**KS3 – Introduction to 2D CAD**

**Overview**

The following 5 lessons will guide your learners through the basics of AutoCAD. They include activities to ensure that the appropriate skills and knowledge is developed to allow for a solid foundation enabling your students to develop advanced 2D design skills.

**Course Preparation**

You will need AutoCAD software on a shared network drive so that children can access it. Optional additions of a template file and plot style table file also available to ensure quality prints on customised border sheets.

**Lesson 1**

*Resources: 2D Design Basics.ppt*

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| **Learning Objectives**   * Be able to name the main features of the AutoCAD interface * Use the zoom, pan and select commands to interact with a given drawing. |
| **Key Terms**  Computer Aided Design, Computer Numerical Control, Application Menu, Quick Access Tool Bar, Ribbon, In-canvas Controls, Drawing Tab, View Cube, Navigation Bar, Model/Layout Tabs, Command Line, Status Bar, UCS (Universal Coordinate System, Enter or Space Bar, Escape, Zoom, Pan, Select All, Select Crossing |
| **Starter: 10 minutes**   * Introduce the ‘Father of CAD’ Dr Patrick Hanratty and discuss the meanings of CAD and CNC. * Log in and open AutoCAD. |
| **Task 1: 20 minutes**  *Resources: AutoCAD Cheat Sheet.pdf*   * Use this activity to introduce the learners to the interface of AutoCAD. * Explain 3 labels at a time, ensuring to demonstrate/highlight the how each aspect of the interface is used. * Use recall questions to name the learnt aspects of the interface, writing them on the board as you go. * Finally, ask the students to label the three they have just learnt. * Move on to the next 3 and repeat. |
| **Task 2: 20 minutes**  *Resources: Example Drawing.dwg*   * Demonstrate the use of select crossing and select all. Allow the students an opportunity to try this out. * Demonstrate how to change the colour of selected lines and set the task:   + Use the ‘select all’ and ‘select crossing’ tools to highlight parts of the drawing. Change the colours of your selected parts to result in a multi-coloured drawing. |
| **Plenary: 10 minutes**  Ask the students to answer the following in their books:   1. Name 3 parts of the AutoCAD interface. 2. Does ‘select crossing’ show as a blue or green shape? 3. If I want to select just the stepped line, would I move my mouse ‘left to right’ or ‘right to left’?   Allow students time to save work and pack away. |

**Lesson 2**

*Resources: 2D Design Basics.ppt*

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| **Learning Objectives**   * Know what the layer functions are for * Be able to manipulate the layers * Draw a simple shape |
| **Key Terms**  Layers, Plot Style, Construction Lines, Rectangle, Polyline |
| **Starter: 10 minutes**   * Talk about the invention of Sketchpad. * Ask the students to study their AutoCAD Cheat Sheet that they created last lesson. You could use an activity here to encourage the students to test each other’s knowledge on the interface. * Log in and open AutoCAD. |
| **Introduction: 5 minutes**   * Discuss with the class why complex drawings require so many layers. Talk about the requirement of collaborative design engineering using the car as an example. |
| **Task 1: 5 minutes**  *Resources: Torch Orthographic.dwg*   * Demonstrate how layers are turned on and off and then allow the students an opportunity to try this out. Ensuring that they see the affects this has on the drawing. |
| **Task 2: 10 minutes**  *Resources: Torch Orthographic.dwg*   * Introduce the plot style table and explain what this means when your drawing is printed. * Ask the students to change the colours of the layers to be in line with the plot style table shown. |
| **Task 3: 20 minutes**  *Resources: Torch Orthographic.dwg*   * Explain the orthographic of the torch – 3 views. * Demonstrate how the construction lines work in this type of drawing and how they are used when adding to the drawing. * Ask the students to use the constructions lines to add a rectangle to represent the LEDs on the front of the torch. |
| **Plenary: 10 minutes**  Ask the students to answer the following in their books:   * 3 things you’ve done today * 2 new skills that you have learnt today * 1 reason why learning these skills is important   Allow students time to save work and pack away. |

**Lesson 3**

*Resources: 2D Design Basics.ppt*

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| **Learning Objectives**   * To learn AutoCAD shortcuts * To learn how to use the ‘Draw’ tools |
| **Key Terms**  Drafting office, drawing board, set squares, parallel arms, draw tools, line, polyline, circle, arcs, polygon, spline, hatch, gradient, rectangle, ellipse, construction lines, ray |
| **Starter: 5 minutes**   * Discuss the drafting offices that design engineers used to work in prior to the introduction of CAD. * Log in and open AutoCAD. |
| **Task 1: 10 minutes**  *Resources: AutoCAD Cheat Sheet.pdf*   * Demonstrate how you can discover the shortcut of a command by typing in the command line. Note, F12 (Dynamic Input) must be turned on. * Ask the students to complete the AutoCAD cheat sheet part 2. |
| **Task 2: 35 minutes**  *Resources: Draw Tools.dwg*   * Demonstrate each box at a time, guiding your students on how to successfully complete each box. Repeat the demonstration asking your students to complete it with you. * Note: The A4 tab is set up for printing if required. You would just need to alter the details. |
| **Plenary: 10 minutes**  Ask the students to answer the following in their books:   * Describe the activities completed during the lesson without using the keywords or topic of the lesson.   Allow students time to save work and pack away. |

**Lesson 4**

*Resources: 2D Design Basics.ppt*

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| **Learning Objectives**   * To learn how to use the ‘Modify’ tools |
| **Key Terms**  Move, rotate, extend, trim, erase, copy, mirror, fillet, chamfer, explode, join, stretch. |
| **Starter: 10 minutes**   * Students have 3 minutes to write down as many keywords from the previous lessons. * Log in and open AutoCAD. |
| **Task 1: 40 minutes**  *Resources: Modify Tools.dwg*   * Demonstrate each box at a time, guiding your students on how to successfully complete each box. Repeat the demonstration asking your students to complete it with you\*. * Note: The A4 tab is set up for printing if required. You would just need to alter the details.   \*More freedom could be given to the students to experiment as they gain in confidence. |
| **Plenary: 10 minutes**  Ask the students to answer the following in their books:   * Expand this sentence to summarise what you have learnt today.   "During today's lesson, I have learnt how to use the modify tools"  Allow students time to save work and pack away. |

**Lesson 5**

*Resources: 2D Design Basics.ppt*

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| **Learning Objectives**   * Continue to learn how to use the ‘Modify’ tools and learn how to annotate your drawing. |
| **Key Terms**  Scale, rectangular array, polar array, offset, multiline text, dimension |
| **Starter: 5 minutes**   * Log in and open AutoCAD. * Find the 2 key terms from the chopped up words on the board. |
| **Task 1: 30 minutes**  *Resources: Modify and Annotate.dwg*   * Students should now have developed sufficient confidence and skills to independently attempt this task. * Circulate around the room assisting where required. * Note: The A4 tab is set up for printing if required. You would just need to alter the details.   Allow students time to save work. |
| **Plenary: 25 minutes**  *Resources: AutoCAD Blockbusters.ppt*   * Split the class up in to two teams to play a game of blockbuster to summarise the learning of the course. |