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# COMPUTER NUMERICAL CONTROL PROGRAMMING

## Programming & development

## Course Curriculum

## Basic – 16 Hours

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# COMPUTER NUMERICAL CONTROL PROGRAMMING

## Module 1 : Introduction to CNC Programming

Introduction to CNC Programming

Basic principles of CNC operation

## Module 2 : Installing the CNC Software

Environmental Setup of CNC

## Module 3 : Introduction to CNC Technology

Explore the historical context and evolution of CNC Technology

Understand the fundamental principles behind CNC machining and its significance in modern manufacturing

Identify key applications and industries where CNC machining is commonly used

## Module 4 : Coordinate systems

Understand the importance of machine and workpiece coordinates

Cartesian coordinate system and its application in CNC programming

## Module 5 : CNC Machine Components

Study the major components of CNC machines

Controller

Motors

Tooling System

Function and operation of CNC machine parts

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## Module 6 : G-code Basics

Introduction to G-code

CNC program structure and syntax

Simple CNC programs

## Module 7 : Toolpath Basics
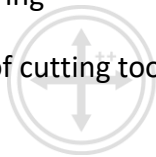
Basic milling and turning operations

Creating simple toolpaths

Simulation and verification of toolpaths

## Module 8 : CNC Machine Setup

Workpiece setup and fixturing

Selection and installation of cutting tools

## Module 9 : Basic Machining Operations

Milling and turning operations

Introduction to drilling and tapping

Simple contouring and pocket milling

## Module 10 : Advanced G-Code Programming

Detailed study of G-code commands

Writing more complex CNC programs

G-code programming for specific machining operations

## Module 11 : Toolpath Optimization

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Fine-tuning toolpaths for efficiency

Use of CAM software for optimized toolpaths

## Module 12 : Multi-Axis Machining

Introduction to multi-axis machining concepts

Programming for 4-axis and 5-axis machines

Simultaneous and indexed machining

## Module 13: Advanced Machining Operations

High-speed machining techniques

Thread milling and other advanced milling operations

Turning operations for complex geometries

## Module 14: CNC Machine Features

Understanding and programming for advanced machine features

Tool changes and tool magazines

## Module 15: Debugging

Identifying and resolving common CNC programming erros

Debugging toolpath issues

## Module 16: Advanced CAM Software Features

Advanced features of CAM software

Custom post-processors

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## **Module 17: Complex Machining Strategies**

High-precision machining techniques

Machining composite materials

## **Module 18: Automation and Integration**

Implementing automation in CNC Programming

Integration with other manufacturing systems

## **Module 19: Industry-Specific Applications**

Understanding industry standards and requirements

Case studies and real-world applications