

Core Mechanical Carousel – Machine Shop Appreciation – Synopsis

Scope

- Following on from prior learning from phase 1 mechanical carousels. The concept is to further develop student skills and knowledge of precision engineering and maintenance by - extending the learning by producing various machined piece parts to a higher standard of precision and more advanced techniques such as: Taper Turning, Screw cutting, Boring, Key cutting & using an indexing device. The learners will also be encouraged to look at the science and theory behind the processes involved – for example - understanding how the dividing head works, surface finish, limits & fits, screw threads, speeds & feeds, workshop calculations (non calculator) for ***trigonometric*** functions . The learners will also have an opportunity to undertake real world maintenance tasks on the machinery and equipment used. By doing so the students will need to assess, plan, set targets and collaborate with each other and the trainer. As all aspects of the projects are tangible and realistically achievable in the time scale. The learning outcome will be very positive.

Potential barriers to be considered are the availability of certain machinery, also potential maintenance issues. Almost always it is difficult to follow the flow of the tasks laid out in the Scheme of Work & Lesson Plans therefore it may be necessary to divide the practical tasks between the group to enable continuity. There is also the case where a maintenance fault may arise early in the carousel which may result in machinery not being available. This scenario may be quite useful as the learner will be required to undertake remedial action to correct the problem which in turn meets the requirement of the ROA for *CME28 Machine Inspection and Maintenance*. See the Scheme of Work for details.

ROA Criterion

- Limits & Fits CME6
- CME27-Workshop Safety Procedures & Practice
- Machine Shop Appreciation CME29
- CME28-Machine Inspection and Maintenance

Aim

- To gain an understanding of Limits & Fits in Engineering.
- To develop awareness, knowledge, understanding and experience of workshop safety.
- To successfully manufacture several piece parts using various machine tools.
- To develop student awareness, knowledge, understanding and experience of machine inspection and maintenance.
- Be able sharpen a twist drill.

Objectives

- Limits & Fits (*ROA Ref CME6*)
- Maintain the safety of self (and others) by following laid down procedures & Instruction. (*ROA Ref CME27*)
- Manufacture piece parts to specification – using the centre lathe. (*ROA Ref CME29*)
- Manufacture piece parts to specification – using the milling machine. (*ROA Ref CME29*)
- Be able to produce an internal and external keyway. (*ROA Ref CME29*)
- Demonstrate an appreciation of how to sharpen twist drills by hand, using the off-hand grinder. (*ROA Ref CME29*)
- Undertake maintenance tasks on machinery. (*ROA Ref CME28*)

Underpinning Knowledge Lectures – Refreshers /Consolidation

- Limits & Fits /Surface Finish
- Apply safe working practices, Work-shop/Machine-shop safety.
- Workshop calculations
- Project / Job planning.
- Measurement –Emphasis on Imperial - **Dependent on prior learning.**
- Engineering drawing – **Dependent on prior learning**
- Safe use of the Centre Lathe.
- Safe use of the Milling Machine.
- Safe use of Hand Tools.
- Abrasive Wheels/Drill Grinding

Hand-outs

- Limits & Fits work sheet & data sheet.
- Detailed part drawings.
- Planning Sheets.
- Measurement – Units, conversions & reading a vernier.
- Milling & Indexing.
- Abrasive Wheels
- Drill Nomenclature

Write-ups

- Planning sheets.
- PPM Record.
- End test.
- ROA.

Experiential Learning - Learning through practical experience and learning by reflecting on experience.

Learning through practical experience

- Learning in a work-based environment – TTE Workshops.
- Planning and carrying out practical tasks and write-ups.
- Expanding skills & knowledge base.

Learning through reflecting at all stages of the experience

- Preparing and planning for the tasks
- Reflecting throughout the tasks to further improve
- Reviewing and adapting as necessary
- Reflecting after the task has been completed
- Evaluating, self-assessing and identifying learning points.

Core Skills Employed

Of the five Core Skills four are covered:

- **Communication** – *Understanding & Interpreting Engineering Drawings,*
- **Numeracy** – *Using Imperial & Si Units to make calculations. (non calculator)*
- **Problem Solving** – *Dealing with problems that arise during the manufacturing process & maintenance tasks.*
- **Working with Others** – *Collaborating to work Effectively & Efficiently by seeking advice from the TO whilst working with their peers as part of a team.*
- **Information Technology** – *Using Computer Aided Machining & Programming-Extension.*

Generic Skills & Attitudes Gained:

- Understanding of the workplace and the employee's responsibilities, for example H&S, time-keeping, appearance.
- Self-evaluation skills.
- Positive attitude to learning.
- Flexible approaches to solving problems.
- Adaptability and positive attitude to change.

Learning Outcomes

- Be fully conversant with the Health & Safety requirements.
- Gain an understanding of Imperial & Metric measurement systems.
- Be able interpret and understand Engineering drawings.
- Be able to plan a project.
- Use the Centre lathe to accurately produce turned components.
- Use the Milling machine to accurately produce milled components.
- Use an Indexing device for the purpose of cutting equal angles.
- Use the CNC Milling machine to program and produce components - Extension
- Use Hand tools to accurately produce fabricated components.
- Develop an understanding of the “Whole Picture” through planning & manufacture.
- Working with others as part of a team.
- Self-Actualization, self-reliance, confidence - through achievement.