

上課時間 Class time : 3 hours

示範助教 Demonstration Assistant : 張桓

1. 開機、暖機程序、工具機簡介 : Start-up, warm-up procedures, machine tool introduction

各種工具機實機介紹 : 第一實習工廠-三軸銑床、四軸銑床、五軸銑床、車銑複合、車床、線切割等。 Introduction to various actual machine tools:

The first internship factory - Three-axis milling machine, Four-axis milling machine, Five-axis milling machine, Turning-milling compound, Lathe, Wire cutting machine, etc.

CNC 工具機介紹 : 控制器、伺服馬達、滾珠螺桿、光學尺、回授控制、多軸同動、線性滑軌、線性馬達。

Introduction to CNC machine tools: Controller, Servo motor, Ball screw, Optical ruler, Feedback control, Multi-axis simultaneous motion, Linear slide rail, Linear motor.

電力源 : 三相電源、穩壓器、停電措施、安全措施等。

Power source: Three-phase power supply, Voltage regulator, Power outage measures, Safety measures, etc.

氣壓源 : 快速接頭、空壓機、氣槽、壓力計、排氣閥、排水處理、乾燥機、油霧等。

Air pressure source: Quick connector, Air compressor, Air tank, Pressure gauge, Exhaust valve, Drainage treatment, Dryer, Oil mist, etc.

主軸 : 立式、臥式、潤滑、冷卻、暖機。

Spindle: vertical, horizontal, lubrication, cooling, warm-up.

刀具 : 換刀裝置、端銑刀、球銑刀、平銑刀、面銑刀、導角刀、鑽頭、中心鑽、螺絲攻、巡邊器、精密探頭等。

Tools: Tool changer, end mill, ball mill, flat mill, face mill, angle cutter, drill bit, center drill, screw tap, edge guide, precision probe, etc.

夾具 : 三爪、四爪、軟爪、虎鉗等。

Clamps: three-claw, four-claw, soft-claw, vise, etc.

2. 面板介紹 Panel introduction

控制器 : Fanuc、SIEMENS、台達電等。 Controller: Fanuc, SIEMENS, Delta, etc.

面板電源鈕、緊急暫停鈕、Reset 鍵等。

Panel power button, Emergency pause button, Reset button, etc.

3. 手動示範 : Manual demonstration:

原點復歸、座標軸、座標系、進給速度、主軸轉速設定、換刀等。

Origin return, coordinate axes, coordinate system, feed speed, spindle speed setting, tool change, etc.

機械座標、工作座標、手輪定位、指定座標定位。

Mechanical coordinates, working coordinates, hand wheel positioning, specified coordinate positioning.

刀具形式設定、刀具長度量測、刀具直徑量測及設定等。

Tool form setting, tool length measurement, tool diameter measurement and setting, etc.

工件位置 : 巡邊器量測(X 軸/Y 軸)、量高器測量(Z 軸)。

Workpiece position: edge detector measurement (X-axis/Y-axis), height gauge measurement (Z-axis).

最重要 : 確認工件座標 (0, 0, 0)位置正確。

The most important: Confirm that the workpiece coordinates (0, 0, 0) are in the correct position.

練習指定座標定位。 Practice specifying coordinate positioning.

4. 手寫 CNC 指令：Handwritten CNC instructions:

G54 ~G59 ; 座標系統 Coordinate system

G90 G91 絕對座標(工件座標) 相對座標

Absolute coordinates (workpiece coordinates) Relative coordinates

G92 X0.Y0. 絕對座標暫設原點定位 (Zero point of setting)

G90 G28 Z0. 原點復歸(經中繼點目前坐標系的 Z0)

Return to origin (Z0 of the current coordinate system via the relay point)

G41/G42 D01 ; G40 刀具半徑補正(左補正、右補正)、補正取消

tool radius compensation (left compensation, right compensation), compensation cancellation

G43 H01, G49 刀具長度補正、補正取消

tool length correction, correction cancellation

G00 X0. Y0. 快速定位 Quick positioning

G01 X10. F100 (mm/min) 直線進給定位 linear feed positioning

G02 X20. Y20. I10. J10. F100 C.W. 用圓心點找弧線進給定位 Positioning via center point arc feed

G03 X30. Y30. R20. C.C.W.藉由半徑找弧線進給定位 Positioning by radius arc feed

G04 P3000 (ms) 暫停 pause

G04 X 3.0 or G04 U 3.0 (s) 暫停 pause

G17 XY plane ; G18 ZX plane ; G19 YZ plane ; 座標平面 coordinate plane

G02 G17 X20. Y20. Z20. I10.J10. 螺線進給 Spiral feed

G80 週期性指令取消 periodic command cancellation

M30 程式停止、光標回到程序頭。program stops and the cursor returns to the program head.

M02 程式停止、光標停在程序末尾。program stops and the cursor stops at the end of the program

M00 (M01) 程式暫停 (面板啟動 OP STOP 鍵時才可用 M01)。

M00 (M01) Program pause (M01 is available only when the OP STOP key is activated on the panel)

5. 西門子控制器程式編輯、模擬、執行

Controller program editing, simulation, and execution

6. 關機流程 Shutdown process