that they will test and evaluate, both during the process of designing and making and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Skills – Technical	**Textiles and Garment Construction**
Applications of garment design principles and elements	Designs garments applying appropriate principles and elements of design – proportions, balance, rhythm and emphasis – colour, texture, size, joint lines, shape, pattern
Construction techniques: develops techniques in garment construction	Develops and demonstrates competent construction techniques and processes including • for commercial patterns - accurate measurement and size identification - pattern, adjustment, layout and cutting - marking transfer
Production processes: appropriate sewing techniques are required for particular purposes.	Produces solutions for specific garment needs and purposes.
Garment construction processes	Analyses and applies appropriate construction techniques in a variety of construction processes, such as those for commercial and original pattern use free-hand cutting pattern drafting single or multiple garment production Develops and evaluates solutions for specific garment needs and purposes.

Skills – Design	**Textiles and Garment Construction**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
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Technical Graphics

Technical Graphics teaches students to design and produce a variety of technical drawings to enhance their communication and interpretive skills. It develops skills and knowledge of processes and materials associated with the application of graphics to designing and making products.

Students will become familiar with mechanical drawing aids, drawing skills and techniques and standards, such as, line types, dimensioning and lettering. Knowledge of simple 3-D graphics, consisting of isometric and oblique, will be developed. The subject will extend students drawing and drafting techniques by the study of appropriate drawing standards as they apply to the process of orthogonal projection.

Students will be able to show their decision making and problem solving skills by selecting an appropriate graphical representational format in response to a design brief, and follow through an evaluative process against a range of given criteria and suggest recommendations for improvement.

By undertaking programs in Technical Graphics students learn to use imagination and creativity to develop solutions to technological problems. They learn to apply a range of technological skills, techniques and systems to create a product that they will test and evaluate, both during the process of designing and making and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Technical Graphics**
Interpenetrations of solids	Understands and applies the principles of intersection to solve problems involving simple geometrical solids with axis lying in one plane – prisms; cylinders. Understands procedures for solving problems on intersecting solids • Axis inclined to each other • Axis offset
Vector diagrams	Identifies and explains forces acting on a mass or body
Forces in Beams	Understands and applies principles of technical graphics to the solution of problems. Identifies types and determines magnitude forces acting on a beam • Wind loads and dead loads, • Graphical resolution of forces • Funicular polygons, reaction forces.
Engineering drawing	Reads and interprets engineering drawing standards and conventional representation of engineering components and fastenings such as: • boss, flange, bush, web/rib • cotter pins, bolt, nut, screws
Structural Drawings	Reads and interprets simple structural drawings that provide for example, illustrations of simple architectural structure, components of furniture parts, joint and fasteners.

Knowledge and Understanding	**Technical Graphics**
Plane figures	Demonstrates knowledge and understanding of the construction of: • regular polygons • similar figures and figures of equal area. Understands and applies principle for solving area reduction and enlargement problems
Helices	Applies helix curve to the projection of screw threads and helical springs Threads – single, two and three start, springs – round, square, pitch and lead
Drawing practices	Understands standard practice of the use of: • Lines • Lettering • Scales • Geometrical construction • Divisions of lines • Arcs • Bisecting
Development	Applies and understands the use of appropriate development practices such as: • Layout development • Rollout development Understands development techniques of: • Radial • Triangulation
Pictorial drawing	Selects appropriate forms of pictorial presentation that provide clear and concise communication for specific situations.
Geometrical solids	Names parts and constructs from given information the following geometrical solids: • Cube • Regular prisms • Regular pyramids • Cylinders • Cones • Sphere

Skills – Technical	**Technical Graphics**
Interpenetrations of solids	Solves problems on the intersection of common geometrical solids such as pyramids, cones, fillet curves, spheres, and axis in various arrangements. Demonstrates the application of the principles of intersection to solve related problems.
Helices	Constructs and produces a helix as a focus on a right cylinder.
Vector diagrams	Determines magnitude of forces and their point of application graphically. Addition and subtraction

Skills – Technical	Technical Graphics
	Force/load diagram Resultant and equilibrium force Line of action, co-planer, non-co-planer forces. Con-curves and non-concurrent forces, link/funicular polygon
Engineering drawings	Produces orthographic views of engineering components working from: pictorial drawing/orthographic drawing Produces accurate assembly orthographic drawings of simple engineering parts and components Produces general assembly orthographic drawings of simple engineering products from detailed drawing.
Plane figures	Constructs solutions to problems involving plane figures reduced or enlarged to specified area ratios.
Projection of lines and planes	Applies procedures of projecting. • True length of lines • True angle of inclination to principle planes • Traces of lines and planes • True shape of planes
Development	Solves technical problems applying principles of development Demonstrates the use of radial and triangulation techniques of development.
Pictorial drawing	Understands and applies: • Isometric drawing • Cabinet oblique • Perspective two-point

Skills – Design	Technical Graphics
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Develops flexible, imaginative, innovative and enterprising solutions • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately

Skills – Design	**Technical Graphics**
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards: • reliability; • safety; • quality; • cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

7B. AREAS OF STUDY-– MINORS

Craft and Design

Craft has an important social, cultural function in many societies. The craft process involves conceiving ideas, practising and refining processes and learning the skills and techniques necessary for the making and replicating of pieces of craft using the chosen materials.

The design of craft pieces is a crucial part of the process of craft and allows the student to develop skills in design that satisfy the requirements of form and function of the craft piece which should be able to be replicated. A range of materials can be used for making craft pieces including glass, ceramics, wood, leather, metal and fibres. To enable a craft worker to design and make pieces using a particular material the skills and techniques normally used for working that material are a necessary part of the learning process.

By undertaking Craft and Design students learn to use imagination and creativity to develop solutions to Craft and Design problems. They learn and apply a range of technological skills and techniques to create a product that they will test and evaluate, both during the process of designing and making and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Craft and Design**
Properties of materials determine the ways in which they can be used	For a range of materials, such as string, grass, leaves, wood, thatch, feathers: • Identifies properties such as strength, appearance, flexibility, texture, absorbency, durability • Explains ways the materials can be used
Appropriate materials and tools must be selected to make a product	• Classifies materials according to use • Compares different materials and selects the most appropriate tools to use.
Traditional craft reflects the needs, values and cultural expectations of the local community	In the context of the local community • Understands and applies local rules and methods
Traditional crafts have been practiced for generations	Understands cultural traditions relating to craft and design in the local situation
A range of career- related opportunities can be created through craft activities	Identifies and explains a range of career opportunities in relation to the student specialization.
Cost of a finished product	Identifies and explains the range of the finished products in terms of • cost • quality • energy and time input

Skills – Technical	**Craft and Design**
Quality of products results from the use of appropriate materials	Selects and uses appropriate materials when making a product
Quality of products results from the correct use of appropriate tools	Selects tools appropriate to the task Uses tools correctly and efficiently and in a safe manner
Safety factors must be taken into account when making a product	Applies knowledge and skills to make a safe product

Skills – Design	**Craft and Design**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement ▪ Seeks other evaluative feedback in relation to expectations of the design brief.

Building and Construction

Building and Construction teaches students the processes of working materials by shaping, forming and joining them in a construction project. Students will work individually and in teams to apply practical problem solving and designing skills associated with using materials and systems in a construction process. They learn and apply a range of technological skills in using tools, materials and processes to create a product that they test and evaluate, both during the process of designing and as a finished product. They develop an understanding of the techniques and systems involved in construction projects.

Building and Construction involves students in the investigation of the structure and properties of a broad range of materials and the functional and aesthetic requirements necessary when undertaking a construction project. By undertaking programs in Building and Construction students learn to use imagination and creativity to develop solutions to Building and Construction problems. They learn and apply a range of technological skills, techniques and systems to create a product that they will test and evaluate, both during the process of designing and making and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Building and Construction**
Safety	Identifies and practices safe working procedures in relation to • General safety • Personal safety • Tools and equipment safety • Storage of tools and materials
National and international building principles and practice	Applies recognized principles and practice for • Reinforcement, concrete mixes, overhang • Stud spacing • Foundation, layout • Rafter spacing • Footing
Building Regulations	Reads and interprets architectural drawings and building regulations Identifies legal requirements and procedures for • Plans and specifications • Building permits • Reading plans
Building materials/fasteners	Identifies the range and variety of building materials. Explains properties of: Timber, cement, reinforcement, roofing, screws Selects the most efficient building and associated materials to use.
Site preparation	Identifies and analyses site preparation needs
Foundation	Recognises, selects and explains – profiles, concrete mixes; reinforcement; compression/tension.
Framework	Lists the parts and describes the methods of construction of walls, roofs and trusses, doors, windows, ceilings.
Roofing	Identifies and selects appropriate roofing material such as corrugated iron, timber, plastic, concrete, tile.

Skills – Technical	**Building and Construction**
Construction drawings	Makes simple building construction drawings
Tools and Equipment	Uses hand and power tools safely and appropriately.
Site preparation	Applies appropriate methods: • Clearing site • Levelling and filling
Profiles	Demonstrates: • Squaring • Measuring; • Levelling,
Framework	Demonstrates the methods of construction of: walls, roofs and trusses, doors, windows, ceilings.
Plumbing	Identifies, selects and fits: • Guttering to roof • Downpiping to guttering • Sealing
Finishes	Demonstrates the use of finishes such as: • Paint • Quarter-round • Kick board, skirting Demonstrates the fitting of doors and windows.
Skills – Design	**Building and Construction**

Skills – Technical	**Building and Construction**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

Shipboard Safety and Navigation

Shipboard Safety and Navigation is a practical subject designed to give students an understanding of, and skills necessary in, the preparation and charting of a vessel in coastal waters. The subject will focus on the use of traditional equipment and methods of navigation. Students will work individually and in teams to devise and plot the vessel's location, calculate and fix positions on a chart, plot a course and plan voyages, and interpret tide tables.

They will develop knowledge of maritime terminology in relation to navigation and an understanding of the importance of accurate verbal and graphic communication.

By undertaking a program in Shipboard Safety and Navigation students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills, techniques and systems to create a product that they test and evaluate, both during the process of designing and making, and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Shipboard Safety and Navigation**
Factors related to personal safety	Explains appropriate action to be taken in response to emergencies at sea. Identifies factors relating to physical safety of the vessel afloat, navigational equipment and personal safety. Explains dangers associated with combustible fuels and risk of fire. Explains equipment used and principles involved in navigation such as : charts, compass, dividers, parallel.
International regulations and codes	Explains basic rules of the international regulations for the prevention of collisions at sea. Explains the IALA buoyage system of navigational marks. Recognises common chart symbols.

Skills – Technical	Shipboard Safety and Navigation
Navigation equipment and uses	Recognises and uses basic chart instruments and basic components of compass and compass card. Understands magnetic variations. Understands origins of tides and causes of variations of tides.
Course plotting	Explains and demonstrates procedures required to obtain a three point and running fix.
Factors affecting navigation	Lists effects of weather conditions on boating

Skills – Design	**Shipboard Safety and Navigation**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

Catering and Hospitality

Catering and Hospitality teaches students to design menus and produce food products using appropriate processes and equipment for catering enterprises. Students will apply the principles of food selection, planning and preparation.

Students will demonstrate good food safety and hygiene practices and investigate issues in food contamination and storage appropriate to catering and hospitality. Students are able to show skills in principles and processes such as menu planning, costing, budgeting, ordering, portion control, and food preparation, presentation and service. Communication and management skills are developed through insights into production systems appropriate to hospitality such as working in teams. Students develop a knowledge of language and terminology used in catering and hospitality. They develop technical skills and knowledge of how these skills can be applied in paid and unpaid work.

By undertaking programs in Catering and Hospitality students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills, techniques and systems to create a product that they will test and evaluate, both during the process of designing and making and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Catering and Hospitality**
Location of food services	Identifies and compares facilities, resources and services available in • Hotels • Take away food establishments • Restaurants
Range of food and drinks available	Identifies and classifies types and quality of food and drinks available: • Compares nutritive values of food and drinks • Compares and recognizes reasons for popularity of food and drinks • Explains differences in cost structures for variety of food and drinks
Acceptable standards and practices in hygiene (food preparation and handling) and customer service (food and beverage).	Understands regulations and guidelines relating to public health and the hospitality industry. Explains relationship to self and • Interprets and explains correct attitudes towards food handling and customer service • Applies hygienic and correct use and maintenance of equipment • Identifies and explains appropriate standards of self-presentation and attire, • Uses appropriate customer service and communication standards
Costing of food and drinks	Accurately calculates the price of dishes in a menu Compares and contrasts the prices of different ingredients Identifies and explains other areas of expenses.
Organising and planning the menus	Identifies and explains different courses in the menu. Explains the traditional order of courses in a meal Identifies correct utensils and cutlery for different courses Compares and explains the reasons for popularity of various packaging materials and equipment.

Skills – Technical	**Catering and Hospitality**
Quality procedures in planning handling, cooking and serving food to suit customer's choice. Presentation of food and the customer service area.	Applies accepted techniques in food and drinks serving locations Demonstrates appropriate standards of hygiene in handling and serving food and drinks. Differentiates the appropriate standards of customer service Demonstrates appropriate standards of communication and interpersonal skills for the hospitality industry.

Skills – Design	**Catering and Hospitality**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution . • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

Plastics

The study of Plastics teaches students to design, make, and evaluate products out of plastic material. This area of study will focus on the uses, sources, characteristics, properties, technological development, manufacturing procedures and environmental concerns related to plastics.

By undertaking programs in Plastics, students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills, techniques and systems to create a product that they will test and evaluate, both during the process of designing and making and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Plastics**
Safety	Identifies and uses safe procedures related to: • General safety • Personal safety • Use of equipment and tools • Fire potential • Chemical safety • Workshop safety – Ventilation; Space organisation
Types of materials (overview)	Identifies, understands and interprets information about the two groups of plastics, thermoplastics and thermosetting: • Thermoplastics such as: Polyvinyl Chloride (PVC) – Nylon; Acrylic; Polytene; Polypropylene; Polystyrene etc • Thermosetting such as: Phenol formaldehyde; Melamine formaldehyde; Polyester resin Explains the advantages and disadvantages of the two groups of plastics.
Designing and drawing	Understands the purposes of marking drawing and sketches
The structure of plastics	Identifies and explains the molecular structure of plastics such as: • Polymerization • Micro-structure of thermoplastics • Micro structure of thermosetting plastics Tests and compares different plastics
Characteristics of plastics	Identifies and explains the properties of plastics such as: hardness, stiffness, toughness, softness chemical resistance, thermal and electrical conductivity, tensile, compression, fatigue, durability, flexibility.
Methods of working with plastics	Understands methods of working with plastics such as: molding, extrusion; compression, forming. Understands shaping plastics: filming, bending, cutting
Tools and equipment	Understands and describes safe use of tools and equipment, such as: saws, hand and power drills, brushes, trimming knives, molds, jigs, sawing machine, marking tools, measuring tools, processing and impelling tools

Skills – Technical	**Plastics**
Designing and drawing	Accurately executes drawing exercises
Methods of working with plastics	Selects and practices appropriate methods of working with plastics such as: • Molding • Extrusion • Compression • Forming – vacuum; blowing • Shaping plastics • Filming • Bending • Cutting; sawing, drilling.
Methods of fastening	Applies appropriate fastening methods using for example: screws, nuts and bolts, rivets, glues, weld
Plastic finishes	Correctly applies plastics finishes such as paint, polishing
Tools and Equipment	Uses tools and equipment safely

Skills – Design	**Plastics**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

Welding and Fabricating

Welding and Fabricating teaches students about the design, construction and evaluation of fabricated metal objects. Students will gain skills in a range of gas and electric welding techniques, the use and construction of jigs, and the safe use of tools, machines and systems used to cut and shape metals. Students will use the design process to evaluate existing designs and to create their own solutions to design problems. An important aspect of the work will be the interpretation of technical drawings and the need for accuracy during project assembly.

By undertaking programs in Welding and Fabricating, students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills, techniques and systems to create a product that they will test and evaluate, both during the process of designing and making, and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Welding and Fabricating**
Safety	Explains the reasons for: • General safety • Personal safety • Fire safety • Equipment safety, maintenance and storage
Types of welding	Identifies and explains Arc, Gas/oxy-acetylene, MIG welding.
Arc welding	Understand and identifies • Equipment of arc welding • Metal preparation • Techniques of welding • Electrodes • Testing of the weld
Oxy-acetylene welding	Understands and identifies • Equipment of oxy-acetylene/gas welding • Opening and closing procedures/lighting-flames • Metal preparation • Techniques of welding • Testing of the weld
MIG welding	Understands and identifies • Equipment of MIG welding • Metal preparation • Techniques of MIG welding • Testing of weld.
Working drawings	Reads and interprets working drawings
Preparing materials.	Understands and explains the processes of • Accurate measurement and marking • Cutting, grinding • Preparation of the edges
Standards	Describes standards such as DIN
Characteristics of materials	Understands and explains the characteristics of metals

Knowledge and Understanding	Welding and Fabricating
Heat Treatment	• Ductile • Tensile • Hardness • Brittleness • Toughness • Malleability • Elasticity • Thermal expansion Understands and explains • Pre-heat • Normalizing • Stress relieving

Skills – Technical	Welding and Fabricating
Application of appropriate welding techniques:	
• Arc welding	Applies arc welding techniques safely and competently
• Oxy-acetylene welding	Applies oxy-acetylene welding techniques safely and competently
• MIG welding	Applies MIG welding techniques safely and competently
Preparing materials	Competently demonstrates • Reading and interpreting working drawings • Accurate measurement • Cutting, grinding • Preparation of the edges • Application of standards (e.g DIN)
Fabricating structures	Applies and demonstrates • Forces • Static, bonding • Dynamics, sheer, tension, compression • Frame • Cell
Heat treatment	Applies and safely demonstrates heat treatment processes

Skills – Design	Welding and Fabricating
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.

Skills – Design	**Welding and Fabricating**
Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

Graphic Design

Graphic Design teaches students to use computers and graphics software to produce a variety of images which incorporate graphics, or a combination of text and graphics. Students develop their skills and understanding in computer graphics technologies to produce special effects in graphic art-work production. These images can be produced in a digital form, or on a range of materials such as paper, fabric, plastic, or ceramics.

By undertaking training in the use of both the hardware and associated software students will be able to access a range of methods of creating graphic images. Further training in composition, colour, text and form, would be appropriate. Additional knowledge of reprographic techniques is appropriate.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Graphic Designs**
Types of computer components/hardware	Identifies • Memory • Data storage • Digitizing device • Output device
Types of graphic software	Identifies and explains the uses and applications of a range of graphics software.
Features of graphic digital imaging software	Explains the uses of graphic digital imaging software such as graphic/retouching, reformatting, resizing, creating special effects
Inputting and fixing images	Explains the uses of software to edit, manipulate and retouch images such as: • scanning • digitalized by digital camera • downloading from web • from file • cropping images • resolution and file size
Creating special effects	Identifies effects that can be created using different software applications: layers, mask, filters, channels, path.
Calculating sizes of files and image	Identifies the right size of the file for quality output and canvas size for the product size.
Choosing the appropriate material for a product.	Identifies and selects appropriate material for the product such as: paper; fabric; transparency; adhesive label; on screen.
File formats	Identifies a range of file formats and their application, such as PDF, TIFF, GIF

Skills – Technical	**Graphic Design**
Graphic images	Uses software to create capture and edit a variety of images required by a given task
Software	Uses graphical digital imaging software appropriately.
Created, capturing and editing images	Uses software to create capture and edit a variety of images competently
Inputting and fixing images	Uses software to edit, manipulate and retouch images: • editing • canvas size
File formats	Uses appropriate file format. Changes file format as needed

Skills – Design	**Graphic Design**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

Small Engine and Automotive Mechanics

Small Engines teaches students about the principles, construction, and operation of a range of small engines. Students will disassemble and reassemble different types of engines safely and competently. Automotive Mechanics teaches students about the role of regular maintenance in the safe, economical operation of a motor vehicle. Students will learn about maintenance requirements, including safe work practices, correct disassembly and assembly techniques, and a range of regular maintenance tasks needed to maintain a vehicle in a roadworthy condition.

Students will gain an understanding of basic engine systems – fuel, ignition, lubrication and cooling, along with power transmission concepts.

Students will demonstrate problem-solving skills in the area of basic fault-finding in fuel and ignition systems.

By applying the design process, students will be able to solve and evaluate teacher initiated design tasks. These may include the design and construction of maintenance equipment, such as engine stands, pullers and test equipment.

By undertaking programs in Small Engine and Automotive Mechanics students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills, techniques and systems to create a product that they will test and evaluate, both during the process of designing and making and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Small Engines and Automotive Mechanics**
Safety	Identifies and practices safety procedures related to: • General and personal safety • Tools and equipment • Chemicals • Fire • Storage of tools, equipment and materials
Engine operation cycles	Identifies and explains operation cycles of • Two stroke engines • Four stroke engines
Small Engines Engine Components	Identifies and describes the components of • Two stroke and four stroke engines
Engine Systems	Describes the operation of : • Fuel system – tank; filter; pump; carburettor • Lubrication system – lubricant; sump, pump, filter • Cooling system – for air cool: fins, fan, cover. for water cool: radiator, pump. • Ignition system – coil, magnet, high tension lead, spark plug
Maintenance	Explains the processes involved in system service
Automotive Mechanics Engine components	
Engine systems	Identifies and explains engine components

Knowledge and Understanding	**Small Engines and Automotive Mechanics**
Maintenance	Identifies and explains components of the • Fuel system • Ignition system • Cooling system • Lubrication system • Starting system • Charging system • Brake system (introduction) • Clutch Explains System service • Fuel – starting • Cooling – charging • Ignition – brakes • Lubrication – clutch

Skills – Technical	**Small Engines and Automotive Mechanics**
Small Engines Engine Systems	Analyses problems and tests solutions related to: • Fuel system • Lubrication system • Cooling system • Ignition system
Maintenance	Analyses problems and tests solutions related to: System service
Automotive Mechanics Engine components	Analyses problems and tests solutions related to engine components
Engine systems	Analyses problems and tests solutions related to: • Fuel system • Ignition system • Cooling System • Lubrication System • Starting System • Charging System • Brake System • Clutch
Maintenance	Analyses problems and tests solutions related to system service

Skills – Design	**Small Engines and Automotive Mechanics**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.

Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

Electricity / Electronics

Electricity/Electronics teaches students about the nature, generation and distribution of electricity. Students will learn basic electrical concepts which include alternating and direct current, and the measurement of voltage, current, resistance and power. Students will also be able to learn electronic operational principles and functions and should develop investigative skills to be able to read, interpret and design simple electrical/electronic circuits

Students will gain skills in reading, interpreting and connecting electrical/electronic instruments. They will demonstrate safe working practices in the construction, maintenance and testing of electrical/electronic circuits. They will evaluate, test and design and create simple electrical/electronic circuits.

By undertaking programs in Electricity/Electronics, students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills, techniques and systems to create a product that they will test and evaluate, both during the process of designing and making, and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Electricity and Electronics**
Safety	Observes and practices safety procedures such as • General safety • Electrical safety • Personal safety • Tools and equipment safety • Safety in power tools • Prevention and treatment of electrical shock • Fire safety
Sources of Electricity	Identifies and explains the different sources of electricity such as • Chemical – Batteries • Mechanical – Dynamo • Solar • Thermal • Pressure • Nuclear
Principles of generators and motors	Explains: • Electro magnetism – Coils; Conductors; Movement
The nature of electricity (how electricity flows)	Demonstrates an understanding of the flow of electricity by explaining the principles of • Atomic structure • Current – AC, DC • Electron flow • Electromotive force • Resistance • Power • Electro magnetic
Types of materials	Identifies, distinguishes and explains different types of conductors and insulators
Circuits and symbols	Recognises: • Types of circuit

Knowledge and Understanding	**Electricity and Electronics**
	• Circuit symbols • Measurement of electricity
Electrical design and circuit	Recognises and interprets • Circuit diagrams • Schematic working diagrams • Body diagrams of electrical parts
Tools and Equipment	Recognises the uses of tools and equipment such as multimeter, soldering iron, altimeter, desolder, wire strippers
The generation of electricity	Explains types of electricity generation.
Resistance	Explains • OHMS law • Effect of temperature on resistance
Electrical power rules	Explains the relationship between Watts and Joules
Effects of electricity passing through a conductor.	Explains • Magnetic effect • Heat effect
Common electronic components	Identifies and recognises common electronic components such as resistors, capacitors, transistors, relays, integrated circuits, transformers, light emitting diodes (LED), light dependant resistors (LDR). Identifies and recognises component polarity
Resistors in electronic circuits	Determines accurate value of resistor in a circuit Explains reasons for combining resistors in a circuit Determines and interprets power rating Determines resistance values and tolerances Identifies material used for formatting resistor.
Understanding how a capacitor works	Explains • its function • Unit of measure • Flow of current when using a capacitor in a circuit • Structure of capacitor form • Material used to make capacitor • Reading values of capacitor
Understanding of the nature of transformers	Explains the function of primary and secondary coils, and AC voltage
The diode and rectification	Explains • Changing AC to DC using diode as rectifier • Bridge rectifier • Voltage stabilization
Understanding switches	Explains • Local switching • Remote switching • Transistor and automatic switching

Knowledge and Understanding	**Electricity and Electronics**
	• The transistor • Temperature and light operated circuits • Buffer circuits
Special electronic circuits	Explains • LDR • LED

Understanding transistors	Explains
	• Latching circuits
	• Delay and timing circuits
	
	Explains
	• Transistor materials and function
	• Transistors in circuit
	• Types of transistors
	  • PNP
	  • NPN

Understanding IC (Integrated circuits)	Identifies the three leads
	  • Collector
	  • Emitter
	  • Collector
	
	Explains its composition and function
	Identify materials used to make IC circuit.

Skills – Technical	**Electricity and Electronics**
Circuits development	Constructs circuits Identifies and Interprets existing circuits Correctly identifies circuit symbols Measures electricity Analyses electrical/electronic circuit fault problems and develops and tests solutions.

Skills – Design	**Electricity and Electronics**
Investigating, devising and interpreting solutions to problems or tasks.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution.
Making/executing the selected solution in accordance with the design brief.	Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately

Skills – Design	**Electricity and Electronics**
Evaluating – checking and testing how well the requirements of the design brief have been met.	Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

Textile Printing and Design

Textile Printing and Design teaches students to design and produce textiles and textile prints using appropriate skills and techniques safely and competently. Students will apply the principles and elements of design and explore how technology has influenced the development of textiles. By undertaking training in various printing techniques and appropriate designing skills, students will be able to design and produce prints onto textiles.

By undertaking Textile Printing and Design students learn to use imagination and creativity to develop solutions to technological problems. They learn and apply a range of technological skills, techniques and systems to create a product that they will test and evaluate, both during the process of designing and making and as a finished product.

KEY IDEAS	REQUIRED STUDENT OUTCOMES
Knowledge and Understanding	**Textile Printing and Design**
Methods of incorporating decorative design include structural and applied designs	
Structural design	Identifies and differentiates details in structure, such as: • yarn construction • fabric construction – eg weaving, knitting, crochet • garment construction detail –eg seams, collars, button-holes
Applied design	Explains different printing and dyeing techniques such as: • block, roller or screen printing • batik and tie-dying
Methods of creating decorative designs	Explains different processes to create designs such as • Computer Aided Design (CAD) • Hand-drawing • Photographic printing
Skills – Technical	**Textile Printing and Design**
Development of skills and techniques in textile printing and decorative design	Creates and produces a variety of printed design products using • Contemporary methods (lavalava, t-shirt) • Decorative dyeing techniques • Traditional methods (Tapa-making, crochet, weaving, smocking) • Embroidery stitches • Appliqué • Screen Printing • Block Printing • Batik
Influences of technology on textile prints and design	Demonstrates ability to use computer aided design Selects appropriate materials and applies them safely
Development of skills and knowledge of inks and dyes	Analyses and evaluates how design processes have been incorporated into a specific product.

Designing appropriate decorations for specific needs and purposes	Creates a variety of patterns using structural and applied designs for specific needs such as: • Printed sulu, T-shirts • Crocheted article using a minimum of 5 patterns • Wall hanging article • Embroidered article

Skills – Design	**Textile Printing and Design**
Investigating, devising and interpreting solutions to problems or tasks. Making/executing the selected solution in accordance with the design brief. Evaluating – checking and testing how well the requirements of the design brief have been met.	For the design brief • Specifies criteria for plans and purposes relating to problems or tasks. • Identifies criteria for evaluation of product outcomes. • Undertakes research and communicates ideas • Prepares sketches/working drawings/action plans. • Tests, modifies and confirms ideas. • Selects an appropriate solution. Applies skills appropriately to new situations: • Manages and controls quality, reliability, safety and cost • Undertakes appropriate maintenance of equipment • Applies principles and concepts in new situations • Works alone and collaboratively • Implements solutions or plans • Uses resources, equipment and or materials appropriately Reviews criteria and standards – reliability; safety; quality; cost effectiveness. Suggests improvements to the outcome by analysing: • Plans designed • Option chosen • Procedures used • Use of materials • Cost effectiveness Prepares reports on the analysis – oral and written. Considers the implications of the consequences of the solution. • Reflects on personal achievement • Seeks other evaluative feedback in relation to expectations of the design brief.

8. COURSE ASSESSMENT

Design Technology

40% **Written Examination** (2½ hours)

60% **Internal Assessment**- 3 projects

Directed Project – 20%
Evaluative Project – 10%
Independent Project – 30%

9. WRITTEN EXAMINATION

Outcomes Tested relate to:

- Design Understanding
- Knowledge and understanding of content information, and application of technical skills from the selected Major area of study.

Structure of Examination

Part A – Design understanding (1 hour)
Questions types:
- Multiple choice
- Short answer
- Extended response

Part B – Major outcomes assessed (1½ hours)
Questions types:
- Multiple choice
- Short answer
- Extended response

10. INTERNAL ASSESSMENT

Assessment criteria are based on the three part Design Process.

Designing
Making
Evaluating

Three internally assessed projects are required to meet the practical requirements of Design Technology. The Directed Project and the Independent Project require students to design, make and evaluate products. The Evaluative Project requires students to evaluate a finished product. Students are required to document each project in a structured project report. Teachers are required to submit their proposals for the Directed project and the Evaluative Project to SPBEA for approval before giving these to students. Teachers are required to submit each student's proposal for their Independent Project to SPBEA for approval before the student undertakes this project.

The Directed Project gives students an opportunity to engage with all aspects of the design process through a project selected by the teacher. The teacher prepares a Design Brief which the students use to design and make a product. They then critically evaluate their product against the Design Brief. This project must be the first the students undertake.

The **Evaluative Project** gives students an opportunity to critically review a product or outcome determined by the teacher. The teacher provides the Design Brief and a completed product. The students' task is to evaluate the product or outcome against the Design Brief provided. The purpose of this project is to assess the students' analytical and evaluative skills.

The Independent Project gives the students an opportunity to develop their own Design Brief and respond to this in by making a product or producing an outcome independently.

All 3 projects provide the opportunity for students to present an oral report (which must be documented by the teacher) to support their written report. When needed this provides students with the opportunity to demonstrate their knowledge in oral as well as written form.

Directed Project – Requirements

This project is weighted at 20% of the total mark for this subject. It will be drawn from the chosen **Minor area** of study. It assesses the development of skills and the evaluative aspects of the Design Process. This project is controlled closely by the teacher.
The teacher:
- provides a short list of possible design briefs from which the student can choose
- for each brief, gives students clear direction as to the project outcome, by providing: the *problem*, the *task* and the *expectations*.

The design brief/s and information about the problem, task and expectations for each brief must be submitted to SPBEA for approval before being given to students.

Time allocation:
Approximately 10 hours of student time is required for this project with half of that time to be in lesson time under the supervision of the teacher. The breakdown of that time should be guided by the assessment weightings below.

Assessment weightings for the Directed Project

Design: 25%
Making: 60%
Evaluation: 15%

Forms of Assessment to be used

Design

Design Journal and Interview – 25%
To include:
- drawings, materials analysis and investigations, equipment needed and purpose and limitations, costing etc
- the opportunity for a structured interview (5-10 minutes) on each student's research and investigations, documented by the teacher.

Making

Skills Test – 30%
To include:
- evaluation by the teacher of relevant skills for this project independent of the quality of the overall product.

Product – Skills Integration – 30%
To include
- assessment of the product against the requirements of the design brief.

Evaluation
Report and Discussion – 15%
To include:
- a written report reflecting on the designing and making process,
- the opportunity for an oral report(10 minutes), based on the written report, and documented by the teacher.

Evaluative Project - Requirements
This project is weighted at 10% of the total mark for this subject. It will be drawn from the chosen **Major area** of study. It assesses the evaluative aspects of the Design Process.
This project provides opportunities for students to critically reflect on a product made by others.
The teacher:
- Gives a design brief providing: the *problem*, the *task* and the *expectations* for a product
- Provides students with the product

The brief and a description of the product to be used must be submitted to SPBEA for approval before being given to students.

Time allocation:
Approximately 5 hours of student time is required for this project with half of that time to be in lesson time under the supervision of the teacher.

Assessment weightings for the Evaluative Project
Evaluation: 100%

Forms of Assessment to be used
Evaluation
Report and Discussion – 100%
To include:
- a structured evaluative report commenting upon:
1. The choice of materials
2. The quality of the execution
3. The actual design
4. The response to the Design Brief and suggestions for improvement
5. An explanation and discussion of their conclusions.

- the opportunity for an oral report(10 minutes), based on the written report, and documented by the teacher.

Independent Project - Requirements

This project is weighted at 30% of the total mark for this subject. It will be drawn from the chosen **Major area** of study. It assesses all aspects of the Design Process. This Project represents the opportunity for the student to demonstrate the extent of their learning in a practical manner and in an area of their own choosing within broad constraints set by the teacher.

The teacher:

- Provides students with the *problem* and the *expectations*

Each student's task proposal must be submitted to SPBEA for approval before the student proceeds further with this project.

Time allocation:

Approximately 15 hours of student time is required for this project with half of that time to be in lesson time under the supervision of the teacher. The breakdown of that time should be guided by the assessment weightings below.

Assessment weightings for the Independent Project:

Design – 30%
Making – 40%
Evaluation – 30%

Forms of Assessment to be used:

Design

Design Journal and Interview – 30%

To include:

- design brief, drawings, materials analysis, records of enquiry's made, research, option for design, costs, equipment to be used, any safety implications etc
- the opportunity for a Structured Interview (5-10 minutes) on the design decision

Making

Skills Test – 20%

To include:

- evaluation by the teacher of relevant skills for this project **independent of the quality of the overall product**.

Product – Skills Integration – 20%

To include

- assessment of the product against the requirements of the design brief.

Evaluation

Report and Discussion – 30%

To include:

- a written report reflecting on the designing and making process,
- the opportunity for an oral report(10 minutes), based on the written report, and documented by the teacher.

Directed Project – Assessment Mark Sheet

STUDENT: _____ **SCHOOL:** _____

MINOR AREA: _____

PROJECT TITLE: _____

CRITERIA FOR ASSESSMENT

The extent to which the student demonstrates the ability to:	**Marks Obtained**	**Comments**
Design Journal and Interview (total 25%) • Interpret the problem and describe the client needs and expectations (5%) • List and analyse the range of materials, processes and equipment used for possible solutions to the problem (10%) • Illustrate a shortlist of 3 possible solutions to the problem that responds to the client needs and/or expectations (5%) • Identify and justify the proposed solution in relation to the client needs and/or expectations (5%)		
Making the product (60%) Skills (30%)*- equal weighting for all criteria* • competently perform the procedures required • use equipment safely and competently • select and use materials appropriately • use oral, written and graphical instructions • complete task within planned timeline ***Product – Skills Integration (30%)* -equal weighting both criteria** • use systems, materials and processes to meet the design brief and expectations • ability to adopt to problems during development of the product		
Evaluation Report and Discussion.(15%) – *equal weighting for all criteria* • draw conclusions about the extent to which the design brief has been met. • identify ways in which the product/production process could have been improved. • explain and justify conclusion.		
TOTAL	100	

Directed Project - Performance standards

Design journal and Interview – maximum 25 marks

High performance – 20-25 marks	Satisfactory performance– 11-19 marks	Low performance– 1-10 marks
The extent to which the student demonstrates the ability to		
Interpret the problem and describe the client needs and attitudes		
States the problem clearly and explains why it is a problem. Clearly describes all the client's needs and expectations. Clearly describes all constraints	States the problem and attempts to explain why it is a problem. Describes some of the client's needs and expectations. Describes some of the constraints	Interpretation of the problem may be given but incomplete and/or confusing. Unclear description of some of the client's needs and expectations. Unclear or no description of constraints
List and analyse the range of materials processes and equipment used for possible solutions to the problem		
Lists and analyses critically and in depth a broad range of materials processes and equipment used for possible solutions to the problem. Provides detailed evidence of investigation.	Suggests and considers some materials, processes and equipment used for possible solutions to the problem. Provides some evidence of investigation	Suggests inappropriate and/or limited tools processes and materials for possible solutions. Provides little or no evidence of investigation
Illustrate a shortlist of 3 possible solutions to the problem that responds to the client needs and/or expectations		
Presents three detailed appropriate and well annotated solutions which are developed as far as possible including justifications for their inclusion.	Presents three appropriate solutions, not necessarily detailed and annotated. Limited justifications for their inclusion	Presents 1 or 2 ideas not necessarily developed to the point of solutions. Little or no justification given for their inclusion.
Identify and justify the proposed solution in relation to the client needs and/or expectations		
Identifies and justifies clearly and concisely the proposed solution in relation to the client needs and expectations and the constraints. Clear justification why this solution was chosen over the other two.	Give some reasons to identify and justify the proposed solution in relation to the client needs and/or expectations and constraints. Some justification of why this solution was chosen.	Makes little reference to identify and justify the proposed solution in relation to the client needs and/or expectations. No justification for the choice of solution.

Making the product – Skills – maximum 30 marks

High performance – 24-30 marks	Satisfactory performance– 14-23 marks	Low performance– 1-13 marks
The extent to which the student demonstrates the ability to		
Competently perform the procedures required		
Demonstrates high level ability to undertake complex procedures independently and competently.	Demonstrates ability to undertake some complex procedures with some degree of competence and sometimes requires limited assistance.	Demonstrates limited ability to undertake procedures and frequently requires assistance.
Use equipment safely and competently		
Selects and appropriately uses the right tools and techniques independently and competently in a safe and efficient manner.	Usually selects and uses appropriately the right tools and techniques with some degree of competence independently in a reasonably safe manner	Selects and uses a limited range of appropriate tools and equipment in a reasonably safe and efficient manner. Frequently requires assistance.
Select and use materials appropriately		
Selects and uses a broad range of appropriate materials independently, confidently and	Selects and uses a reasonable range of appropriate materials in a safe and efficient manner. Able	Selects and uses a limited range of appropriate materials in a reasonably

in a safe and efficient manner. Makes personal judgments about the appropriate materials to use.	to make some individual decisions about appropriate materials to use.	safe and efficient manner. Requires frequent supervision and direction when using materials
Use oral written and graphical instructions		
Uses a range of appropriate communication and presentation techniques which enhance the clarity of the report. Technical language is extensively used accurately and correctly	Uses a limited range of communication and presentation techniques to produce a reasonably clear and interesting report. Some technical language is used appropriately.	Uses few techniques to develop a report with limited visual impact and clarity Little or no evidence of technical language being used.
Complete task within planned timeline		
Successfully completes all planned tasks to required standard within the planned timeline.	Successfully completes **most** planned tasks to the required standard within the planned timeline.	Incomplete tasks, most not up to required standard, within the planned timeline.

Making the product – Skills Integration – maximum 30 marks

High performance – 24-30 marks	Satisfactory performance – 14-23 marks	Low performance – 1-13 marks
The extent to which the student demonstrates the ability to		
Use systems materials and processes to meet the design brief and expectations		
Produces a high quality product which successfully meets all the client's expectations.	Produce a good quality product which meets some of the client's expectations.	Produces a poor quality or incomplete product which may or may not meet the client's expectations.
Ability to adapt to problems during development of the product		
Makes appropriate modifications to improve the identified weakness/es in the outcome.	Makes some modifications, not necessarily appropriate to improve the identified weakness/es in the outcome	Makes little or no modifications to improve the identified weakness/es in the outcome

Evaluation report and discussion – maximum 15 marks

High performance – 12-15 marks	Satisfactory performance – 7-11 marks	Low performance – 1-6 marks
The extent to which the student demonstrates the ability to		
Draw conclusions about the extent to which the design brief has been met		
Presents considerable (factual, specific, reasonable) evidence to support the argument for the chosen alternative (solution).	Shows reasonable (general terms with reasons) evidence of testing and analysis of final solution against the design brief specification.	Shows little or no evidence of testing and analysis of final solution against the design brief specification.
Identify ways in which the product/production process could have been improved		
Clearly identifies and describes its strengths and weaknesses	Identifies and describes some strengths and weaknesses	Identifies and describes one or no strengths and weaknesses
Explain and justify conclusion		
Documents detailed modifications on how to improve the identified weaknesses in the outcome	Prepares some (2-3) documentation discussing modifications to improve identified weaknesses in the outcome	Presents little or no documentation showing awareness of possible modifications required to improve any weaknesses in the outcome

Independent Project – Assessment Mark Sheet

STUDENT: _____ **SCHOOL:** _____

MAJOR AREA:_____

PROJECT TITLE: _____

CRITERIA FOR ASSESSMENT

The extent to which the student demonstrates the ability to:	Marks Obtained	Comments
Design Journal and Interview (total 30%) • Identify the problem and prepare a design brief that clearly describes the problem and the client's needs and expectations (10%) • List and analyse the range of materials, processes and equipment used for possible solutions to the problem (10%) • Illustrate a shortlist of 3 possible solutions to the problem that responds to the client needs and/or expectations (5%) • Identify and justify the proposed solution in relation to the client needs and/or expectations (5%)		
Making the product (40%) Skills (20%) - *equal weighting for all criteria* • competently perform the procedures required • use equipment safely and competently • select and use materials appropriately • use oral, written and graphical instructions • complete task within planned timeline ***Product – Skills Integration (20%)*-equal weighting both criteria** • use systems, materials and processes to meet the design brief and expectations • ability to adopt to problems during development of the product		
Evaluation Report and Discussion.(30%) – *equal weighting for all criteria* • draw conclusions about the extent to which the design brief has been met • identify ways in which the product/production process could have been improved • explain and justify conclusion		
TOTAL	100	

Independent Project - Performance standards

Design Journal and Interview – maximum 30 marks

High performance – 24-30 marks	Satisfactory performance – 14-23 marks	Low performance – 1-13 marks
The extent to which the student demonstrates the ability to		
Identify the problem and prepare a design brief that clearly describe the problem and the client's needs and attitudes		
States the problem clearly and explains why it is a problem. Gives a clear brief and concise statement of the task providing specific direction. Clearly describes all the client's needs and expectations. Clearly describes all constraints	States the problem and attempts to explain why it is a problem. Statement of the task is reasonably clear, and indicates some direction. Describes some of the client's needs and expectations. Describes some of the constraints	Interpretation of the problem may be given but incomplete and/or confusing. Statement of the task is lengthy, unclear and lacking in specific focus. Unclear description of some of the client's needs and expectations. Unclear or no description of constraints
List and analyse the range of materials processes and equipment used for possible solutions to the problem		
Lists and analyses critically and in depth a broad range of materials processes and equipment used for possible solutions to the problem. Provides detailed evidence of investigation.	Suggests and considers some materials, processes and equipment used for possible solutions to the problem. Provides some evidence of investigation	Suggests inappropriate and/or limited tools processes and materials for possible solutions. Provides little or no evidence of investigation
Illustrate a shortlist of 3 possible solutions to the problem that responds to the client needs and/or expectations		
Presents three detailed appropriate and well annotated solutions which are developed as far as possible including justifications for their inclusion.	Presents three appropriate solutions, not necessarily detailed and annotated. Limited justifications for their inclusion	Presents 1 or 2 ideas not necessarily developed to the point of solutions. Little or no justification given for their inclusion.
Identify and justify the proposed solution in relation to the client needs and/or expectations		
Identifies and justifies clearly and concisely the proposed solution in relation to the client needs and expectations and the constraints. Clear justification why this solution was chosen over the other two.	Give some reasons to identify and justify the proposed solution in relation to the client needs and/or expectations and constraints. Some justification of why this solution was chosen.	Makes little reference to identify and justify the proposed solution in relation to the client needs and/or expectations. No justification for the choice of solution.

Making the product – Skills – maximum 20 marks

High performance – 16-20 marks	Satisfactory performance – 9-15 marks	Low performance – 1-8 marks
The extent to which the student demonstrates the ability to		
Competently perform the procedures required		
Demonstrates high level ability to undertake complex procedures independently and competently.	Demonstrates ability to undertake some complex procedures with some degree of competence and sometimes requires limited assistance.	Demonstrates limited ability to undertake procedures and frequently requires assistance.
Use equipment safely and competently		
Selects and appropriately uses the right tools and techniques independently and competently in a safe and efficient manner.	Usually selects and uses appropriately the right tools and techniques with some degree of competence independently in a reasonably safe manner	Selects and uses a limited range of appropriate tools and equipment in a reasonably safe and efficient manner. Frequently requires assistance.

Select and use materials appropriately		
Selects and uses a broad range of appropriate materials independently, confidently and in a safe and efficient manner. Makes personal judgments about the appropriate materials to use.	Selects and uses a reasonable range of appropriate materials in a safe and efficient manner. Able to make some individual decisions about appropriate materials to use.	Selects and uses a limited range of appropriate materials in a reasonably safe and efficient manner. Requires frequent supervision and direction when using materials
Use oral written and graphical instructions		
Uses a range of appropriate communication and presentation techniques which enhance the clarity of the report. Technical language is extensively used accurately and correctly	Uses a limited range of communication and presentation techniques to produce a reasonably clear and interesting report. Some technical language is used appropriately.	Uses few techniques to develop a report with limited visual impact and clarity Little or no evidence of technical language being used.
Complete task within planned timeline		
Successfully completes all planned tasks to required standard within the planned timeline.	Successfully completes **most** planned tasks to the required standard within the planned timeline.	Incomplete tasks, most not up to required standard, within the planned timeline.

Making the product – Skills Integration – maximum 20 marks

High performance – 16-20 marks	Satisfactory performance – 9-15 marks	Low performance – 1-8 marks
Use systems materials and processes to meet the design brief and expectations		
Produces a high quality product which successfully meets all the client's expectations.	Produce a good quality product which meets some of the client's expectations.	Produces a poor quality or incomplete product which may or may not meet the client's expectations.
Ability to adapt to problems during development of the product		
Makes appropriate modifications to improve the identified weakness/es in the outcome.	Makes some modifications, not necessarily appropriate to improve the identified weakness/es in the outcome	Makes little or no modifications to improve the identified weakness/es in the outcome

Evaluation report and discussion– maximum 30 marks

High performance – 24-30 marks	Satisfactory performance – 14-23 marks	Low performance – 1-13 marks
The extent to which the student demonstrates the ability to		
Draw conclusions about the extent to which the design brief has been met		
Presents considerable (factual, specific, reasonable) evidence to support the argument for the chosen alternative (solution).	Shows reasonable (general terms with reasons) evidence of testing and analysis of final solution against the design brief specification.	Shows little or no evidence of testing and analysis of final solution against the design brief specification.
Identify ways in which the product/production process could have been improved		
Clearly identifies and describes its strengths and weaknesses	Identifies and describes some strengths and weaknesses	Identifies and describes one or no strengths and weaknesses
Explain and justify conclusion		
Documents detailed modifications on how to improve the identified weaknesses in the outcome	Prepares some (2-3) documentation discussing modifications to improve identified weaknesses in the outcome	Presents little or no documentation showing awareness of possible modifications required to improve any weaknesses in the outcome

Evaluative Project – Assessment Mark Sheet

STUDENT: _____

SCHOOL: _____

MAJOR AREA: _____

PROJECT TITLE: _____

CRITERIA FOR ASSESSMENT

The extent to which the student demonstrates the ability to:	**Marks Obtained**	**Comments**

Evaluation-Written Report and Discussion (100%)
• draw conclusions about the extent to which the product has met the design brief expectations (50%)
  o choice of materials
  o quality of workmanship
  o choice of equipment/tools/processes
• identify ways in which the product/production process could have been improved (25%)
• explain and justify your conclusions (25%)		

TOTAL	100	

Evaluative Project – Performance Standards

The extent to which the student demonstrates the ability to

Draw conclusions about the extent to which the design brief has been met- maximum 50 marks		
High performance – 40-50 marks	Satisfactory performance – 23-39 marks	Low performance – 1-22 marks
Presents considerable (factual, specific, reasonable) evidence to support the argument for the chosen alternative (solution).	Shows reasonable (general terms with reasons) evidence of testing and analysis of final solution against the design brief specification.	Shows little or no evidence of testing and analysis of final solution against the design brief specification.

Identify ways in which the product/production process could have been improved- maximum 25 marks		
High performance – 20-25 marks	Satisfactory performance – 12 - 19 marks	Low performance – 1-11 marks
Clearly identifies and describes its strengths and weaknesses	Identifies and describes some strengths and weaknesses	Identifies and describes one or no strengths and weaknesses

Explain and justify their conclusions – maximum 25 marks		
High performance – 20-25 marks	Satisfactory performance – 12 - 19 marks	Low performance – 1-11 marks
Documents detailed modifications on how to improve the identified weaknesses in the outcome	Prepares some (2-3) documentation discussing modifications to improve identified weaknesses in the outcome	Presents little or no documentation showing awareness of possible modifications required to improve any weaknesses in the outcome

11. MODERATION

Moderation is a process designed to place different teachers' assessments of their students' performance in the same subject on the same scale so that valid comparisons between performances can be made. The purpose of moderation is to help to ensure fairness to students and to provide the wider community with reliable information about student performance. Moderation is undertaken to ensure that the internally assessed scores given to students who take the subject are comparable from school to school.

The Directed Project and the Independent Project will be moderated by visit. Material available for moderation for each student will include:

- Design Journal
- Skills test
- The product or some representation of it
- Evaluation Report
- Completed Assessment Mark sheet
- Teacher's documentation of oral reports, where used

The Evaluative Project will be statistically moderated by the Examination.

12. ADVISORY NOTES

Analysis of materials, processes and equipment used in Directed and Independent Projects

One of the key criterion statements for both the Directed and Independent project is:
The extent to which the student demonstrates the ability to:
List and analyse the range of materials, processes and equipment used for possible solutions to the problem.

One way to help students undertake this analytical process is by constructing a grid similar to the one below which charts the range of materials and processes against certain criteria related to the client's needs and expectations. This example relates to Wood Technology.

		CLIENT'S NEEDS AND EXPECTATIONS					
		Cost	**Durability**	**Availability**	**Hardness**	**Ease of use**	**Etc.**
MATERIALS, EQUIPMENT AND PROCEDURES	*Materials*						
	Wood						
	Type A						
	Type B						
	Type C						
	Etc.						
	Fixings						
	Nails						
	Screws						
	Etc.						
	Tools						
	Hammer						
	Drill						
	Etc.						
	Equipment						
	Jigs						
	Etc.						
	Processes						
	Planing						
	Drilling						
	Etc.						

Skills Tests – Directed and Independent Projects

The criteria for assessment of skills in making a product are:

- competently perform the procedures required
- use equipment safely and competently
- select and use materials appropriately
- use oral, written and graphical instructions
- complete task within planned timeline

For each task, the set of particular skills being tested should be provided to the student. An example skills test checklist is shown below on the following page.

DIRECTED PROJECT/INDEPENDENT PROJECT **(circle the one which is applicable)**

Skills Test

STUDENT: _____ *SCHOOL* _____

AREA OF STUDY: _____

PROJECT TITLE: _____

	Competency Demonstrated		
Skills Demonstrated	**Competent**	**Developing**	**Still to be Demonstrated**
Assessor's Note: Please initial and date skills in the appropriate column.			

Advice to Students — Projects

In this subject you are required to work through all or part of the design process in 3 different projects:

1. The Directed Project: This is where your teacher 'directs' you to make a product to certain specifications explained by your teacher.
2. The Independent Project: This is where you have identified and solve a problem by making a product to your 'clients' specifications.
3. The Evaluative Project: This is where your teacher identifies a completed product made by someone else and you have to analyse the quality of the product as made to the client's (owner) specifications.

For each of these projects there are a set of criteria that will be used to assess your performance. You should read the Assessment Mark Sheet and the Performance Standards carefully to work out how you will be assessed. The Performance Standards describe what you need to do to achieve marks.

When you are preparing your Independent Project the following questions may help you develop your Design Brief and then make and evaluate your product.

Independent Project

Design Brief
The Problem:
Has the need or problem been clearly described?
The Task:
Have you clearly stated the task or tasks that you need to undertake?
The Expectations:
Are there any physical or performance requirements or constraints that your solution or product needs to take into consideration?
Interview: Your teacher may wish to interview you. Can you explain clearly to your teacher how you investigated possible solutions to your problem and the reasons why you have chosen your solution?

Does your design journal support and justify both your investigation process and the final solution chosen?

Making
Skills Test:
Your teacher will have devised skills tests to assess the specific skills used in your making stage, and in particular any new skills you needed to acquire to produce your solution.
Product execution (skills integration)
Have you successfully produced your solution?

Design and Product Evaluation
Did the solution fully meet the design brief?
Have you recorded both the things that went well and any problems you had?
Can you say what you have learnt about the materials, equipment, production techniques and processes, and the designing process?
Discussion: You may be asked to give a short talk on your work. Are you prepared to discuss all aspects of the Independent Project in detail?
Structured Report:
Have you prepared a polished summary of your evaluation report for inclusion in your Independent Project Portfolio?

Advice to Teachers - Teaching Approaches

Skills and Knowledge

Learning in technology involves a combination of skills and knowledge. Students combine their designing and making skills with knowledge and understanding of materials, information, and systems to undertake activities that lead to making high-quality products for intended purposes. Many students will have previous experience in the subject. Using the key ideas and required student outcomes in the prescription as a guide, teachers will judge the extent to further develop skills and knowledge as they assess the needs of the class group.

As a guide it would be expected that up to one third of the course would be devoted to the training of skills and development of knowledge. This may be done separately from the actual practical/design work or in the context of practical/design activities - or of course a combination of both.

Dependent Learning and Independent Learning

Successful students in a technology subject will exhibit independent learning behaviours and will be able to draw on their own skills and understanding, identify what they need to know, and know where to find this information to support the completion of a task or activity.

The teacher will provide structured opportunities to develop the skills needed, but one of the important measures of achievement will be the degree of independence from the teacher the student can demonstrate. The teacher will still have a role but it will be up to the student to work with the teacher as an important adviser. Ultimately the student will need to demonstrate their individuality as an independent investigator as they seek to solve problems and design and make a product. Such products may be small or large, complex or simple. When we seek to assess the outcomes of such a process we need to take into account the complexity of the task to ensure that appropriate weightings are applied to recognise creativity and design complexity. The ability to use expensive materials or sophisticated equipment will not be a factor in assessing achievement.

Collaborative Learning and Teamwork

Most of life's activities involve working with others in a support or leadership role. Study in Technology provides these opportunities. The Design Process provides a framework within which there are opportunities for students to work with fellow students and also with people within their community. The Directed Project can provide an opportunity for collaborative learning, for example:

Designing

A team of perhaps 3 students can share the task of finding out the cost of materials, another student could investigate other similar problems and explore how these were solved and explore the solutions devised by other technologists. A third student could prepare some sketches in preparation for more detailed drawings.

Making

The same team might then share out the specific tasks in much the same way that the 'boss' might allocate jobs to his employees, to ensure that the whole job is completed.

Evaluating

After the team has completed the 'product' there is a need to critically reflect on the Design and Making (production) stages and see what can be learnt. This evaluation stage is critical, as here students are applying a combination of knowledge and practical skills. By emphasising this part of the process the teacher will ensure that the appropriate cognitive demands of the subject are being met. At this stage it is possible for the students to share in this evaluation as a team and perhaps make an individual or joint presentation depending on the assessment requirement.

The teamwork approach is not without its administrative difficulties, particularly in assessment. This can be largely overcome as long as the assessment criteria are clear and each student's role is defined and perhaps validated by the teacher before the students commence their task. In any group work situation the 'ensemble' criterion is one of the criteria to be used to reflect the importance of working together. However the ultimate outcome can be compromised by one individual and so appropriate criteria need to be used to reflect the individual roles as well as the group ones. In such a situation the ensemble criterion may carry significant weight so that the need to work together is valued in the marking scheme.

Presentation of Learning - oral and written

For the teacher to be able to determine the extent of learning some form of presentation by the student must be made. Clearly the product is one important presentation but in the context of this course this is but one outcome.

Students should be able to demonstrate the acquisition of certain skills and the gaining of particular knowledge and ideas - often as a result of specific teaching and training activities - so called 'theory' lessons.

They demonstrate their use and understanding of the Design process as they produce objects, or present other practical outcomes. Within each step of the design process there will be opportunities for students to demonstrate their:

- Design skills and understanding in a particular context
- Production skills and the quality of their products perhaps set in an industry context
- Ability to critically evaluate their product (or the production of others) and their own design process

This demonstration of learning may be presented orally or in written form. It may be short or extensive to reflect the importance of one part of the design process or another and the presentation may use a variety of media. In certain circumstances the presentation may be informal (e.g. the student may not even be aware that it is happening, as it is part of an apparent casual conversation or gentle questioning). In other situations the presentation will be formal (e.g. examination, test, folio, assignment, oral presentation).

When a test is written, it may be in English or the vernacular. As the test is testing the student's knowledge of technology, it may be appropriate in some situations to allow the student to respond in their native tongue.

Written tests should be quite structured and have minimal extended response or essay requirements. For many students the writing requirement will not extend beyond a requirement to respond to dot points, construction of lists, or to provide sequences or steps in a process. Tests or examinations should reflect this approach.

All 3 projects provide the opportunity for students to present an oral report (which must be documented by the teacher) to support their written report. When needed this allows students to demonstrate their knowledge in oral as well as written form.

In summary, the presentation of ideas and understanding is essential and critical to assess the learning outcomes. The form of this presentation should provide each student with a fair opportunity to demonstrate his or her learning. It may be oral and/or written and be formal and/or informal. The purpose of each assessment must be clearly linked to a learning outcome(s) with the assessment criteria made known to the student. In this way it will be possible to measure the extent to which a student has performed against an outcome(s).

Authenticity of Learning and Verification of Student Work

As we reach a point of measuring a student's learning we must be confident that we are in fact measuring the actual student's performance and not the learning or work of another student or person. We need to be able to verify the authenticity of the student's work.

Collaboration and teamwork is an integral part of working and family life and is replicated in a Technology course. Students are to be encouraged to seek help from others: family, their peers, friends, teachers, people in industry and from traditional sources such as libraries, books, magazines, and where possible the Internet. This will make the learning process more authentic but with this comes a problem of being able to identify the student's own contribution to the learning outcome.

At each point of the Design Process, designing, making, evaluating, the student should keep a record of the nature and extent of the support sought, and gained. In some cases information sought from a person or organisation but not received might still be an appropriate part of the record. Success as well failure in achieving this additional information is an important part of the corroboration of the student's engagement with the process. The important part of the assessment is to determine not only how well the process was followed but what has been learnt by the student.

Students who collect much but think little about the usefulness and the applicability of the information will be rewarded with a low score. Quantity does not always equal quality.

In extreme cases where a student and teacher cannot validate the learning a serious breach of rules has occurred. A penalty may well apply with a score of zero being the outcome for the task. Continual breaches of this kind may necessitate more serious action. The teacher and student should engage at appropriate times over the course of an independent project to maintain some verification capability.

Enterprise Learning

The knowledge gained and the skills learned in a technology framework and following the Design Process lends itself to working closely with a student's community to achieve the learning outcomes. This may be at the local village or family level, or at a wider municipality or town level. The opportunity for an independent study that is drawn from a real need in the community and can then possibly have some community validation and even quality controls is a valid and desirable outcome. This can be encouraged as it meets the needs of the course, and maintains a high level of authentic learning in ways that cannot be achieved in more theoretical or abstract subjects.