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| **2019 GRADE 8 PACE SETTER TECHNOLOGY** | | | | | | | | | | | | | | | |
| **TERM 1** | | | | | | | | | | | | | | | |
| **Week** | | | **FOCUS** | | | | | **CONTENT, CONCEPTS AND SKILLS** | | **TASKS** | **PLANNED DATE OF COMPLETION** | **ACTUAL DATE OF COMPLETION** | | **HOD MON ITORING** | **EXTERNAL MONITORING** |
| 1 | | | Structures  Investigation skills | | | | | **Frame structures**  • Definition of ***frame*** structures.  -- Purpose of structural members (components) in wood and steel roof trusses (king and queen post, strut, tie, rafter, tie beam).  -- Learners identify structural members and type of force (shear, torsion, tension, compression) acting on them in given frame structures.  **• Case study**: Electrical pylons – use pictures of a range of pylon designs noting:  -- The variety of designs that solve the same problem effectively.  -- The use of ***internal*** cross-bracing and triangulation to provide stiffness.  • Structural members under tension/compression (worksheet). | |  | 11 / 01 / 2019 |  | |  |  |
| 2 | | | Structures | | | | | **Structural members**  • Structures that span over space:  -- Beams: steel I-beams (girders), concrete lintels; beam and column bridge.  -- Alternative bridge supports: suspension bridges; cable-stayed bridges.  -- Arches: arches in buildings, bridges, dam walls.  -- Cantilevers: simple cantilever, cable-stayed cantilever.  Structural failure – the three most likely ways structures fail are:  -**- Fracture** of a member – due to lack of strength.  -**- Bending** (flexing, buckling) – due to lack of stiffness (rigidity).  -**- Toppling over** – due to lack of stability (top heavy, narrow base). | |  | 18/01/2019 |  | |  |  |
| 3&4 | | Communication skills | | | | | | **• Purpose of graphics**: develop and communicate ideas.  **• Conventions**: outlines (thick/dark); construction lines (thin/feint); hidden detail (dashed);centre lines (chain dash-dot); scaling up and scaling down; dimensioning (in mm).  **• Working drawing** techniques for planning:  -- Single view flat 2D drawing with dimensions, line types and scale.  -- Isometric – using underlying isometric grid (term 1) and simple instruments (term 3).  **• Artistic drawing:** Double vanishing point perspective with colour, texture and shading.  -- Sketching – using pencil, ruler and blank paper.  -- Enhancing drawing to promote realism using colour, texture, shading and shadows. | |  | 25/01/19  to  01/02/19 |  | |  |  |
| 5&6 | | Mechanical systems and control  Investigation skills  Communication skills | | | | | | **• Revision**: mechanical advantage. Well-designed machines give “***mechanical***  ***advantage***”.  • All complex machinery consists of combinations of simple mechanisms.  -**- The wedge:** e.g. inclined plane or ramp, door wedge, knife blade, etc.  -**- The wheel and axle:** e.g. from bicycle to shopping trolley.  **• Gears:** (wheels with wedges for teeth)  -- Show how meshing of two spur gears causes **counter-rotation**.  -- Show how introducing an **idler** gear between two spur gears synchronises rotation of the driver and driven gears. **Note**: Since a small idler will rotate more times than the larger gears, it should be made of harder material. | |  | 08/02/19 |  | |  |  |
| -- Gear ratios:  Show how different sized gears result in a change in the velocity ratio as well as an ’opposite’ change in the force ratio –*if force increases, speed decreases, and vice versa.*  • Mechanisms that change the direction of movement:  -- The Cam: show how a cam converts rotary motion into reciprocating motion. Compare an eccentric wheel and a snail cam.  -- The Crank: an adaptation of a second-class lever. Show how a crank converts rotary motion into reciprocating motion.  **• Graphic skills**: learners draw an artist’s impression of one of each of the above mechanisms in their books using colour, shading and texture. | |  | 15/02/2019 |  | |  |  |
| **BEGINNING OF PAT** | | | | | | | | | | | | | | | |
| 7 | Structures  Evaluation skills  Making skills | | | | | | | Learners work in teams to design and make a structure utilising required structural components and mechanisms to suit the context provided.  **• Evaluate**: learners examine information on several complex structures and list advantages and disadvantages in the designs.  **• Design**: initial idea sketches.  **• Design**: design brief with specifications and constraints.  **• Make**: a 3D isometric projection of the idea with dimensions and drawn to scale.  • Make: a working drawing in 2D showing one view with dimensions and line types. |  | | 22/02/19 |  | |  |  |
| 8 | Making skills | | | | | | | • Make: teams build their structure housing mechanisms using safe working practices. |  | | 01/03/19 |  | |  |  |
| 9 | Communication skills | | | | | | | • Communicate: teams present their plans and model.  • Communicate: a sketch in double VP perspective enhanced using two of colour, texture or shading. |  | | 08/03/19 |  | |  |  |
| 10&11 |  | | | | | | | **TERM TEST AND MARKING** |  | | 11-15/03/19 |  | |  |  |
|  | **TERM 2** | | | | | | | | | | | | | | |
| 1 | Impact of technology  Processing  Investigation skills | | | | | | | **• The positive impact of technology:** many natural materials have been replaced in modern times by new or improved materials. Some new materials are environmentally friendly by being bio-degradable.  **• Case study 1:** investigate the impact of plastic shopping bags on the environment.  **• Report**: learners write a report evaluating the effectiveness of using thicker, bio-degradable plastic shopping bags which shoppers must buy. |  | | 05/04/19 |  | |  |  |
| 2 | Communication skills  Investigation skills  Designing skills | | | | | | | • Case study 2: technology with a positive impact on society.  -- Investigate how waste paper and cardboard are recycled to produce new products for the packaging industry.  • Development: draw a development of an opened container. |  | | 12/04/19 |  | |  |  |
| 3 | • Practical activity: a product requires packaging. Design and make packaging for a purpose.  The nature of the product determines the design and properties of the packaging material.  • Learners work safely to make and assemble the above packaging product. |  | | 18/04/19 |  | |  |  |
| **BEGINNING OF PAT** | | | | | | | | | | | | | | | |
| 4 | Impact of technology  Investigating skills | | | | | | | **• Case study 3**: technological products can have a negative impact**.**  • Investigate a technological product that can have a negative impact on society.  **• Class discussion**: facilitate a class discussion on possible solutions that can counteract orcompensate for the negative impact of the technology identified. |  | | 26/04/19 |  | |  |  |
| 5 | Structures  Processing | | | | | | | **• Revise:** forces that act on material – tension; compression; bending; torsion; shear.  • Adapting materials to withstand forces – reinforcing concrete, plywood.  • Selecting metal sections (I-beam, angle iron, T-bar, etc.) to withstand forces and to savematerial. |  | | 03/05/19 |  | |  |  |
| 6 | | | | | | | Design skills  Making skills | **• Design**: learners adapt a material or design a product that will solve the problem or reduce  the impact or negative effects of the technology identified.  **• Design**: learners sketch free-hand sketches showing two possible solutions.  **• Make:** learners draw their chosen solution in 3D using isometric projection.  **• Make**: learners make the model/prototype/product they have designed safely. |  | | 10/05/19 |  | |  |  |
| 7 | | | | | | | Making skills  Evaluation skills | **• Make (cont.)**: Learners make the model/prototype/product they have designed safely.  **• Evaluate**: learners evaluate their solution in terms of its effectiveness in solving or reducing the negative impact of the technology identified. Their evaluation will be assessed in terms of its objectivity, fairness, accuracy and scope (depth). |  | | 17/05/19 |  | |  |  |
| 8 | | | | | | | Communication skills | • Communicate: Teams present their plans, model and evaluation. |  | | 24/05/19 |  | |  |  |
| 9-11 | | | | | | |  | EXAMINATIONS AND MARKING |  | | 31/05/19  to  14/06/19 |  | |  |  |
| **TERM 3** | | | | | | | | | | | | | | | |
| 1 | | | | | Mechanical systems and control | | | **Revise: Levers –** single levers and levers linked in pairs.  Single first-class lever – mechanical advantage depends on the position of the fulcrum.  Linked first-class levers – consider various samples, e.g.:  -- Paper scissors (if equal length blade and handle) – no mechanical advantage.  -- Secateurs (long handle and short, strong blades) – mechanical advantage > 1.  -- Single second-class lever – always gives some mechanical advantage.  -- Linked second-lass levers – consider various samples, e.g.:  -- Office punch – mechanical advantage > 1.  -- Heavy duty stapler – mechanical advantage > 1.  -- Single third-class lever – never gives any mechanical advantage.  -- Linked third-class levers – consider various samples, e.g.:  -- Office light-duty stapler – mechanical advantage < 1.  -- Pair of tweezers – mechanical advantage < 1.  -**- Gear systems** – concepts (counter rotation, idler, velocity ratio, force multiplication).  -- Two spur gears of unequal size – note counter rotation and velocity ratio.  -- Two spur gears of unequal size – note velocity ratio and force ratio (mechanical advantage  <or> 1).  -- Two spur gears connected via an idler – note synchronised rotational direction.  -- Suitable materials – the idler needs to be of a harder material than the other gears.  -- Two bevel gears linked to transfer the axis of rotation through 90o. |  | | 12/07/2019 |  | |  |  |
| 2 | | | | |  | | | ***Calculate* mechanical advantage (MA)**  **• Levers:** mechanical advantage calculations for levers using ratios.  • Calculations using LOAD/EFFORT; load ARM/effort ARM; etc.  *• Do NOT use the method of “taking moments about a point”.*  **• Gears:** mechanical advantage calculations for gears using ratios.  Calculations using tooth ratios; gear wheel diameters; velocity ratios. |  | | 19/07/2019 |  | |  |  |
|  | | | | |  | | |  |  | |  |  | |  |  |
| 3 | | | | Communication skills  Design skills | | | | **Represent gear systems graphically:** use circular templates and/or pair of compasses to draw gear systems with:  • The driven gear rotating in the ***opposite*** direction to the driver (counter rotation).  • The driven gear rotating in the ***same*** direction to the driver (include an idler gear).  • The driven gear rotating ***faster*** than the driver (with and without an idler).  • The driven gear rotating ***slower*** than the driver (with and without an idler).  **Design brief**: learners write a design brief with specifications for a device that will use a  combination of gears to achieve:  • A mechanical advantage with force multiplication of three times.  • An increase in output velocity of four times.  **Draw**: use an isometric projection using simple instruments (as in Maths Set) to draw sketches showing gear systems that meet each of the two above specifications. |  | | 26/07/2019 |  | |  |  |
| 4 | | | | Design skills  Investigation skills  Design skills | | | | **Sketches** (2D) showing gear systems that:  Provide an output force four times greater than the input force (MA = 4:1).  Provide double the rotation rate on a driven axle at 90o to the driver axle.  **System analysis – bicycle gear system**  Analysis of the gears used on modern bicycles – terminology: master/slave or driver/driven;chain wheel; cogs.  **Systems diagrams**  **Analyse** a mechanical system by breaking it into input-process-output.  Draw a Systems Diagram for a gear system with a mechanical advantage of 4:1.  **Plan** a mechanical system to produce a specific output.  Systems diagram for a gear train with the driven gear rotating faster than the driver. |  | | 02/08/2019 |  | |  |  |
| 5 | | Investigation skills  Impact of technology  Indigenous technology  Bias in technology | | | | | | **Learners working in teams investigate and report on ONE of the following:**  *Distribute the investigations so* ***all*** *are covered and reported in each class***.**  **Investigate**: The **impact** on the environment as a result of mining of:  Acid mine drainage ....................................................................... OR  **Investigate**: The **impact** on the environment as a result of mining of:  Dust pollution from mine dumps on residential areas ..................................... OR  **Investigate**: Iron age technology:  Indigenous mining of iron in South Africa before the modern era .......................... OR  **Investigate**: Bias in technology:  Gender bias in career choice / opportunities related to mining. |  | | 08/08/2019 |  | |  |  |
| **BEGINNING OF PAT** | | | | | | | | | | | | | | | |
| 6 | | Investigating skills  Design skills | | | | | | **Investigate**: Lifting mechanisms (wire rope-driven mine head-gear) in use at South African mines for raising people and ore.  **Sketch**: initial idea sketches to meet the requirements given in the scenario.  **Design brief** with specifications and constraints. |  | | 16/08/2019 |  | |  |  |
| 7 | | Evaluation skills  Making skills  Design skills | | | | | | **Simulation**: teams form mechanical engineering companies.  They **evaluate** sketches of individuals and select the best idea for the team tender bid.  **Drawings for the shaft head-gear** – each learner draws a:  3D isometric drawing of the selected design giving dimensions and drawn to scale.  2D working drawing showing one or more views with dimensions and lines.  **Budget**: teams prepare a realistic budget detailing expected costs of constructing a real mine shaft headgear, detailing valid prices of materials and labour costs of the range of workers who would be involved in designing and building such a device. |  | | 23/08/2019 |  | |  |  |
| 8 | | Making skills | | | | | | **Make**: teams build their working scale model using safe working practices. |  | | 30/08/19 |  | |  |  |
| 9 | | Communication skills | | | | | | **Communicate**: teams present their tender proposal for the mine shaft headgear (research, plans, flow chart, model and budget) to the “Tender Board”. |  | | 06/09/19 |  | |  |  |
| **10-11** | | **TERM TEST AND MARKING** | | | | | | |  | | 09-20/09/2019 |  | |  |  |
|  | | **TERM 4** | | | | | | | | | | | | | |
| 1 | | Electrical systems and control  Design skills | | | | | | **• Revise:** simple circuit components; input devices (electrochemical cell; generator; solar panel), output devices (resistor; lamp; heater; buzzer; motor); control device (switches).  Note: Some devices can serve as input, output, process or control device.  • Correct connections, short circuits. Electrical components and their accepted symbols.  • Drawing electrical circuits using accepted symbols (as in Grade 12 see Addendum C).  • Set up circuits using a range of components. Draw the circuits using symbols. |  | | 04/10/2019 |  | |  |  |
| 2 | | Impact of/bias in technology  Evaluation skills  Bias in technology | | | | | | • Energy for heating, lighting and cooking in rural and informal settlements.  • Energy from illegal connections; ethical issues; safety considerations.  • Class discussion: equitable sharing of resources – industry needs reliable power for job creation; schools need power for lighting and computing.  • Written report: Learners write a balanced report on these issues. |  | | 11/10/2019 |  | |  |  |
| 3 | | | | | | Electrical systems and control  Impact of technology | | • Electrochemical cells.  • Practical: make your own batteries – fruit, vegetable and salt water batteries.  Advantages and disadvantages of series and parallel batteries.  • Photovoltaic cells - advantages and disadvantages of solar cells. |  | | 18/10/2019 |  | |  |  |
| 4 | | | | | | Electrical systems and control  Impact of technology | | • Generate electricity for the nation – advantages and disadvantages of:  Thermal power stations (steam turbines – sources of heat: coal, gas, nuclear, sun).  Hydroelectric power stations (including pumped storage schemes).  Wind-driven turbines.  Alternating current; step-up and step down transformers; distributing electric power across the country: the national grid. |  | | 25/10/2019 |  | |  |  |
| **BEGINNING OF PAT** | | | | | | | | | | | | | | | |
| 5 | | | | | | Design skills  Investigation skills | | **• Practical**: learners draw circuit diagrams AND connect circuits showing the effect of circuits with resistors connected in series and parallel.  **• Investigation**: introduce Ohm’s Law (*qualitatively – no calculations*). Learners use one cell, then two cells, and then three cells connected in series and note the effect on the brightness of a lamp. They must conclude that more cells in series (*more voltage*) will cause the *current strength* to increase, if the *resistance* does not change.  **Investigation**: AND logic gate and simple cases where it is used.  **• Investigation**: OR logic gate and simple cases where it is used.  **• Lesson**: truth tables for AND & OR logic conditions. |  | | 01/11/2019 | |  |  |  |
| 6 | | | | | | Deign skills  Making skills  Communication skills | | • Design brief: learners write a design brief giving specifications for a suitable panic button system OR scenario given by the textbook.  • Circuit diagram: draw the circuit diagram using correct symbol conventions.  **• Make**: connect the components specified to form a circuit suitable for at least two switches.  **• Communicate**: learners draw the truth table for the device.  **• Communicate:** learners prepare an advertising poster for their device. |  | | 08/11/2019 | |  |  |  |
| 7 - 10 | | | | | |  | | **EXAMINATION AND MARKING** |  | | 11/11/2019to  04/12/2019 | |  |  |  |
|  | | | | | |  | |  |  | |  | |  |  |  |