

COMPUTERISED PRODUCTION & INSPECTION PROCESSES CIT, SPECIAL PURPOSE AWARD, 15 CREDITS: YEAR 1

DRAFT PROGRAMME

Developed in collaboration with the South-West Regional Skills Forum

YEAR 1: 3 Modules

- CNC Programming & Manufacturing
- CAD/CAM
- Introduction to Metrology Systems (Semi & Fully-Automated)

CNC Programming and Manufacturing [Module 1].

Examination: Five Lab Reports, 70%, based on in class work, End of Term written exam, 30%.

Learning Outcome 1: Principles of CNC Machine Tools.

Indicative Content:

Machine Types and Axis, Controls, Open/Closed Loop systems, Spindle and drive Motors, Ballscrews/Linear motors, Guideways, Encoders, Tool holders and Magazines, Tool Setting, Datums/Datum setting.

Learning Outcome 2: Tooling and Coolants.

Indicative Content:

Coolants: Types/Purpose, Delivery methods, Pressures/Filtration, Problems/Solutions, management.

Tooling: Tooling Material, Tool Angles, Tool Properties, Tool Coatings, Applications, Speeds and Feeds, Surface Texture.

Learning Outcome 3: Process Planning.

Indicative Content:

Work Holding methods, Work Holding Problems, Drawing Interpretation, Drawing Tolerances and Symbols (Simple GD&T, Surface, etc.), Logical Procedures, Machining options/strategies.

Learning Outcome 4: 2D Programming, Mill and Lathe.

Indicative Content:

ISO, Conversational (Heidenhain, Hurco, CELOS), Coordinate Systems, Coordinate Modes, Editing, Tool Tables, Canned Cycles, Programme section repeats, Datum Selection, Simulations.

Learning Outcome 5: Multi Axis Milling.

Indicative Content:

5 axis Layout/Types, 3+2 Positioning, 3+2 Programming, Orientation, Planes, Canned Cycles, Work holding, Extended Tool holders, etc.

Learning Outcome 6: Multi Axis Turning.

Indicative Content:

Y and C axis. Live Tooling Holders, Live tooling setup, Radial and Axial Tools, Drilling/Tapping, Canned Cycles, etc.

Learning Outcome 7: Mill Manufacturer.

Indicative Content:

Workpiece Alignment, Origin setting, (Manual and Probe), Tool Setting, Machining Modes, Dry Run, Feeds and Speeds Overrides, Part Inspection, Error correction.

Learning Outcome 8: Lathe Manufacturer.

Indicative Content:

Tool Setup, Machining Modes, Dry Run, Feeds and Speeds Overrides, Part Inspection, Error correction.

[CAD/CAM \[Module 2\]](#)

Examination: In class assessment 100%.

Learning Outcome 1: 2D CAD (Mill and Lathe)

Indicative Content:

Simple 2D Drawing, Line Types, Line Weights, Layers, Commands (Line, Arc, Circle, Rectangle, Chamfer, Fillet, Array, etc.), Editing, Saving, Formats (dwg, dxf, etc.).

Learning Outcome 2: 2D CAM (Mill and Lathe)

Indicative Content:

Machine Orientation, Tool library, Tool creation and editing, Materials, Origin Setting/Editing, Tool Planes, Tool offset, Machining Strategies (Drill, Pocket, Rough, Finish, etc.), File Import/Export.

Learning Outcome 3: Post Processing (Mill and Lathe)

Indicative Content:

Post Selection, Posting, Communications (DNC, Network, USB, etc.) Machine selection, Editing of Simple Posts,

Learning Outcome 4: 2 ½ and 3D Machining (Mill only)

Indicative Content:

Import/Export of Surface and Solid Models, Tool selection, Boundaries, Solid Model to 2D model (extraction), Automatic Feature Programming. Automatic feature strategy editing.

Learning Outcome 5: Live Tool Programming (Lathe only)

Indicative Content:

Import/Export of Surface and Solid Models, Tool selection, Boundaries, Automatic Feature Programming. Automatic feature editing.

Learning Outcome 6: Simulation

Indicative Content:

Simulation Types/Modes, Crashes Detection, Error Detection, Clamping/Vice, Machine Tool Model.

Introduction to Metrology Systems (Semi and Fully Automated) [Module 3].

Learning Outcomes:

On successful completion of this module the learner will be able to:

1. Interpret & Translate part drawings into measurement system requirements,
2. Select appropriate measurement methods for a given application,
3. Understand specifications of measurement systems,
4. Assess basic capabilities of measurement systems, and translate achieved results into actions,
5. Understand methodologies for measurement system management and calibration.

Indicative Content:

Part Specification:

Tolerancing methods & standards. Basic geometric dimensioning & tolerancing including datum structures. Surface roughness & surface finish.

Measurement Instrumentations & Methods:

CMM systems and configurations, sensor types: tactile, vision, laser etc. Optical Comparator systems & attribute gauging. Surface Roughness systems.

Measurement Systems Analysis & Management:

Measurement system selection, Sources of measurement error, gauge R&R, calibration & traceability, resource management, case studies.



Assessment Strategy:

50/50 split between Practical & Exam.

- 1 x 10 % Mid Term Exam Assessment
- 2 x 20% Mid Term Projects (Gauge R&R and System Selection 20% each)
- 1 x 10 % End of Term Practical Assessment (Gauge R&R on PC) Linked to 40% exam.
- 1 x 40 % End of Term Exam Assessment

Total 100%

Completion of a suite of accredited modules will lead to an award of Certificate in Computerised Production & Inspection (currently awaiting validation).