International CAM Course @ Tecnun School of Engineering
Summer 2026 Syllabus

Course: Fundamentals of Computer Aided Manufacturing and CNC
(6 ECTS/4.5 Quarter Credits Cal Poly SLO)

Dates: June 15th – July 3rd, 2026

Overview: This 3-week international course combines engineering students from the US and Europe at Tecnun Universidad in San Sebastian, Spain. Students will be immersed with hands-on practice and instruction in computer aided manufacturing (CAM), with a focus on computer numerical control (CNC) metal-removal equipment (Haas CNC mills and lathes) along with programmable inspection equipment and techniques for machined components. Lecture and Lab activities will take place in Tecnun's state-of-the-art Gene Haas CNC Manufacturing Lab. The course, "Fundamentals of Computer Aided Manufacturing and CNC," a 4.5-unit quarter class (6 ECTS), can substitute for IME 335 at Cal Poly and will be taught in the English-language by two experienced Cal Poly faculty members. After lunch on campus, in the afternoons, Tecnun faculty will lead cultural activities, industry tours, and local sightseeing with the course participants.

Reference Textbooks:
Machinery's Handbook 30th Ed. Industrial Press
ISBN# 978-0-8311-3092-3
Machining & CNC Technology 4th Edition
ISBN#: 978-1259827440
Haas CNC Mill & Lathe Programming Workbooks

Software: SolidWorks 2026 (Sponsored by SolidWorks)
Mastercam 2026 (Sponsored by Mastercam)

Prerequisites: Computer Aided Design (CAD) Course & Basic Machining Knowledge

Instructors: Dr. Dan Waldorf & Mr. Trian Georgeou

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Computer Aided Manufacturing Class Schedule

Week	Lecture Topics	Lab Topics
June 15	CNC Safety, Machinability, Cutting Tool Selection/Applications, Work-Holding, Job Planning & Manufacturing Operations Planning ***Introduce CNC Project #1 – Manual Program Mill***	Chip Formation, Feed/Speed Calculations for Drilling, Milling, & Turning, Material Removal Rates, Horsepower, & Setting Up a CNC Mill & Machining a Part Lab Demo CAD Lab Assignment
June 16	CNC Mill Manual G & M Code Programming, Rapid-, Linear-, Circular-, Helical-, Interpolation & Canned Cycles, C.L. Data, & Cutter Comp & Writing G&M Code from C.L. Data	CNC Project #1 Mill Setup Lab & CNC Project #1 Toolpath Drawings Assignment
June 17	The Anatomy of a CNC Machine: CNC System Design / Architecture Control Formats, Axes, Drive & Control Elements	CNC Project #1 Manual G & M Code Creation, Simulation, Machine Setup, & Mache Time
June 18	Manual Metrology Tools, Inspecting CNC Parts, Conventional vs Geometric Dimensioning & Tolerancing (GD&T) specifications Creating a First Article Inspection Reports (Chapters 4, 6 & 7)	CNC Project #1 First Article Inspection Report & CNC Project #1 F.A.I.R. Lab
June 19	CNC Macro Programming Overview CNC Probing on Haas Machines Tool Probe & Spindle Probe Macros.	CNC Macro Programming Lab Assignment
June 22	Coordinate Systems and Transformations Parametric representation of Lines and Circles	Introduction to CAD/CAM Software for CNC Mill Programming ***Introduce CNC Project #2 -CAD/CAM Mill*** Mastercam 2026 2 ½ Axis Toolpath Introduction & Demo Part Programming
June 23	Parametric Representation of Curves, Splines, and Surfaces	CNC Project #2 CAD Design & Mastercam Programming Overview CNC Project #2 Workholding & Soft Jaw Creation & CNC Project #2 Mastercam CAD/CAM Programming
June 24	Data Exchange Formats and Digital/Additive Manufacturing	Tool Life & Productivity in CNC Milling: Dynamic Milling, Radial Chip Thinning & The Golden Rules for Milling *CNC Project #2 CNC Mill Setup* *&* *CNC P*roject #2 Machine Time
June 25	CNC (Lathe) Hardware, Hardware Interpolation, and System Controller Design	3-Axis & Multi-Axis CNC Programming Overview Haas 3+1 Machining Demo & *CNC P*roject #2 Machine Time
June 26	CNC Lathe Anatomy, Turning Operations, Lathe Tooling Manual and Advanced Manual CNC Lathe programming	CNC Project #2 Coordinate Measuring Machine PCDMIS Part Inspection & Machine Time
June 29	CAD/CAM CNC Lathe Programming	Setting Up a CNC Lathe Overview CNC Lathe Programming with Visual Quick Code ***Introduce CNC Project #3 – CAD/CAM Lathe*** CNC Project #3 CNC Lathe Setup
June 30	CAM Compiler, Post-processor and CL Tool Path Generation	CNC Project #3 Mastercam CAD/CAM Programming & *CNC P*roject #3 Machine Time
July 1	Curve & Surface Software Interpolation Errors	CNC Project #3 Machine Time & CNC Project #3 First Article Inspection Lab
July2	Summary of CNC Errors and Tolerances	Curves and Corner-Rounding Errors Lab / Advanced Equipment / Robot Arm Demo
July 3	Review / Final Exam	CMM Programming/Inspection

Course Learning Objectives:

Students will be able to:

- Produce and interpret engineering drawings with parametric relations and design specifications such as dimensions, size and geometric tolerances, and reference datums.
- Construct CNC code manually, interpret CNC codes, and generate CNC codes using commercial CAM package.
- Identify hardware and software elements that make up a CNC machine.
- Set-up and operate a CNC-controlled machine tool safely and efficiently.
- Describe the steps taken in CAM software to produce G&M code for a CNC machine tool.
- Propose design recommendations, including dimensional tolerances, for a part that is to be machined on a CNC machine tool.
- Compute cutter location points for a CNC-programmed machine tool based on a desired geometry, including complex curves, surfaces, and multi-axis movement.
- Analyze manufacturing processes and processes selection for optimum design.
- Describe basic metalworking and machining terminology
- Perform machining calculations: feed, speed, material removal rates, & horsepower
- Apply appropriate inspection tools and application methods.
- Prepare and perform a First Article Inspection Report on a CNC machined part.
- Design and document manufacturing process routings / procedures
- Describe the use and importance of coordinate systems in CAD and CAM and coordinate system transformations
- Explain the use of parametric representation of geometric entities in CAD and CAM
- Represent geometric entities associated with line segments, arcs, curves, splines, and surfaces mathematically in parametric forms.
- Describe the various formats and standards for electronic storage of CAD data.
- Design a CNC motion control system to meet performance and cost specifications.
- Recognize and list the various errors inherent with CNC-controlled machining.