



## **Lesson Plan: Introduction to CNC Technology with Unimat CNC Machines**

**This semester-long lesson plan for an Introduction to CNC Technology using Unimat CNC machines. The plan assumes a 16-week semester with weekly sessions lasting 2–3 hours. Adjustments can be made for different schedules or learning speeds.**



# 1 Week 1: Introduction to CNC Technology

- **Topics:**
  - Overview of CNC technology: history, applications, and industries.
  - Introduction to Unimat CNC machines: features and capabilities.
- **Activities:**
  - Tour of the workshop and safety protocols.
  - Start unpacking and recognizing the parts of the Unimat CNC machines.
- **Assignments:**
  - Read about CNC applications in manufacturing.
  - Watch introductory videos on CNC machining.
  - Discuss the difference between Unimat CNC machines and industrial CNC machines

# 2 Week 2: Basics of CNC Machining

- **Topics:**
  - Cartesian coordinate system (X, Y, Z axes).
  - Machine components: spindle, bed, chuck, and tool holder.
  - Measuring tools and tolerances
- **Activities:**
  - Identify and label parts of the Unimat CNC machine.
  - Start assembling the Unimat CNC milling machine
  - Hands-on practice: manually moving the machine axes.
- **Assignments:**
  - Write a short summary of how CNC machines differ from manual machines.

# 3 Week 3: CNC Machine Setup

- **Topics:**
  - Tools and materials: selection and properties.
  - Mounting workpieces and aligning tools.
- **Activities:**
  - Load and secure a sample workpiece in the machine.
  - Practice tool alignment with Unimat CNC machines.

- **Assignments:**

- o Research types of tools used for different machining operations.

## 4 Week 4: Introduction to G-Code

- **Topics:**

- o Basics of G-Code: common commands and syntax.
- o Reading a simple G-Code program.

- **Activities:**

- o Write a basic G-Code to move the machine along the X and Y axes.
- o Test the code in the simulation mode.

- **Assignments:**

- o Write a short program to draw a square on paper. – see manual

## 5 Week 5: Software for CNC Programming

- **Topics:**

- o Introduction to CAD/CAM software compatible with Unimat CNC machines
- o Overview of workflow: design, toolpath generation, simulation, and machining.

- **Activities:**

- o Design a simple part in the CAD software.
- o Start with Inkscape to make the first designs – see manual
- o Generate the toolpath for the design.

- **Assignments:**

- o Complete a tutorial on basic CAD design.

## 6 Week 6: Basic Machining Operations

- **Topics:**

- o Cutting, drilling, and facing.
- o Understanding feed rate, spindle speed, and depth of cut.

- **Activities:**

- o Perform a basic facing operation on the Unimat CNC machine.
- o Adjust feed rate and spindle speed for different materials.

- **Assignments:**
  - Research material-specific cutting parameters.

## 7 Week 7: Practical G-Code Applications

- **Topics:**
  - Modifying and troubleshooting G-Code.
  - Using G-Code for real-world tasks.
- **Activities:**
  - Create and run a G-Code program to machine a small part.
  - Debug errors in sample G-Code programs.
- **Assignments:**
  - Create a G-Code program for a personalized nameplate.

## 8 Week 8: Mid-Semester Project

- **Project:**
  - Design and machine a simple object (e.g., a keychain or coaster).
  - Submit design, G-Code, and final machined part.
- **Activities:**
  - Receive feedback on design and machining process.

## 9 Week 9: Advanced Machining Techniques

- **Topics:**
  - Sub-routings, contouring, and pocketing.
  - Multi-axis operations on Unimat machines.
- **Activities:**
  - Perform worm milling or contouring operation.
  - Experiment with multi-pass machining for complex shapes.
- **Assignments:**
  - Research the benefits of multi-axis machining.

## 10 Week 10: CNC Machine Maintenance

- **Topics:**
  - Routine maintenance of Unimat CNC machines.
  - Troubleshooting common issues.
- **Activities:**
  - Clean and lubricate machine components.
  - Replace a worn tool.
- **Assignments:**
  - Write a maintenance checklist.

## 11 Week 11: CNC Tooling and Optimization

- **Topics:**
  - Types of CNC tools and their applications.
  - Optimizing machining processes for efficiency.
- **Activities:**
  - Perform a tool change and measure tool offsets.
  - Compare machining times with different setups.
- **Assignments:**
  - Analyze a case study on process optimization.

## 12 Week 12: Automation in CNC

- **Topics:**
  - Overview of automation and robotics in CNC technology.
  - Benefits and challenges of automated machining.
- **Activities:**
  - Program the machine for batch production.
  - Discuss integration of CNC with robotic arms.
- **Assignments:**
  - Research trends in CNC automation.

## 13 Week 13: Quality Control and Inspection

- **Topics:**
  - Measuring tolerances and surface finishes.
  - Common inspection tools (calipers, micrometers).
- **Activities:**
  - Inspect machined parts for accuracy.
  - Record and evaluate deviations from design.
- **Assignments:**
  - Write a report on quality assurance in CNC machining.

## 14 Week 14: Advanced CAD/CAM Applications

- **Topics:**
  - Creating complex designs using advanced CAD features.
  - Generating multi-tool toolpaths in CAM.
- **Activities:**
  - Design and machine a more complex part using multiple tools.
- **Assignments:**
  - Complete a detailed CAM tutorial.

## 15 Week 15: Final Project

- **Project:**
  - Design, program, and machine a functional product (e.g., a small mechanical part or decorative item).
  - Submit a project report covering design, process, and lessons learned.
- **Activities:**
  - Present projects to the class and discuss challenges faced.

## 16 Week 16: Review and Wrap-Up

- **Topics:**
  - Review key concepts and skills learned during the semester.

- o Discuss potential career paths in CNC machining.

- **Activities:**

- o Class discussion on lessons learned.
- o Feedback session and course evaluation.

This plan ensures students build a solid foundation in CNC technology while gaining hands-on experience with Unimat CNC machines. It also incorporates theoretical knowledge, practical applications, and opportunities for creativity and critical thinking.

